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| Title | A data driven approach to student retention: the impact on leadership behaviour |
| Authors | McCarthy, Jonathan |
| Publication date | 2019 |
| Original Citation | McCarthy, J. 2019. A data driven approach to student retention: the impact on leadership behaviour. PhD Thesis, University College Cork. |
| Type of publication | Doctoral thesis |
| Rights | © 2019, Jonathan McCarthy. - http://creativecommons.org/licenses/by-nc-nd/3.0/ |
| Download date | 2026-11-06 02:06:53 |
| Item downloaded from | https://hdl.handle.net/10468/8988 |



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## Business Information Systems



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University College Cork, Ireland

# A Data Driven Approach to Student Retention: The Impact on Leadership Behaviour

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Bachelor of Arts, Master of Commerce, Post Graduate Diploma

*A Thesis Submitted for the Degree of Doctor of Philosophy (PhD) of the National University of Ireland*

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**2019**

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# Declaration

The Author hereby declares that, except where duly acknowledged, this thesis is entirely his own work and has not been submitted for any degree in the National University of Ireland, or any other University.

Signed: 

# Abstract

Student retention is important to all Higher Education Institutions (HEI's). The typical focus has seen institutions identifying 'at risk' students by monitoring a set of factors such as student attendance, engagement, performance, socio-economic background, etc. Institutions want to identify 'at risk' students and intervene before the 'at risk' student becomes a retention statistic. Once the factors are identified, this typical model often provides data to decision makers (leaders and/or senior managers) to assist with the identification of 'at risk' students in each leader's department. However, some HEI's have also historically relied on more tacit knowledge (opinions, anecdotes and biases) rather than actual data. In a data driven culture, leaders make decisions based on data and information rather than intuition and bias. HEI's typically provide relevant data to leaders creating an opportunity to craft an intervention to change student behaviour. Interestingly, whether HEI's are using data or tacit knowledge, all typically employ the same next steps once an 'at risk' student is identified: intervene to try and change the 'at risk' student's behaviour. These interventions are quite consistent across HEI's and can include supports such as interaction with faculty, mentoring, career guidance, counselling, orientation programmes or even access to technology. These interventions, or supports, can be grouped into three categories: Academic, Environmental and Institutional. What is also interesting however, is that there are a number of methodological and theoretical gaps in the area of student retention research. The vast majority of the research has used positivist approaches to collect and analyse data and focused, understandably, on the perspective of the student. Exploiting these gaps, this exploratory study is building theory by analyzing data gathered through interviews, surveys and participant observation in a HEI. A single case study design is chosen with an Irish HEI as the case. Another crucial difference is that this research focuses on the perspective of the leader rather than the student. After moving towards a data driven culture, the paper will ask a number of key questions:

1. What characterises leadership behaviour in a typical[1] student retention model?
2. What is the impact of a data-driven approach on leadership behaviour in a student retention model?

[1] A typical student retention model is one which may rely heavily on opinions, biases and anecdotes i.e. (non data-driven). It also focuses on 1st year full time students, which is also the primary focus of this research

# 1. Chapter 1: Introduction

This chapter will introduce the main elements of the research and set the scene for the remainder of the thesis.

## 1.1 About the Practitioner/Researcher

This practitioner/researcher[2] joined Cork Institute of Technology (CIT) in 2013 as Head of IT for the institute. This covers all aspects of IT for CIT and all its constituent colleges (Cork School of Music, Crawford College of Art and Design and the National Maritime College of Ireland). Being a member of CIT's senior leadership team has provided the researcher with a fantastic opportunity to access the leadership team across CIT. During 2013 while spending time reviewing what processes, people and technologies were central to CIT the researcher also spent time meeting with as many of CIT's senior leadership team as were available. These discussions led the researcher to conclude many things, one of which was that CIT was blessed with rich data sets but was not exploiting those data sets. In late 2013 the researcher kicked off a programme of work that set out to exploit those data sets.

The data driven programme of work involved taking the substantial data sets available to CIT, in particular in its data warehouse, and presenting that data visually to our senior leadership team in a way that would allow them to consume the data on their terms. Effectively, the programme was setting out to push data back into the organisation through its leadership in a way that would allow leaders self-serve and make decisions based on data rather than intuition alone. The programme of work was commencing in 2014 and the researcher anticipated that it would take at least 2 years for the programme to start having real impact among our leadership. Much of the initial focus was on providing data related to student retention. At this point, the researcher was also interested in pursuing a PhD and saw this programme of work as an opportunity for some applied research. There were a number of important points which influenced the research at this juncture:

[2] From this point on the word 'researcher' will be used to represent the practitioner/researcher. The term practitioner/researcher refers to a practicing manager who undertakes research and can make sense of the realities they face through leveraging their practitioner perspective and their research perspective, therefore allowing two views to combine.

- As an area that the researcher felt passionate about, and also an area central to the programme of work, the researcher hoped that leadership might provide a research opportunity
- The researcher knew that student retention was going to be one of the primary areas of focus for the leadership team and that CIT held significantly rich stores of that data in its data warehouse
- However, being new to CIT and Higher Education (HE), the researcher did not have a strong view on a relevant research problem
- As a member of the senior leadership team, the researcher knew that he would have access to the leadership in a way that could prove extremely beneficial to any research
- The researcher knew that this provided him with an opportunity for some relevant applied research, however, the researcher did not yet have a research gap identified

The above points confirmed for the researcher that he needed to conduct a review of the literature in the areas of student retention, leadership and data to further understand each area. In particular the literature review was aimed at understanding if there was a research gap that the researcher could exploit with the new programme of work commencing in CIT.

## 1.2 Chapter 2: Literature Review

To review the relevant literature the researcher commenced with student retention. To gain a better understanding of this core topic, the researcher explored the background to student retention: why do students leave Higher Education Institutions (HEI's); why student retention is important to HE and what type of research had already happened across the HE sector? Then the researcher proceeded to explore various student retention theories: at first focusing on the methods (the how) used to study student retention which raised some interesting points:

i. Student retention focuses strongly on the student (understandable of course). Studies are interested in testing hypotheses by either exploring or explaining the perspective of the student. There are some examples (c.f. Thomas, 2002) of studies straying from

this and instead looking at the perspective of the institution and how that affects students.

ii. There is also a strong propensity (c.f. Kuh et al., 2008b; McKenzie and Schweitzer, 2001; Milem and Berger, 1997; Murtaugh et al., 1999; Pascarella and Terenzini, 1980) to rely heavily on data mining[3] to collect data. Some exclusively rely on this technique, while others use it as a technique to identify a sample set and then possibly use more qualitative techniques to collect data from that sample.

iii. Owing to the positivist nature of many of the studies ( c.f. Bean, 1980; Kuh et al., 2008b; McKenzie and Schweitzer, 2001; Milem and Berger, 1997; Murtaugh et al., 1999; Pascarella and Terenzini, 1980), there is a strong leaning towards quantitative analysis techniques to analyse the data collected.

Having gained a better understanding of the how, the researcher then needed to learn more about the what. The researcher needed to understand what factors were being used to predict student retention. Here again the researcher found lots of consistency with a strong focus on the student's background (socio-economic), individual attributes (age, employment history, family situation etc), pre-college schooling (where they attended) and even residence (on or off campus). Also, the level of commitment, academic and social integration shown by the student were other factors used to quantify student retention risk. At this point, having better understood the research methods, and the factors used to quantify student retention risk, the researcher explored the approaches taken to reduce this risk. While the researcher found lots of consistency here again, there was also some variation. The researcher found, however, that the approaches taken to reduce student risk could all be categorised into three main categories which are listed in Table 1.

[3] Data mining is a process for extracting hidden, unknown, but potentially useful information and knowledge from massive, incomplete, noisy, fuzzy, and random data (Chen et al., 2014)

| Category | Support |
|---|---|
| Academic Supports | Interaction with faculty |
| | Assessment and feedback |
| | Mentoring |
| | Positive role models |
| Institutional Supports | Learning communities |
| | Career guidance and counselling |
| | Funding |
| | Orientation programmes |
| Environmental Supports | Physical facilities |
| | Access to technology |
| | Sense of community |
| | Expectation climate |

**Table 1 - Categorisation of student retention supports**

At this point, the researcher understood that many student retention approaches involved using data to measure student retention risk and also using data to measure the impacts of any supports or interventions introduced to reduce that risk. This led the researcher to conclude a further literature review was required to understand this new concept: data. What does it mean for an institution to be data driven? Is being data driven just another phrase for analytics or big data? What is the difference between analytics, big data and data driven? These are questions many 3rd level Institutes ask, and when allied to the increasing popularity of digital transformation, explain why data are becoming an even more important company asset. The researcher needed to understand what it meant for a 3rd level Institution to become more data driven. The researcher had a good understanding of the link between student retention and data and at this point the researcher also began to see a pattern in what the leaders brought to the equation. Typically, student retention models involved harvesting data on the student (factors identifying risk) and then presenting that data to leaders who would make decisions on what approaches could be used to reduce the risk. Interestingly data closed the loop as it was often used to measure the success or otherwise of any approaches taken. Having completed the literature review of all three concepts, the researcher found there was a significant research gap that could be explored within the programme of work. Student retention models typically involve harvesting data on the student (factors identifying risk), presenting that data to leaders who make decisions (on what approaches can be used to reduce the risk). All of this is aimed at lowering the retention risk of the ‘at-risk’ student so, understandably, the spotlight is entirely on the student. However, the research presented in the literature reviewed does not focus on what impact, if any, this approach might have

on the leader. Instead, this research asks if a data driven approach aimed at the 'at-risk' students impacts on the behaviour of the leader in any way? Data driven approaches to student retention do not consider the impact on the leader as they are not at all focused on the leader. All of the data is being provided to the leader, yet all of the focus is on the student. The literature review confirmed that an opportunity existed to explore the leader in the context of student retention. Having understood that exploration of the leader in a data driven approach to student retention presented an opportunity, the researcher needed to find a mechanism to measure change in a leader. The researcher explored the "traits theories" and the "behavioural theories" of leadership. The trait theories are described as "*What Leaders Are*", while the behavioural theories focus on "*What Leaders Do*". Rather than focus on a leader's characteristics, behavioural theories instead focus on the behaviours of a leader and often those behaviours which influence performance of subordinates and / or performance of the organisation (Brooks, 2009). Ultimately, behaviours can change while traits cannot. For this reason, the behavioural theories of leadership became more relevant for this research. This presented an opportunity to research the impact that a data driven approach to student retention might have on the behaviour of the leaders involved in that approach. However, the researcher needed a mechanism to measure behaviour. A further search of the behavioural theories presented a taxonomy of behaviours from Yukl et al. (2002). This taxonomy of 12 leadership behaviours is shown in Table 2.

| **Style** | **Behaviour** |
|---|---|
| Task Oriented | Short Term Planning |
| | Clarifying Roles |
| | Monitoring Operations |
| Relations Oriented | Supporting |
| | Recognizing |
| | Developing |
| | Consulting |
| | Empowering |
| Change Oriented | External Monitoring |
| | Envisioning Change |
| | Encouraging Innovative Thinking |
| | Taking Risks for Change |

**Table 2 - Leadership behaviours (after Yukl et al. 2002)**

At this point the researcher had a solid taxonomy which would facilitate measurement of leadership behaviour and, in particular, measurement of change in leadership behaviour. The

researcher had a research gap that could be explored using this taxonomy, and most importantly, had a programme of work that could be leveraged to explore this research gap.

## 1.3 Chapter 3: Methodology

Marrying the research gap found in the literature with the data driven programme the researcher was about to lead, the following research objective was adopted:

**Research Objective**: "To explore the impact of a data-driven approach on leadership behaviour in the context of student retention"

This research objective in turn required two distinct research questions:

**Research Question 1**: What characterises leadership behaviour in a typical[4] student retention model?

The purpose of this research question is to determine what leadership behaviours are evident in leaders involved in the student retention model based on the 'as-is'[5] approach to student retention. The measure for leadership behaviour will be Yukl et al.'s (2002) taxonomy of leadership behaviours. This question is answered by taking a snapshot of leadership behaviour at the beginning of the research. This snapshot data is gathered through interviews, survey and observations. In order to properly explore the research gap and objective, this research question is answered in advance of any significant organisational data driven approach being introduced to CIT. This research question also helps to position an organisation on the Davenport and Harris (2017) analytics maturity framework[6].

**Research Question 2:** What is the impact of a data-driven approach on leadership behaviour in a student retention model?

Having answered Research Question 1, the focus can then move to the impact, if any, a data driven approach to student retention may have on the leader's behaviour. The same population is interviewed, surveyed and observed during and after the programme of work[7]. Leadership behaviour is compared before, during and after this programme of work to

[4] A typical student retention model is one which may rely heavily on opinions, biases and anecdotes i.e. (non data-driven)
[5] The 'as-is' approach to student retention in CIT did not involve the provision of data. Leaders had to rely primarily on experience and intuition alone.
[6] This framework is discussed in detail in section 2.3.3
[7] The programme of work was to introduce a data driven approach to student retention in CIT

understand if the data driven approach to student retention has had any impact on leadership behaviour. To answer this research question, the Davenport and Harris (2017) DELTATA framework is used to measure data analytics maturity in the organisation. In order to confirm the presence of a data driven approach, the organisation should be seen to move further to the right of the DELTATA framework i.e. to stage 2+ at a minimum. Once the presence of a data driven approach can be confirmed, this research question will then help to understand the impact a data driven approach in a student retention model may have on the leader.

As a researcher, with a large data driven programme commencing, it was natural that a method of applied research was considered to answer these research questions. This type of research is one potential method to address the need for IS research to become more impactful and interesting. Practitioner research aims to "bridge the divide" (Nagle et al., 2016) between research and practice. There are many ways in which to bridge this divide, practitioner research being only one. Having explored the options of various research designs, the researcher felt that an exploratory case study was the most appropriate design as this would take advantage of the practitioner's role in CIT. With access to all the leadership of CIT and leading a programme of work that involved that same leadership, a case study offered another unique opportunity to really explore the research objective and questions. A case study protocol was adopted based on Eisenhardt (1989).

### 1.3.1 Data Collection

The primary sources of data collected were interviews, participant observation and questionnaire (survey) as documented in Table 3. A total of 34 interviews were conducted across the 59 leaders. However, as the number of leaders in the group was so significant it was not planned to interview all 59, but to engage a representative sample at various points in time. Therefore, to increase representation, the design also collected data through participant observation and questionnaire.

| | Interviews | Questionnaire | Observations |
|---|---|---|---|
| **Design** | Semi-structured to identify presence, or otherwise, of the 12 leadership behaviours | Anonymous. Structured to identify presence, or otherwise, of the 12 leadership behaviours | Structured to identify presence, or otherwise, of the 12 leadership behaviours |
| **Timing re data programme** | Pre + During + Post | Pre + During + Post | Pre + During + Post |
| **Media** | Audio Recordings and subsequent transcriptions. 32 interviews and a total of 17-18 hours of recordings | Online Survey of all 59 leaders. 3 surveys with 75% - 82% participation. | Observations lead to informal discussions and subsequent note taking. Participants were aware of observations. |

**Table 3 - Summary of data gathering process**

Early in the study, the interviews used were exploratory and would be best categorised as semi-structured and open-ended. These initial interviews then led to the creation of a very focused and semi-structured interview protocol and questionnaire protocol aimed at identifying the presence, or otherwise, of the 12 leadership behaviours being studied. Interview questions took an open-ended form, for example "*Tell me about the approach to student retention in your department*", with the interviewer then probing for evidence of particular leadership behaviours: e.g. evidence of a plan (*Short-Term Planning*), clearly defined roles (*Clarifying Roles*), any relations oriented behaviours such as empowering, developing, consulting etc or evidence of the approach being changed in the past? A subsequent interview question then included "*tell me about your experience with the additional data sets you have been given*" with the interviewer then further probing for evidence of any impact the data sets might have had on the types of leadership behaviours and styles being used. Figure 1 provides an illustration of the data gathering timeline. Data returned from the three primary sources were used for corroboration and triangulation. Interviews ran from early 2014 through until late 2016. Interviews were always 1-1. A total of 3 questionnaires were conducted with the same population; a baseline in 2014, an interim in 2015 and a final questionnaire in 2016. As a member of the senior management team, the researcher also used participant observation as a data gathering technique from mid-2014 up to late 2016 and all observations were documented using a personal notebook file structured around the 12 leadership behaviours. The three data gathering techniques facilitated the collection of very relevant data sets on the leader involved in the student retention model.

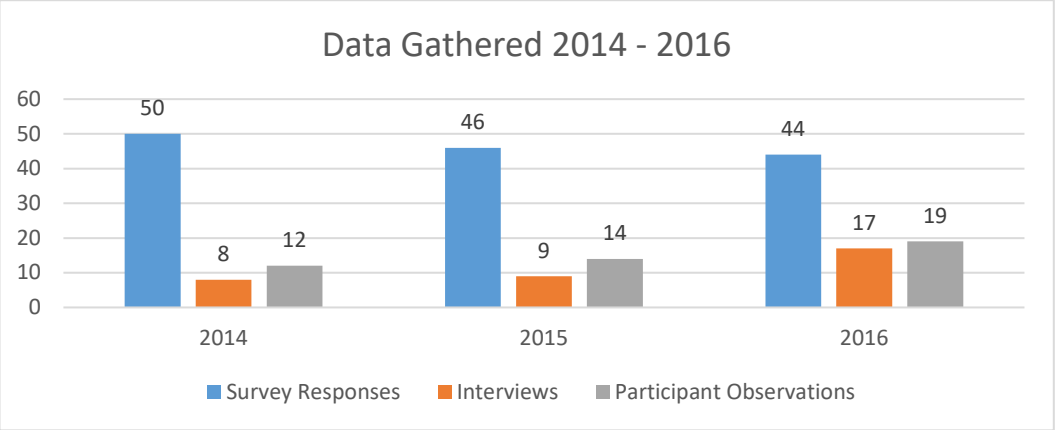



**Figure 1 - Data gathering timeline**

### 1.3.2 Data Analysis

The data analysis techniques used in this study including coding, constant comparison and thematic analysis.

**Coding**

#### CODING OF INTERVIEWS AND OBSERVATIONS

In this research coding was a central part of analysing all collected data. Using the interview protocol form in Appendix 7.2, all interviewer notes were taken against the leadership behaviours in the form. This protocol form was also used to code observations. As the interviewee spoke, anything which suggested evidence of a leadership behaviour was noted in the appropriate column and used to subsequently recheck the recording for confirmation. Interviews and observations were then coded in Excel using the structure outlined in Appendix 7.3. Each mention of an action which was consistent with any of the 12 leadership behaviours, resulted in an additional 1 being added to the corresponding cell. Participants could then display evidence of particular leadership behaviours multiple times during the same interview.

### CODING OF QUESTIONNAIRES

While the results of each questionnaire were coded differently from the interviews and observations, there were similarities in that the aim and 12 behaviours were consistent. All of the questionnaire data was exported to Excel. Then an additional 12 columns were added to that Excel file, one for each leadership behaviour. Table 4 shows the formulae used to populate each of the leadership behaviour columns.

| Leader Behaviour | Related Questions |
|---|---|
| Short-Term Planning | If Q13 = Yes and Q14 has sufficient detail on the plan |
| Monitoring Operations | If Q10 = Yes and Q11 has sufficient detail on how student retention is monitored |
| Clarifying Roles | If Q5 = Yes and Q6 has sufficient detail on the roles |
| Supporting | If Q29 = Yes and Q30 has sufficient detail on the support mechanisms |
| Developing | If Q7 = Yes |
| Consulting | If Q31 = Yes and Q32 has sufficient detail on the roles consulted |
| Recognizing | If Q8 = Yes and Q9 has sufficient detail on the recognition mechanism |
| Empowering | If the answer to Q15 or Q17 = 'By staff who are empowered to use their own discretion' |
| External Monitoring | If Q33 = Yes and Q34 has sufficient detail to describe knowledge of the external environment |
| Encouraging Innovative Thinking | If Q37 = Yes or Q38 = Yes |
| Envisioning Change | If Q22 = Yes or Q26 = Yes |
| Taking Risks for Change | If Q36 = Yes |

**Table 4 - Coding of questionnaires**

#### Constant Comparison

In this study, much of the comparisons were done within Excel. Interview data were compared to other interview data at a number of levels. Leadership behaviours were compared to each other across other interviews. Leadership behaviours were compared to other leadership behaviours in the same interview and across interviews. Similarly, interview data were compared to observation data and questionnaire data. Observation data were compared to questionnaire data at an individual behaviour level across observations, and across behaviours within observations. Questionnaire data were more dense than observation

and interview data, and as a result took more time to compare both to itself and across other techniques.

**Thematic Analysis**

In this research, thematic analysis was done across all three techniques: interviews, observations and questionnaires. As each of the techniques collected data in a structured fashion, the thematic analysis was predominantly focused on the presence, or lack thereof, of particular leadership behaviours. Some analysis was done on the themes emerging of leadership behaviours by job role and leadership behaviours over time (central to the research questions).

## 1.4 Chapter 4: Case Analysis and Findings

Chapter 4 allows the researcher to provide a background to the case itself (CIT); a student and leadership profile is provided; an introduction to why student retention is important to CIT, when the notion of data became important and how that led to the introduction of a data driven programme of work is introduced. This programme of work then allowed rich research data sets to be collected which were analysed to answer the research questions. Having surveyed, interviewed and observed CIT's leaders over a three-year period, the presence (or lack thereof), of Yukl's leadership behaviours was analysed. This provided an understanding of which behaviours were present or absent across each of the three years. Analysis of the 2014 data (pre-data driven programme) contributed to answering Research Question 1. Analysis of the 2015 (during data driven programme) and 2016 (after data driven programme) data then allowed comparison against the 2014 data to provide an answer to Research Question 2. Having completed the analysis, chapter 4 then discusses the findings which arise from the analysis of each research question. This research produced a number of interesting things:

- In 2014, very little data was being provided to the CIT leader so, understandably they were leaning towards what they knew: tacit knowledge about the area and sector. CIT's 2014 leader was inclined to stick to their own, known, short-term plans, clarify all roles required for those plans and then monitor against those plans. This is not to suggest for one second that those plans were incorrect in any way, it merely confirms

that the leaders were seen to be strongly task oriented (56.51%[8]). CIT's 2014 leader was found to be *Task Oriented* 56.51% of the time, *Relations Oriented* 34.72% of the time and *Change Oriented* only 8.76% of the time.

- CIT's 2014 leader was rarely seen to embrace change. Though some evidence was found of external monitoring, very little evidence was found of encouragement of innovative thinking, envisioning change or taking risks for change. This is not really of significant surprise, when one considers that the availability of data, for the 2014 leader, was limited in the extreme. Leaders relied heavily on tacit knowledge and any information they could get their hands on was limited and arguably questionable in terms of data quality[9]. With this as a backdrop, it is not surprising that the 2014 leader exhibited these change-oriented behaviours so infrequently: taking risks for change (1.10%); envisioning change (1.54%); encouraging innovative thinking (3.65%) and external monitoring (4.92%).
- Having been provided with data, CIT's 2016 leader then became less task-oriented and far more change-oriented. CIT's 2014 leader demonstrated task-oriented behaviours 56.51% of the time, while this dropped to 43.64% of the time for CIT's 2016 leader, equating to a total drop of 12.87%. While predominantly task oriented (56.51%), CIT's (2014) tacit knowledge driven leader was also relatively change averse as the change-oriented behaviours were only demonstrated 11.21% of the time. However, having been provided with data to fill this data vacuum, CIT's 2016 leader was seen to become change-oriented 25.81% of the time, equating to the significant overall increase of 14.60%. Examples are provided which speak to a leader who took some significant risks to change the provision of education to a particular cohort of students. The cohort in question had far poorer retention statistics than all other programmes in the institution, and it was only when armed with supporting data that the leader fully realised and appreciated this. The leadership response was to drastically change how that programme was delivered and create blended cohorts rather than programme cohorts. This change had a drastic impact on staff who were quite unhappy and threatened industrial action. However, the leader

[8] See section 4.7.1.1 for more detail
[9] See data quality section of 5.3.5 for further information

armed with data supporting their position yet in the face of strong discontent from his staff, felt strongly enough to take personal risks and make sacrifices to encourage and promote change in the organization

- Added to becoming more change oriented, CIT's 2016 leader, now armed with significant data sets, became much more interested in the external environment. CIT's 2016 leader was seen to lean more towards the 'External Monitoring' behaviour which raises another interesting observation: when taking the 1st ('Monitoring Operations') and 4th ('External Monitoring') ranked behaviours together CIT's 2016 leader is shown to have become far more data driven and demonstrates a strong leaning towards monitoring. CIT's 2016 leader was seen to show an increased interest in what the data was saying and, more importantly, in how the data could be used to monitor their own operations.

These items are discussed in more detail in chapter 4.

## 1.5 Chapter 5: Contributions and Conclusions

Chapter 5 then discusses the contributions and conclusions of the applied research. Initially the contributions are discussed and a total of four contributions are made to research and three contributions to practice. The contributions to research include a mapping of leadership styles, hypotheses and student retention supports which are used to build a higher education leader's model for student retention. The contribution to practice includes a model to support a Chief Data and Analytics Officer (CDAO) transforming leadership behaviour in higher education which is based on a data driven programme and the role of the CDAO.

### 1.5.1 Contribution to Research: A new student retention model: the perspective of a higher education leader

Many student retention models already exist: Tinto (1975), Bean and Metzner (1985), Tinto (1993) and Bean and Eaton (2001) are some. Each of these models has significant merit in their position. Each outlines the areas upon which institutions must focus in order to increase student retention. All models are consistent with, while not listing, six summary steps to student retention (*Identify Factors, Harvest Data, Identify 'at risk' Students, Introduce Supports, Monitor Students and Change Student Behaviour*). However, each of these

models, have one other significant (and understandable) consistency. They are all focused on the perspective of the student, and in particular changing the behaviour of the student to achieve better student outcomes. This new model, illustrated in Figure 2, can now propose a leader's perspective in a student retention model, and in particular the perspective of a higher education leader. This new model is made up of a number of different components:

1. The model is underpinned by the six summary steps to student retention (*Identify Factors …. Change Student Behaviour).* This provides some context for the main stakeholder in the model (the higher education leader).
2. The higher education leader is placed at the centre of the model as the key person of interest. The higher education leader is the focus of this model and needs to concern themselves with these six steps to have an impact on student retention.
3. The model surrounds the higher education leader with Yukl et al.'s (2002) leadership styles which can be employed when dealing with student retention. Leaders will naturally lean toward particular leadership styles but this model prescribes those behaviours which are required under all styles. Therefore, the model can act as a guide for those leaders not naturally inclined to particular styles or behaviours.
4. The model then links each of those leadership styles to the hypotheses of leadership behaviours taken from the findings of this research. There are seven task-oriented (T1-T7), six relation-oriented (R1-R6) and four change-oriented (C1-C4) hypotheses. These are the behaviours which can be employed by higher education leaders wanting to have an impact on student retention. Leaders employing particular behaviours will be able to understand the leadership style they are employing in their student retention approach and more importantly, the implications of those behaviours. These hypotheses are discussed in detail in section 5.2.3.
5. The model finally links each of those hypotheses to the various supports (academic, institutional and environmental) identified during the literature review. These are supports which leaders can utilise to reduce retention risk of 'at risk' students. For all leadership styles, the model will provide guidance to the leader on the types of supports that may be offered to 'at risk' students. These supports are discussed in detail in section 5.2.2.

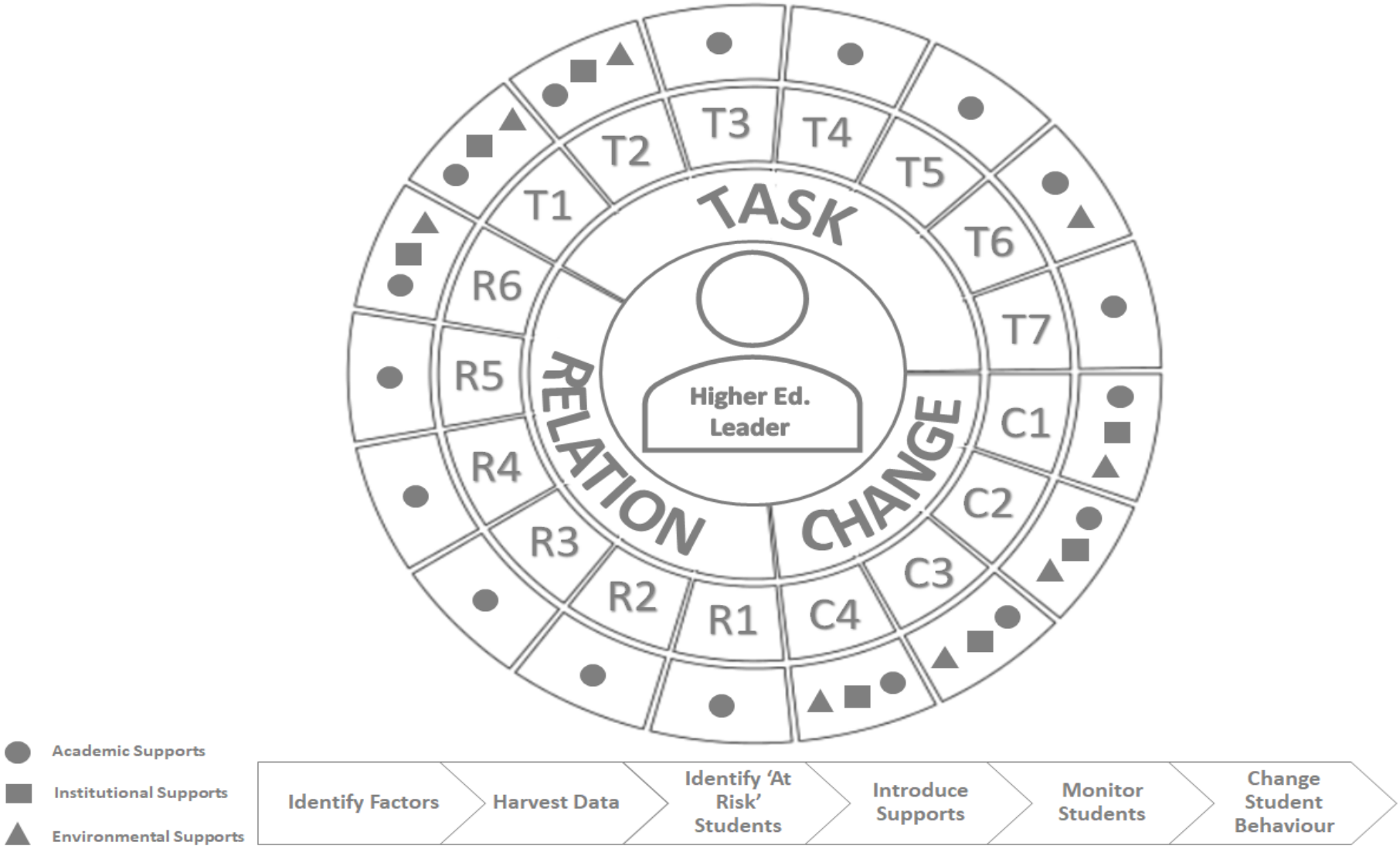



**Figure 2 - A new student retention model: the perspective of a higher ed. leader**

Having introduced the two main contributions to research, this section will now introduce the main contribution to practice. This contribution is aimed at the Chief Data and Analytics Officer (CDAO) in higher education and aims to guide the CDAO who is working to facilitate, using data, the transformation of leadership behaviour. This transformation will lead to tacit knowledge driven leaders becoming more data driven. This transformation will make a significant contribution to improving student retention. Finally, this transformation will make a significant contribution to better student outcomes.

### 1.5.2 Contribution to Practice: A Model to Enable Leadership Behaviour Transformation in Higher Education (HE)

Figure 3 illustrates the main contribution to practice: *a model to enable leadership behaviour transformation in higher education*. This model has three main personas: the tacit knowledge driven leader (e.g. CIT's 2014 Leader), the data driven leader (e.g. CIT's 2016 Leader) and the Chief Data and Analytics Officer (CDAO). The CDAO is the person in the best position to transform leadership behaviour and create data driven leaders in a higher education institution. The CDAO is the enabler and must recognise the characteristics of a tacit knowledge driven leader. A tacit knowledge driven leader is one who does not use data to inform decisions. This leader is highly task oriented, may rely heavily on short-term plans (or no plans) and is likely to be quite change averse. The CDAO must recognise, and articulate to executive leadership, the consequences of tacit knowledge driven leaders in a higher education institution: high uncertainty, HIPPO (Highest Paid Person's Opinion) decision making; less appropriate (or ineffective) supports for 'at risk' students; all leading to poor student outcomes. The CDAO must fulfil the four aspects[10] of the CDAO role, namely: 1) Lead the data and analytics vision and strategy for the organization; 2) Create and implement a data driven programme for the organisation; 3) Communicate, evangelise and extract the value of treating data as an asset; 4) Serve as trusted partner to, and build relationships with, key business executives. Once these aspects are fulfilled a number of changes can be observed. Leaders are likely to become more data driven which *reduces uncertainty, informs decision making, chooses more appropriate supports* and leads to *better student outcomes*. This provides HEI's with another way to improve student retention. This new model will enable HEI's to impact student retention through leadership and data.

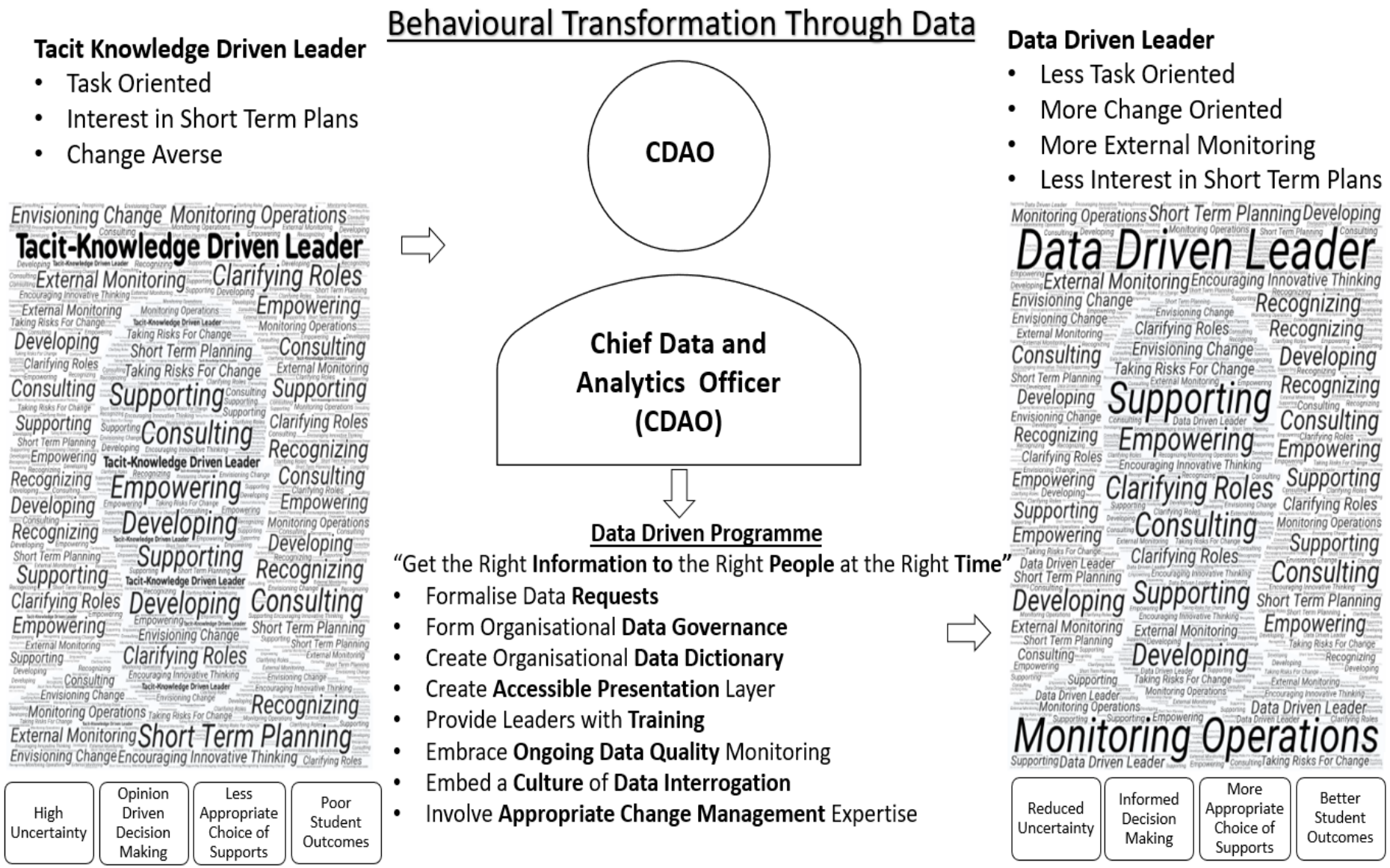



Figure 3 - A model to transform leadership behaviour in higher education

## 1.6 Publications from this Research

1. McCarthy, J., Sammon, D. and Murphy, C. (2016) Can a data analytics solution change leadership behavior in education?', '', in HEAnet Conference, Galway, Ireland, 9-11 November, pp. 2625-2634. Available at: https://conferences.heanet.ie/2016/programme

2. McCarthy, J., Sammon, D. and Murphy, C. (2017) 'Changing Leadership Behaviours: A journey towards a data driven culture', '', in Proceedings of the 25th European Conference on Information Systems (ECIS), Guimarães, Portugal, 5-10 June, pp. 2625-2634. Available at: http://aisel.aisnet.org/ecis2017_rip/15

3. McCarthy, J., Sammon, D. and Murphy, C. (2017) 'Leadership styles in a data driven culture', '', in Proceedings of the 13th European Conference on Management, Leadership and Governance (ECMLG 2017), London, England, 11-12 December, pp. 313-321. Available at: https://books.google.ie/books?id=5blDDwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

# 2. Chapter 2: Literature Review

## 2.1 Chapter Introduction

The literature review will focus on a number of key areas. There are three primary concepts explored: student retention, the concept of being data driven, and leadership. Each concept is explored individually at first but as the intersections with other concepts arise, this provides a segue to exploring the next concept individually. The emergence of these three concepts has a direct link to the programme of work being led by the practitioner. The programme was focused on getting more data to leaders to improve student retention. The programmes primary aim was to improve student retention through providing more data to the leadership of the Institute. The literature review commenced with student retention as that was the central thematic area for the programme of work. Having conducted the literature review on student retention it emerged that a very strong dependency existed in almost all student retention models whereby, models to identify at risk students, intervene with at risk students and monitor the success or otherwise of those interventions was largely dependent on data. This led the literature review in the direction of data, being data driven and using data as an organisation to improve student retention. Once this second concept was explored it another consistent theme emerged. Student retention models relied on capturing data on at risk students and getting that data to leaders for decision making. In particular those decisions were aimed at changing student behaviour: getting the student to attend, engage or just seek assistance before becoming a retention statistic. However, it emerged that no focus appeared to be on the leader and whether this model was having an effect on the leader's behaviour. This required a further literature review of the third concept: leadership, and in particular if any literature existed that might allow the measurement of leadership behaviour and in particular measuring a change in leadership behaviour. The following sections will discuss this in more detail.

## 2.2 Concept 1: Student Retention

### 2.2.1 Introduction

As illustrated in Figure 4, student retention is the first major concept to be explored in this literature. In exploring student retention, this section will first discuss the background to student retention. To offer this background, questions such as "*Why do students leave Higher Education Institutions (HEI's)*?", "*Why is student retention important to HEI's*?" and "*What is happening in the Higher Education (HE) sector*" will be explored. After the background, a thorough exploration of student retention theories will be discussed by focusing first on the factors used to predict student retention risk and then the approaches used to reduce that risk.

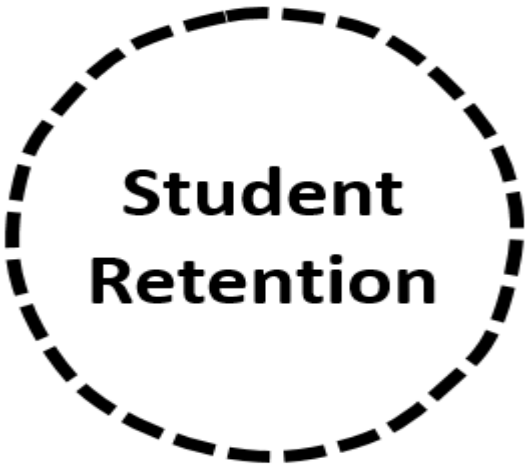



**Figure 4 - First major literature review concept: student retention**

### 2.2.2 Background to Student Retention

*Why do students leave Higher Education Institutions?*

First year students face a turbulent and emotional time when entering third level education (Gerdes and Mallinckrodt, 1994). They are in institutions that they generally know little about, and finding themselves in unfamiliar social situations (Gerdes and Mallinckrodt, 1994). This is all in an environment where the level of parental influence (and support) has decreased significantly for the first time in their lives (Fass and Tubman, 2002). Adult norms like financial management and time management are also thrust upon students at this time (Fleming and Finnegan, 2011). Any one of these issues can be enough to overwhelm a young

mind (Gerdes and Mallinckrodt, 1994) let alone all of them combined. In an Irish context, those students living away from home, and in particular males, felt particularly overwhelmed and thus posed a greater retention risk (Eivers et al., 2002).

HEI's are of course aware of these pressures and have been making attempts to understand and counteract them (Cabrera et al., 1992, 1993; Gerdes and Mallinckrodt, 1994; Braxton et al., 2000; Braxton, 2002; Braxton et al., 2004). Historically, it was felt that an "entering student's academic record" was the most important factor in future retention so that received some focus (Kuh et al., 2008a; Webster and Showers, 2011). A "student's potential for persistence" was further analysed through understanding details such as GPA's (c.f. Kuh et al., 2008a; Webster and Showers, 2011), parental history (c.f. Hu, 2011), race and family structure (c.f. Webster and Showers, 2011). Subsequently the potential positive impact counselling sessions could have on first year students was explored (c.f. Abdullah et al., 2010). Also, student retention risk can be increased when colleges don't attend to the student's individual needs, problems and concerns (Webster and Showers, 2011). However, all of this can be simplified significantly. First year students just need more engagement through this turbulent time. An engaged student is more likely to persist (National Survey of Student Engagement, 2004, 2007; Kuh et al., 2008a).

### *Why is student retention important to colleges?*

With falling budgets and more competition for enrolments, the financial pressures on HEI's are increasing significantly (Webster and Showers, 2011). In general customer relationship management terms, research has shown that it is far more costly to attract a new customer than to retain an existing one (Gemme, 1997) with some suggesting that it can be as high as five to seven times more costly (Leigh and Marshall, 2001). When applying this concept to HE, Ackerman and Schibrowsky (2007), using the *Lifetime Value of Customers* (LTV) as their primary measure, found that an increase of 10% in retention rates would account for an increase of 22% in revenue and fees. With an example of a private college in the US, this 10% increase in retention equated to an increase of almost $22 million in revenue. Interestingly, while colleges have tended to focus more time on student recruitment, a focus on retention is actually far more cost effective (c.f. Astin, 1993; Fike and Fike, 2008; Pascarella and Terenzini, 1991; Tinto, 1993; Webster and Showers, 2011). For this reason, among others, retention has become far more of a concern.

There are various statistics on the number of first year students who do not progress to second year. Raths (2012) posit that the attrition rate can be as high as 33% in the first year. ACT (2012) state that depending on the type of college, retention rates of first years progressing to their second year varies from 55.5% to 80.2%. This is a significant attrition rate and one which places a huge strain on a college's financial health.

### *What is happening in HE sector?*

The response from colleges is to try and define the factors which impact on retention and manage the associated risks by analysing students against those factors. While there are some similarities among factors, colleges have to define the factors which are most relevant to their own students. Table 5 shows some of the major HEI's along with some details of their approach to retention and the factors they found useful for identifying retention risk.

| HEI | Retention System | Details | Factors of Interest | Reference |
|---|---|---|---|---|
| Case Study on an unnamed UK University | | Adopts and explores the term 'institutional habitus', and attempts to provide a conceptual and empirical understanding of the ways in which the values and practices of a higher education institution impact on student retention | Socio-economic background, academic integration | (Thomas, 2002) |
| Syracuse University | Syracuse Analytics | Adaptation of learning communities to the needs of academically under-prepared low-income students | Socio-economic background, academic preparedness | (Tinto, 2006) |
| Ball State University | MAP-Works (Making Achievement Possible) | Sought to determine if very early college experiences impact academic outcomes. | Academic integration, social integration, institutional commitment | (Woosley and Miller, 2009) |
| Graduate School of Medicine, University of Wollongong | SNAPP (Social Network Adapting Pedagogical Practice) | Monitor student behavioural patterns to identify variations from good practice through the development of a tool that integrates with common commercial and open source Learning Management Systems (LMS) to deliver real-time social network visualisations of discussion forum activity | Social (Network) integration | (Bakharia et al., 2009) |
| The American Military University | APUS Data Warehouse | Develop a model to improve student retention in a HEI (fully reliant on an online delivery environment) by understanding the retention risk factors particularly relevant to that environment. | Transfer credit, LMS activity | (Boston et al., 2011) |
| Rio Salado College | PACE (Progress and Course Engagement) | Aimed to improve student retention by helping non-traditional students reach their educational goals through programs and services tailored to individual needs. To do this it displayed a traffic light system for lecturers and students with a red/amber/green light being displayed against each student to predict likelihood of success | LMS activity | (Smith et al., 2012) |
| Purdue University | Signals | Aiming to improve student retention, Course Signals was developed to allow instructors the opportunity to employ the power of learner analytics to provide real-time feedback to a student | Grades, demographic characteristics, past academic history, LMS activity | (Arnold and Pistilli, 2012) |
| Northern Arizona University | GPS (Grade Performance System) | Improve retention through an early warning system where students receive alerts regarding grades, attendance, academic issues as well as positive feedback. | Grades, attendance, academic issues | (Picciano, 2012) |
| University of Alabama | SAS | Improve student retention by using a predictive model to identify at risk students and flag them to faculty for intervention | Academic achievement, student commitment | (bin Mat et al., 2013) |
| University of Melbourn | | Identifying At-Risk Students in Massive Open Online Courses (MOOC's) | Grades (target only those students at risk of failure) | (He et al., 2015) |
| Survey of Australian HEI's | | Identifying attrition risk based on the first-year experience | Belonging, Intellectual engagement, Support from staff, Workload stress | (Naylor et al., 2018) |

**Table 5 - Student retention in higher education**

In a study in an un-named English University, Thomas (2002) highlights that socio-economic background and the level of academic integration were the important factors for identifying student retention risk. Syracuse University also felt that socio-economic background was important but were more interested a student's pre-higher education academic history (Tinto, 2006) rather than their level of academic integration at 3rd level. However, Ball State's MAP-Works solution was also interested in academic integration at 3rd level but placed further emphasis on a student's level of social integration with their peers as well as the commitment and services offered by the institution to assist students (Woosley and Miller, 2009). University of Wollongong School of Medicine then took the social integration factor to a different level by measuring the level of social integration of a student but in the context of online social networks only (Bakharia et al., 2009). The American Military University System used a students' previous experience of higher education and the frequency of visits to the virtual learning environment (Boston et al., 2011), while Rio Salado College felt that login behaviour on the virtual learning environment, site engagement and pace through the course are more accurate at predicting student success (Raths, 2012). Purdue University in Indiana, as far back as 2005, was using its Signals software to "detect early warning signs and provide intervention to students who might not be performing to the best of their abilities"(Raths, 2012, p. 11). Signals used an algorithm to predict student risk based on a student's grades, socio-economic background, past academic history and LMS activity (Arnold and Pistilli, 2012). Northern State University's GPS (Grade Performance System) focuses on a student's grades, attendance and any academic issues arising as the factors it believes are important.

What is evident is that while the HE sector is absolutely interested in, and responding to student retention, there appears to be inconsistency in the factors used to predict student retention risk across the HE sector. The next section will explore the literature in greater detail to understand what research has found in the context of factors used to predict student retention risk.

### 2.2.3 Exploration of Student Retention Theories

In exploring student retention theories, this section will do so under three main headings. Firstly, the research methods used to study retention will be explored. Then the factors used to predict student retention will be explored. This section will discuss those factors that

institutions use to identify an ‘at risk’ student. Finally, once those factors are understood, the final section will discuss the approaches used to reduce student retention risk.

### *Methods used to study student retention*

Table 6 illustrates the methods used in some of the main empirical studies of student retention. While a significant number of studies exist on student retention, this table focused on some of the main empirical studies only. The table illustrates some things which are really interesting for a researcher seeking to find a research gap:

i. There is a strong propensity (Bean, 1980; Kuh et al., 2008b; McKenzie and Schweitzer, 2001; Milem and Berger, 1997; Murtaugh et al., 1999; Pascarella and Terenzini, 1980), understandably, to focus on the perspective of the student. Studies are interested in testing hypotheses by either exploring or explaining the perspective of the student. There are some examples (c.f. Thomas, 2002) of studies straying from this but a significant majority are still focused on the perspective of the student.
ii. There is also a strong propensity (Kuh et al., 2008b; McKenzie and Schweitzer, 2001; Milem and Berger, 1997; Murtaugh et al., 1999; Pascarella and Terenzini, 1980) to rely heavily on data mining to collect data. Some exclusively rely on this technique, while others use it as a technique to identify a sample set and then possibly use more qualitative techniques to collect data from that sample.
iii. Owing to the positivist nature of many of the studies (Bean, 1980; Kuh et al., 2008b; McKenzie and Schweitzer, 2001; Milem and Berger, 1997; Murtaugh et al., 1999; Pascarella and Terenzini, 1980), there is a strong leaning towards quantitative analysis techniques to analyse the data collected.

*Research Gap 1:* There are very little examples of interpretivist approaches used in the context of student retention research. Data collection (data mining) and analysis (statistics) methods are predominantly positivist and the vast majority of studies focus on the perspective of the student. There would appear to be an opportunity to conduct some interpretivist research focused from a perspective other than that of the student.

| Publication | Author | Name | Citations | Perspective | Research Design | Data Gathering | Data Analysis |
|---|---|---|---|---|---|---|---|
| Research in higher education | Bean (1980) | Dropouts and turnover: The synthesis and test of a causal model of student attrition | 1358 | Student | Explanatory experimental design using a quantitative technique to collect data. | Custom questionnaire with 1195 responses. | Regression and path analysis |
| The Journal of Higher Education | Pascarella & Terenzini (1980) | Predicting freshman persistence and voluntary dropout decisions from a theoretical model | 1042 | Student | Explanatory longitudinal design using quantitative and qualitative techniques to collect data | Data mining along with a questionnaire which received 1457 responses. | Multivariate Analysis and discriminant analysis |
| Journal of college student development | Milem and Berger (1997) | Exploring the relationship between Astin's theory of involvement and Tinto's theory of student departure | 418 | Student | Explanatory longitudinal design using quantitative and qualitative techniques to collect data. | Data mining along with a questionnaire with 1343 responses. | Multivariate Analysis |
| Research in higher education | Murtaugh et. Al (1999) | Predicting the retention of university students | 448 | Student | Exploratory longitudinal design using quantitative techniques to collect data. | Data mining | Survival (failure-time) analysis |
| Higher education research and development | McKenzie and Schweitzer (2001) | Who succeeds at university? Factors predicting academic performance in first year Australian university students | 416 | Student | Exploratory case study design using quantitative techniques to collect data. | Data mining and Questionnaires | Regression analysis |
| Journal of Education Policy | Thomas (2002) | Student retention in higher education: the role of institutional habitus | 611 | Institution | Exploratory case study design using qualitative techniques to collect data. | Focus Groups, Questionnaires, Interviews | Some statistical analysis |
| Journal of Higher Education | (Kuh et al., 2008b) | Unmasking the Effects of Student Engagement on First-Year College Grades and Persistence. | 364 | Student | Exploratory [11] Longitudinal design using quantitative techniques to collect data. | Data Mining | Statistical significance, ordinary least squares, logistic regression |

**Table 6 - A review of research methods used**

[11] Determine the relationships between student behaviours and institutional practices….

### *Factors used to predict student retention risk*

There are many different factors used to predict student retention risk. These factors are subjective and vary from institution to institution. While the list of factors is increasing as more research is conducted, there is however, much repetition in the factors found to predict student retention risk. Table 7 shows some of the major studies and the factors they found most useful for predicting student retention risk.

| | Socio-Economic Background | Individual Attributes | Pre-College Schooling | Student Commitment | Academic Integration | Social Integration | Residence |
|---|---|---|---|---|---|---|---|
| Tinto (1975) | √ | √ | √ | √ | √ | √ | |
| Astin (1975) | √ | √ | √ | √ | | | |
| Bean (1980) | √ | √ | √ | | | | √ |
| Bean and Metzner (1985) | √ | √ | √ | √ | √ | | √ |
| Pascarella and Terenzini (1980) | √ | √ | √ | √ | √ | √ | |
| Milem and Berger (1997) | | | | | √ | √ | |
| Healy et. Al (1999) | √ | | √ | √ | | | |
| Murtaugh et. Al (1999) | √ | √ | √ | | | | √ |
| McKenzie and Schweitzer (2001) | | √ | √ | | √ | | |
| Thomas (2010) | √ | | √ | | √ | | |
| Robbins et al (2004) | | √ | | √ | | | |
| Kuh et al. (2008) | √ | √ | √ | √ | √ | | |
| Kelly et al. (2012) | √ | √ | √ | √ | | | |

**Table 7 - Factors used to predict student retention risk**

This next section will discuss these factors in more detail.

#### ***Socio-Economic Background***

One of the most frequently found factors is the socio-economic status of the student (Astin, 1975; Bean, 1980; Pascarella and Terenzini, 1980; Bean and Metzner, 1985; Milem and Berger, 1997; Healy et al., 1999; Murtaugh et al., 1999; McKenzie and Schweitzer, 2001; Thomas, 2002; Robbins et al., 2004; Kuh et al., 2008b; Kelly et al., 2012). Socio-economic status can also be described as the student's family background (Astin, 1975; Kuh et al., 2008b), hometown size (Bean, 1980), ethnicity of the student (Bean and Metzner, 1985; Murtaugh et al., 1999), financial circumstances of the student (Bean and Metzner, 1985; Healy et al., 1999; Murtaugh et al., 1999) or social background of the student (Healy et al., 1999). Strong correlations have been found by all authors between students of a disadvantaged socio-economic background and students posing a retention risk.

### *Individual Attributes*

Similarly, correlations can be drawn between individual attributes of a student and retention risk (Astin, 1975; Tinto, 1975; Bean, 1980; Pascarella and Terenzini, 1980; Bean and Metzner, 1985; Murtaugh et al., 1999; McKenzie and Schweitzer, 2001; Thomas, 2002; Robbins et al., 2004; Kuh et al., 2008b; Kelly et al., 2012)**.** Bean and Metzner (1985) found individual attributes such as age (Murtaugh et al., 1999), amount of outside encouragement received, family responsibilities (such as caring for a loved one), employment responsibilities (McKenzie and Schweitzer, 2001) and the levels of stress showed correlations with retention risk in a student. Bean (1980) found that students who attended college in the same state as their home had a higher chance of persistence while Kelly et al. (2012) found the further a student's home was from college the greater the retention risk. Finally, the student's own mind set can also be seen as an influencer (McKenzie and Schweitzer, 2001; Robbins et al., 2004):

> *"..an expectation of academic success (self-efficacy) has a highly significant positive relationship with actual academic success and with low withdrawal rates." (McKenzie and Schweitzer, 2001, p. 23)*

### *Pre-College Schooling*

A frequently used predictor of third level academic success and persistence is the pre-college schooling of a student (Astin, 1975; Tinto, 1975; Bean, 1980; Pascarella and Terenzini, 1980; Bean and Metzner, 1985; Healy et al., 1999; Murtaugh et al., 1999; McKenzie and Schweitzer, 2001; Thomas, 2002; Kuh et al., 2008b; Kelly et al., 2012). Bean (1980) and Bean and Metzner (1985) found that a student with a proven academic performance record (pre-college grades) was more likely to persist in college while Healy et al. (1999) found that a student with a leaving certificate grade point average of between 100 and 195 was less likely to persist than students with higher points average. Healy et al. (1999, p. 2) had even more granular findings relating to leaving certificate mathematics:

> *"Those who failed or left were especially likely however to have obtained a low grade in Leaving Certificate Mathematics."*

### *Level of Student Commitment*

The level of commitment a student shows, both to the institution and his/her individual goals, has been found to have a significant impact on persistence (Astin, 1975; Tinto, 1975; Pascarella and Terenzini, 1980; Bean and Metzner, 1985; Healy et al., 1999; Robbins et al., 2004; Kuh et al., 2008b; Kelly et al., 2012). The educational ambition of the student (highest level of education sought and importance ascribed to college education) is also an indicator of student committment (Bean and Metzner, 1985). Healy et al. (1999) found that 18% of students who failed to persist said that the decision to attend college was not their own. Robbins et al. (2004, p. 267) found achievement motivation to be a statistically significant predictor of success and defined this as:

> *"one's motivation to achieve success; enjoyment of surmounting obstacles and completing tasks undertaken; the drive to strive for success and excellence"*

In a study aimed at predicting success of students entering 3rd level in Ireland and Portugal, Kelly et al. (2012) found that the Portuguese students who did not access their first choice program were less motivated than those students who were given their first choice and as a result less likely to persist.

### *Academic Integration*

The level to which a student integrates or engages with the academic system can be an indicator of that student's chances of persistence (Tinto, 1975; Pascarella and Terenzini, 1980; Bean and Metzner, 1985; Milem and Berger, 1997; McKenzie and Schweitzer, 2001; Kuh et al., 2008b; Thomas, 2002). At its most basic, this level of integration can be measured by the student's grade performance (Tinto, 1975). However, students may not receive any grades until the end of semester, by which time they may already have become a negative retention statistic. Students with a poor attendance record is another example of poor academic integration which can also be used to predict retention risk (Bean and Metzner, 1985). Similarly, students with good study habits and study skills, display a much higher tendency to persist (Bean and Metzner, 1985). Students who, outside of class time, have any involvement with faculty (coffee, lunch, dinner, chat) are more academically integrated and, thus, more likely to persist (Milem and Berger, 1997).

***Integration with the social systems of the college***

Similar to academic integration, students who spend more time with their peers outside of class time (study time, movies, socialising, problem solving, activism) are more socially integrated and also more likely to persist (Milem and Berger, 1997). While similarities like these exist, however, academic integration and social integration can be mutually exclusive;

> *"..a person may perform adequately in the academic domain and still drop out because of insufficient integration into the social life of the institution (e.g., through voluntary withdrawal)" (Tinto, 1975, p. 92)*

Social integration can also be described as a student's involvement in extra-curricular activities in their 1st year, for example Tinto (1975) posits that at least two hours per week of extra-curricular activities would be sufficient to categorise a student as "socially integrated".

***Residence***

The location where a student resides is also something which some colleges use to measure retention risk. A student who lives in the same state as the college he/she attends is more likely to have a higher level of satisfaction (Bean, 1980) or be a lower retention risk (Murtaugh et al., 1999) than a student attending college in another state. Bean and Metzner (1985) categorise students who reside on campus accommodation as 'traditional' students while those who commute to and from college are referred to as 'non-traditional'. Commuter students spend less time on campus outside of class time and this contributes to those students having "*fewer college friends, less contact with faculty members outside of class, and less participation in extracurricular activities*." (Bean and Metzner, 1985, p. 495).

### *Trends in factors*

Interestingly, Figure 5 shows that while there is variety in the factors used, some factors are certainly more popular than others. *Pre-college schooling* is particularly popular as a risk predictor as it shows in 11 of the studies listed. There is a real strong interest among HEI's in a student's academic performance pre-college as studies have shown a strong correlation between academic performance and student persistence. Next most popular are both *socio-economic status* and *individual attributes* which were included in 10 of the studies. Colleges found strong correlations between a student's family background, age and employment responsibilities and his/her ability to persist.

Having explored the factors used to predict student retention risk, this next section will now discuss those approaches employed to address and reduce student retention risk.

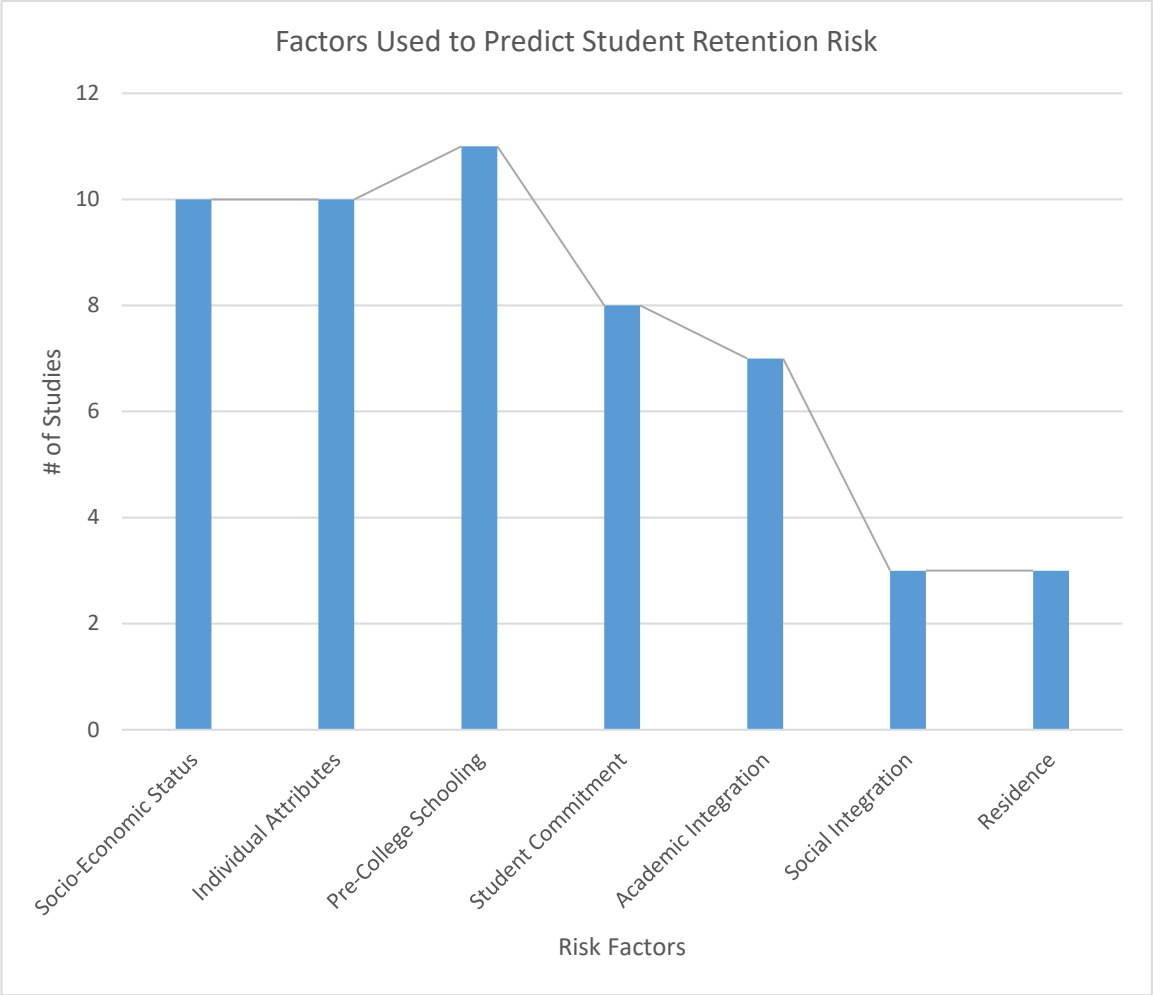



**Figure 5 - Trends in factors used to predict student retention risk**

### *Approaches Used to Reduce Student Retention Risk*

Much of the early literature on student retention focused on first identifying those students failing to persist and then finding some tangible trends among those students. It was this search for trends that fed into the main objective of those studies at that time: "*predicting student retention risk*". Once some consistent trends begun to emerge, the focus inevitably switched to preventing rather than just predicting. As competition between institutions started to increase, the loss of a student to a competing institution, or from the education system completely, was something institutions worked hard to prevent (Peltier et al., 2000). Institutions who had succeeded in identifying a cohort of students who were a retention risk, now had to focus on approaches to try and keep those students in the Institution. Some of these approaches found in the literature are illustrated in Table 8.

| | Marketing | Recruitment | Support Programmes | Funding | Academic Support | Managing Multiculturalism & Diversity | Physical Facilities | Technology | Hands on Computer Experience | Emphasis on Teaching and Learning | Cooperative learning | Collaborative Learning | Academic Advising | Student Accountability | Motivation | Tutoring and Small Group Training | Role Model | Institutional Commitment | Institutional Expectations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Astin (1975) | | | | √ | | | | | | | | | | | | | | | |
| Tinto (1987) | | | | | √ | | | | | | | | | | | | | | |
| Chickering and Gamson (1987) | | | | | √ | | | | | | √ | √ | √ | | | | | | √ |
| Murtaugh et al (1999) | √ | √ | √ | | | | | | | | | | | | | | | | |
| Bean and Eaton (2001) | | | | | √ | | | | | | √ | | √ | | | | | | |
| Lau (2003) | | | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | | |
| Kuh (2003) | | | √ | | √ | | √ | | | √ | | √ | √ | | √ | | | | |
| Zhao & Kuh (2004) | | | | | | | | | | | √ | √ | | | | | | | |
| Tinto (2005) | | | √ | | √ | | | | | | √ | √ | | | | | | √ | √ |
| Pascarella and Terenzini (2005) | | | | | √ | | | | | | √ | √ | √ | | | | | | √ |
| Umbach & Wawrzynski (2005) | | | | | | | | | | √ | √ | √ | | | | | | | |
| Fleming (2011) | | | | √ | | | √ | | | | | | | | | | | | |

**Table 8 - Approaches to reduce student retention risk**

While there are more studies that can be included, and the primary approaches are covered by this list, it is still evident that it is quite an extensive and diverse list. It is interesting however, that while many of the approaches fall naturally into appropriate categories, they have not been categorised to date. For this reason, the researcher has categorised the approaches that can be taken to reduce student risk into three categories listed in Table 9.

| **Category** | **Support** |
|---|---|
| Academic Supports | Interaction with faculty |
| | Assessment and feedback |
| | Mentoring |
| | Positive role models |
| Institutional Supports | Learning communities |
| | Career guidance and counselling |
| | Funding |
| | Orientation programmes |
| Environmental Supports | Physical facilities |
| | Access to technology |
| | Sense of community |
| | Expectation climate |

**Table 9 - Categorisation of student retention supports**

Each approach is discussed individually but also in the context of its category:

### *1. Academic Supports*

The main approaches under the *Academic Support* category include *interaction with faculty*, *mentoring*, *assessment and feedback* and the use of *positive role models*. This section will discuss each of those approaches in further detail.

One of the most widely agreed factors that reduces student retention risk is the contact between faculty and student, in particular for those at risk students (Bean and Eaton, 2001; Chickering and Gamson, 1987; Kuh, 2003; Lau, 2003; Pascarella and Terenzini, 2005; Tinto, 2005). Chickering and Gamson (1987) outline the seven principles for good practice in undergraduate education. Their first principle states that "*Good practice in undergraduate education: encourages contacts between students and faculty*" (Chickering and Gamson, 1987, p. 2). This support can be provided both in and out of the classroom and may come in the form of advice or feedback. Getting the students and faculty together outside of the classroom, as early as possible in the semester, can be achieved through freshman seminars under the guise of orientation (Bean and Eaton, 2001) or merely on important topics (Chickering and Gamson, 1987). Academic support can also be provided by the faculty facilitating and/or creating learning communities or first year interest groups among the

students (Bean and Eaton, 2001; Lau, 2003). The National Survey of Student Engagement (Kuh, 2001, p. 29) lists "Student Faculty Interaction" as one of its five benchmarks for measuring student engagement. However, there can be a limit to the amount of student faculty interaction and sometimes there can be too much interaction, "where more may not necessarily be better". Too much casual contact can have the opposite effect on learning gains and effort however, with the key to successful contact being substantive contact (Kuh, 2003). Substantive contact can take the form of faculty providing frequent feedback opportunities to the student, for example use of assessment techniques (Pascarella and Terenzini, 2005; Tinto, 2005).

Frequent feedback is also an important support as students must be aware of what they know and what they do not know (Tinto, 2010). The substantive contact through feedback, mentioned earlier, is imperative to facilitate this. Once a student can benchmark themselves against a class or standard, that student can then understand where improvements can be made (Chickering and Gamson, 1987; Tinto, 2010). Feedback and assessment are intrinsically linked however, as feedback cannot occur without first having some sort of benchmark assessment, and assessment without feedback makes little or no contribution to the student's learning (Chickering and Gamson, 1987; Kuh, 2009).

Another important academic support that can improve student retention is the provision of an academic mentor for an at risk student (Tinto, 2005). At its most basic level, this mentorship can provide a student with information on university services (academic or social) which can have a significant positive and stabilising influence on a first year student struggling to cope with his/her new environment (Lau, 2003). More substantially, however, this support can lead to the academic mentor becoming a role model for the student and

*"there is evidence to indicate that students who have continual contact with their role models during college tend to be successful and excel in classroom learning"* (Lau, 2003, p. 135).

### *2. Institutional Supports*

The second category of approaches is Institutional Supports. This category includes approaches such as the fostering of learning communities to support student learning, the provision of funding and also career guidance and counselling for students who might benefit

from it and the development of orientation programmes to assist an easy transition to third level. This section will discuss each of those approaches in more detail**.**

There is a significant body of research supporting the use of *learning communities* to reduce the student retention risk (Chickering and Gamson, 1987; Bean and Eaton, 2001; Lau, 2003; Kuh, 2003; Zhao and Kuh, 2004; Tinto, 2005; Pascarella and Terenzini, 2005; Umbach and Wawrzynski, 2005; Tinto, 2010). Also referred to as Freshman Interest Groups (Bean and Eaton, 2001), a *learning community* is a structure to get students working together academically and socially, interacting with each other but also with faculty (Tinto, 2005, 2010). These interactions help students develop new academic and social skills that can lead to coping strategies for at risk students (Bean and Eaton, 2001). The community, or group, may be 5-6 students from the same course grouped together to assist each other. With group tasks being set by a faculty member the group works together, learning from each other on group projects, discussions and presentations (Lau, 2003). The process of sharing and debating ideas allows students to develop and sharpen their own thinking, but, to be effective, it is important that the groups are educated in the importance of group dynamics and etiquette (Chickering and Gamson, 1987). Once a student becomes part of a learning community, the potential benefits can then include increased academic performance, student engagement, positive student perception of the campus environment and more positive learning outcomes (Zhao and Kuh, 2004**).**

Another institutional support widely used in many institutions to reduce student retention risk is the creation of *orientation programmes* designed for the benefit of the student. An orientation programme runs in almost every third level institution. These programmes vary from first day orientation to week long orientation courses in organisations like Ohio State University (Murtaugh et al., 1999). Those students who do not participate in any orientation programme are a higher retention risk (Murtaugh et al., 1999). Aimed at both students and their parents, successful orientation programme can contribute to very positive outcomes for students; social and academic integration, self-efficacy, increased confidence and increased awareness of facilities and services (Bean and Eaton, 2001), higher academic achievements and increased student satisfaction (Lau, 2003).

*Career Guidance and/or Guidance Counselling* are two institutional support services often intrinsically linked to each other due to organisational structure. While an academic mentor can have a positive effect on a struggling student, so too can a non-academic mentor in the

form of a career guidance and/or guidance counselling. A student may have realised that they have chosen the incorrect course and rather than drop out and add to the retention statistics, Institutions encourage students to engage with the local career/guidance counsellor who may be able to help with outlining options open to the student (Fleming and Finnegan, 2011). Students who have raised mental health difficulties, including those who persist and fail to do so, frequently elude to the positive influence the local career/guidance counsellor has had on them (Tinto, 2010; Fleming and Finnegan, 2011).

The final institutional support that has a significant impact on reducing student retention risk is funding support from the institution itself (Bean and Metzner, 1985; Tinto, 2005). The costs of education have continued to rise in most countries and students, even with part time jobs, struggle to make ends meet. As a lack of funds leads to many students leaving college, institutions have begun to offer funding support for those students who need it most (Lau, 2003; Fleming, 2011). As well as the obvious financial assistance institutional funding provides, this type of funding also confirms that the state "recognised and wanted non-traditional students in Higher Education" (Fleming, 2011, p. 9). Institutions are very astute and refined at identifying students who require financial assistance by taking factors into account such as parents socio-economic status, student's and/or parent's income and students current and short-term work prospects (Bean and Metzner, 1985).

### *3. Environmental Supports*

The final category of approaches is *Environmental Supports*. This category includes approaches such as the provision of *physical facilities*, *access to technology*, an *expectation climate* and a *sense of community*. This section will discuss each of those approaches in more detail**.**

The *physical facilities* available in the student's environment can have an influence on the student's perception of that environment. A student who is struggling to adjust to college life may find that the availability of suitable accommodation or library access can have a profound influence on the student's social integration (Bean and Metzner, 1985). Astin (1993), includes library facilities, computer facilities and laboratory facilities in the list of facilities which impact on a student's satisfaction with their environment. Physical facilities can also include student dormitories (accommodation), study rooms, facilities for disabled students, and career centres (Lau, 2003). Student dormitories can be arranged so that

international students can be accommodated together, or diverse cultures can be respected and facilitated. This can contribute to a better social integration for the at risk students.

Lau (2003) also writes that an environment which provides students with access to appropriate technology can enrich and complement teaching and learning and further engage a student. Technology can aid the presentation, visual or aural, of appropriate material in a way that further engages students with their learning objectives. The use of multimedia, tablets and smart boards can engage a student in different ways. Also, the access to appropriate computer labs in order to complete coursework can have a significant impact on a student's impression of the environment in which they are learning. A student asked to complete an assignment which requires software available only in a particular lab, is unlikely to be happy if access to that lab is heavily restricted. This particular software may only be spreadsheets, databases or graphics packages, but lack of access to it can have a significantly negative effect (Lau, 2003).

An institution that facilitates a *sense of community* among the students is typically one which succeeds better with student involvement and retention (Tinto, 2010). This sense of community can mean many things; being involved in the classroom dynamic between students and faculty, being part of a group project with class members, sharing curriculum experiences with fellow students, joining particular clubs and societies or living in student accommodation. This sense of community is made up of many things but it makes a significant contribution to a student feeling involved or not, feeling part of something or not and a student who feels more involved is more likely to persist (Tinto, 2010).

Another environmental variable that can impact on the student success is the *expectation climate* (Tinto and Pusser, 2006). The expectations of a student's family and their direct faculty contacts (course co-ordinators, lecturers and heads of department) can influence this climate. High expectations have a positive influence while low expectations have the opposite effect. Put another way "*no student rises to low expectations*" (Tinto and Pusser, 2006, p. 6). In turn, this climate can be influenced through communications (direct or indirect) from faculty and family. Conflicting expectations can have a major impact on the expectation climate. The climate is also influenced when faculty may have different expectations for different students, or groups of students (Tinto and Pusser, 2006). Negative terms such as "remedial" have arisen which, when picked up by students, have a major influence on this expectation climate. Institutions wishing to have a positive impact on

student success then consider approaches which positively influence this "*expectation climate"*, which include clear communication, clear and positive expectations and discouraging negative expectations.

### 2.2.4 Concept 1 Conclusion

This section commenced by discussing the background to student retention. To offer this background, questions such as "*Why do students leave Higher Education Institutions (HEI's)*?", "*Why is student retention important to HEI's*?" and "*What is happening in the Higher Education (HE) sector*" were explored. After the background, a thorough exploration of student retention theories was discussed by focusing first on the factors used to predict student retention risk and then the approaches used to reduce that risk. Interestingly, data is central to the model in terms of balance, as illustrated in Figure 6.

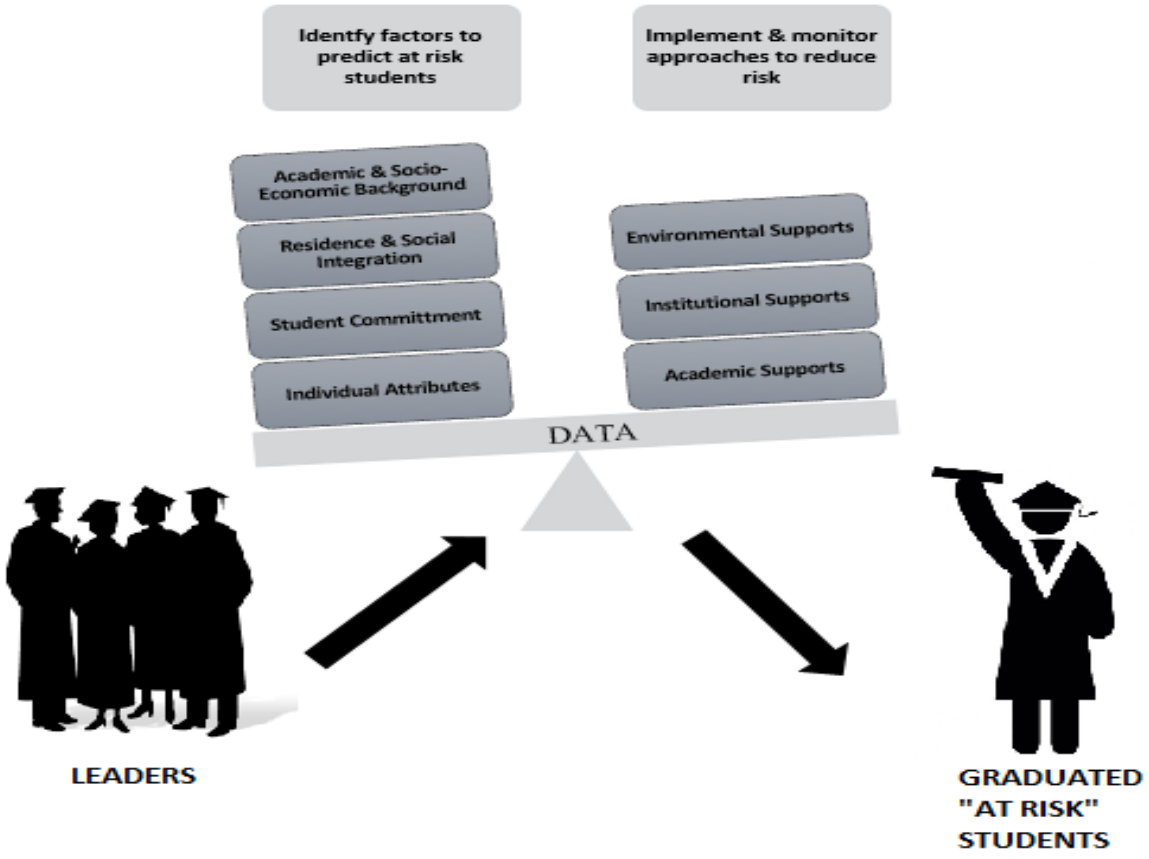



**Figure 6 - Model of retention risks and remediation approach categories**

Almost all approaches used to identify risk rely heavily on data. Regardless of what factors an institution uses to identify student retention risk, all rely heavily on measuring those factors in a way that provides additional information to decision makers. Once the 'at risk' cohort are identified using whatever data is available, the institution then uses similar and/or

additional data to monitor the effectiveness of the mitigation approach taken. There is an obvious balance between risk identification and risk mitigation upon which data has a significant influence. Institutions showing an interest in student retention, which is pretty much every institution, are in one way or another showing an interest in using more data, in becoming more data driven.

Section 2.2 has discussed student retention but has seen how that section bleeds into the concept of having a 'data driven approach'. But what does it mean to be more data driven really? How would an organisation know or recognise if it had become more 'data driven'? To understand this concept further, the next section will explore the research to determine what being data driven means for an Institution.

## 2.3 Concept 2: Data Driven Approach

### 2.3.1 Introduction

As discussed in the above section the intersection, or dependency, between student retention and a data driven approach is understood. As illustrated in Figure 7, this has highlighted the second major literature review concept to be explored: *Data Driven Approach*. This section will now explore the concept of being data driven in its entirety, rather than just its intersection with student retention. What does it mean for an institution to take a data driven approach? Is being data driven just another phrase for analytics or big data? What is the difference between analytics, big data and data driven? These are questions many 3rd level institutes ask and with the increasing popularity of digital transformation, data are becoming an even more important company asset. To understand what it means for a 3rd level institution to become more data driven, this section will explore these questions and clarify each of the concepts with a definition.

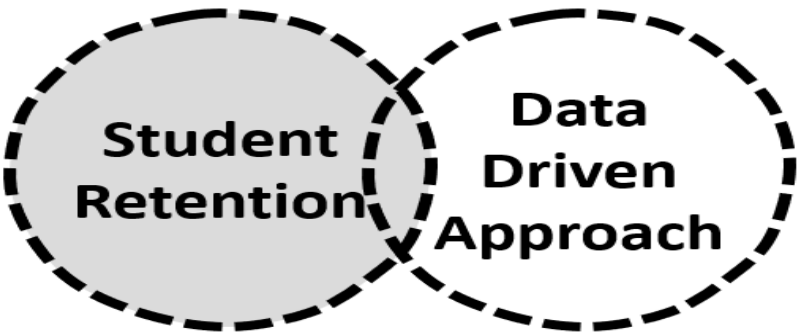



**Figure 7 - Second major literature review concept: data driven approach**

After those definitions are clear, data driven maturity models will be explored with a view to adopting a model which would help measure whether an institution is becoming more data driven or not.

### 2.3.2 Big Data and Business Analytics

#### *Big Data*

McAfee et al. (2012b) use three characteristics to differentiate data from big data: *volume*; *velocity* and *variety*. NIST (2015) add a fourth characteristic: *variability*. Known as the four 'V's' of big data, *volume* refers to the size of the data, *velocity* to the speed at which it is collected, *variety* to how varied it is in terms of source or type, and *variability* to the degree to which the previous three characteristics may change (NIST, 2015). In a survey of 20 large companies, Davenport and Dyché (2013) found that executives are more interested in the variety of big data rather than its volume. In an education context, volume could represent the volume of data an institute holds which could include all student record system (SRS) data, learning management system (LMS) data among others. Velocity would then refer to how quickly that data is collected. For example, a student submitting an assignment on the LMS, or even reading content from the LMS, could trigger and create data in real time showing these engagement statistics. In this example, the velocity of the data in question could be deemed to be quite high. On the other hand, data such as second level results, in Ireland's case the Leaving Certificate, could be described as low velocity as it is only collected once a year. LMS data could be described as of 'low variety' as learning management systems are typically very structured systems designed to store the data in standard formats. Finally, in the case of LMS data at least, each of the three variables described (volume, velocity and variety) would not themselves vary so much, meaning it would also have a low variability. It would be unlikely, therefore, to describe LMS data as Big Data. Davenport (2013, p. 3), in describing a history of analytics, heralds Analytics 1.0 as "*business intelligence*" and Analytics 2.0 as the "*era of big data*" and neatly distinguishes big data, from its predecessor data or just 'small' data, as it cannot merely be generated purely from a firms internal transactional systems. While there are many definitions of big data, the following is particularly suitable:

> ***"Big Data** consists of extensive datasets primarily in the characteristics of volume, variety, velocity, and/or variability that require a scalable architecture for efficient storage, manipulation, and analysis"* (NIST, 2015, p. 5).

### *Business Analytics*

Business analytics on the other hand then focuses on an organisation analysing the data for patterns and meaning which lead to insights, knowledge and value. If 'big data' refers to the data itself, and in particular its characteristics, then analytics refers to the processes and procedures within a company that seek to manage and gain insights from the data. Analytics can be used on all data, big or otherwise, and it is important to note the link to insights. A central objective of analytics is to gain insights, and the objective of gaining insights is to make decisions. In fact, decisions are quite often the products of information (Redman, 2008). Davenport (2009) proposes decision-making disorder is a result of decisions being the prerogative of senior executives, where data goes into the 'black box' and decisions come out without anyone really understanding the decision making process. Decisions based upon data are better decisions (McAfee et al., 2012b) and are inherently about managing uncertainty:

> *"By definition decisions involve uncertainty. If a decision algorithm could completely eliminate uncertainty, then the right thing to do would be clear and there would be no need to make a decision at all." (Redman, 2008, p. 91)*

Figure 8 shows a model illustrating how data can impact upon uncertainty in decision making. Decisions based on data and information are more likely to have an increased level of certainty. Conversely, decisions based on anecdotes and biases, HIPPO[12] decisions, are more likely to have an increased level of uncertainty.

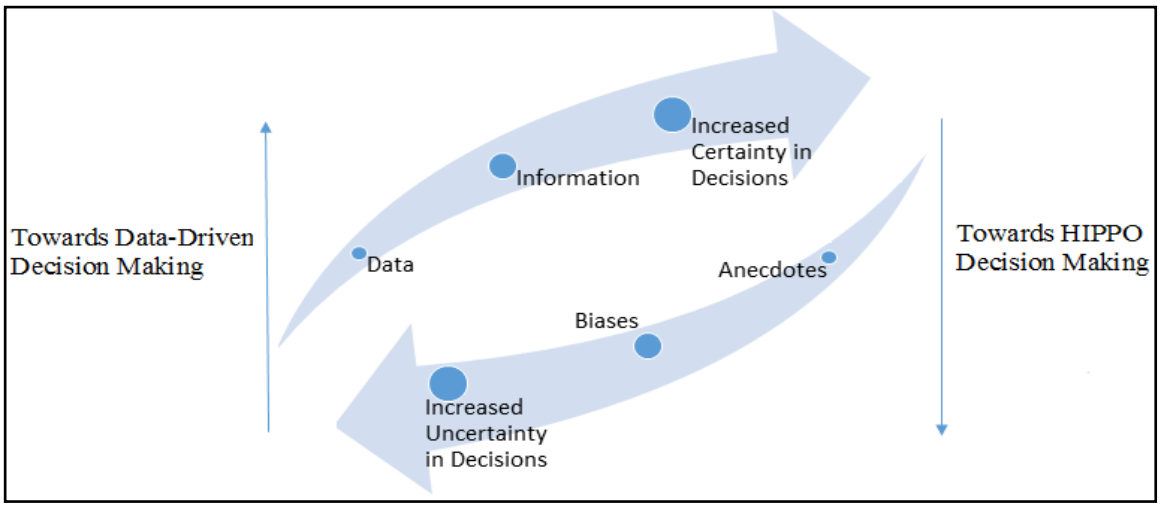



**Figure 8 - Uncertainty in decision making**

[12] HIghest Paid Persons Opinion

Another way of articulating Figure 8 would be to speak of evidence-based decision making. When data are rare, difficult and/or expensive to obtain it can make sense for decisions to rely heavily on persons in influential positions (McAfee et al., 2012a).

However, what, if anything, does this have to do with being data driven? Is it the case that an institution making decisions based on data, rather than the HIPPO style decision making, could be described as being 'data driven'? Are data driven institutions making decisions with less uncertainty? Are institutions using data in the same way today as they have always done, or is that changing? The next section will explore the literature further with a focus on answering these questions.

### 2.3.3 Exploration of Data Driven Maturity Models

There is not a huge sample set of literature exploring the maturity levels of organisations from a data driven perspective. However, there is significant research in the area of 'Business Intelligence Maturity Models (BIMM)' and 'Data Analytics Maturity Models', which will be explored to understand if a model exists which would be suitable for this research. In particular, this research requires a model which could measure the analytics (or data driven) maturity level of the organisation before and after the implementation of a data driven programme. Table 10 shows a list of just four maturity models which will be discussed further to understand their suitability, or otherwise, for this research.

| **Analytics Maturity Models** | | | | |
|---|---|---|---|---|
| **Maturity Level** | **AMR Research (2006)** | **HP (2007)** | **Gartner (2012)** | **Davenport & Harris (2017)** |
| 1 | Reacting | Stage 1 (Operation) | Descriptive | Analytically impaired |
| 2 | Anticipating | Stage 2 (Improvement) | Diagnostic | Localized analytics |
| 3 | Collaborating | Stage 3 (Alignment) | Predictive | Analytical aspirations |
| 4 | Orchestrating | Stage 4 (Empowerment) | Prescriptive | Analytical companies |
| 5 | | Stage 5 (Excellence) | | Analytical competitors |

**Table 10 - Business intelligence / analytics maturity models**

It is also important to note that companies, while largely characterised by one level or another, may also display characteristics from varying levels at the same time. This next

section will explore these five models in a little more detail with a view to adopting the most appropriate for this research.

**Maturity Level 1**

Focusing on using BI/Analytics Maturity to improve performance culture across the organisation, AMR Research's maturity model starts at level 1 with a stage called *Reacting*. Companies at this stage tend to ask questions such as "*Where have we been*?" or "*What happened?*" effectively reacting to what has happened. While stage 1 is named differently across the other three models (*Reacting* (AMR), *Operation* (HP), *Descriptive* (Gartner) and *Analytically Impaired* (Davenport & Harris)), there is consistency in how each model describes a company at this stage of maturity. Information latency is poor with reports updating monthly or even quarterly with most successes only tactical at a departmental or local level (Hagerty, 2006; Chuah and Wong, 2011). The extraction, transformation, loading and presentation of information is likely manual which makes the availability of any cross-departmental data stores unlikely (HP, 2007, 2009). Data may reside in single instance, dispersed files (Hagerty, 2006; Gartner, 2010) or even redundant data marts rather than a centralised data warehouse (Raber et al., 2012). Analysis of information is ad-hoc (Hagerty, 2006; Chuah and Wong, 2011) and function specific with little or no organisational consolidation of processes or metrics (Hribar Rajterič, 2010). There is little or no focus on a project management discipline for any BI work and it is unlikely that many/any senior executives are involved in BI (HP, 2009, 2007). Those executives and managers who are consumers of BI are reliant on a small number of analysts to manually feed them the data periodically (Muntean et al., 2011). Owing to the lack of frameworks or consistency of data management, the manual effort involved for an analyst to produce even basic reports is likely to be quite considerable (HP, 2009, 2007). It is possible that IT is the sole group developing reports, likely causing a backlog of report requests (Eckerson, 2007) and this is only for pockets of users with no real integration or information sharing. Looking at Table 10, it is interesting that Davenport & Harris provide a far more descriptive term for their stages. Each of the other models use a general term whereas Davenport & Harris are far more specific when they use terms such as '*Analytically Impaired*'. This is quite descriptive and useful as it accurately reveals where a company is at in the context of BI/Analytics maturity.

**Maturity Level 2**

Organisations who are at level 2 of maturity are likely to anticipate, rather than react to, events and key questions are more likely to be "*where are we now?*" (AMR) or "*why did it happen?*" (Gartner). This stage is referred to as *Anticipating* (AMR), *Improvement* (HP), *Diagnostic* (Gartner), *Prescriptive* (Davenport) *or Localized Analytics* (Davenport & Harris). Data analysis has moved out of individual departments and may have VP level accountability spanning multiple departments with the focus now more strategic than tactical (Hagerty, 2006; Hribar Rajterič, 2010). This inter-departmental approach now starts to take a more coherent view of organisational processes and may even contribute to their re-design (Hagerty, 2006). Analysts and end-users are far more likely to use dashboards rather than spreadsheets (Hagerty, 2006; Chuah and Wong, 2011). Graduation to level 2 is likely to see the creation of vertical data warehouses and data marts and a single information set is now being used by multiple/all departments involved in a single process. This increases awareness, and importance, of data quality. However, while multiple departments use the same information from a given process there is still limited integration between processes. Strategically, the organisation starts to realise the value of project management and the need for the BI team to have inter-departmental responsibilities (HP, 2009, 2007). While the levels of managers and executives consuming data increases, there is still little engagement from C-level executives [13]. As with stage 1, the term used by Davenport and Harris is also the most revealing and useful: a company at maturity level 2 could be described as having '*Localized Analytics*'. This is defined by Davenport & Harris (Davenport and Harris, 2017, p. 36) as "l*ocal and opportunistic – may not be supporting company's distinctive capabilities*".

**Maturity Level 3**

Companies at stage 3 maturity ask questions such as "*where are we going?*" or "*what is going to happen?*", "*what's happening now, can we extrapolate trends?*" and are now trying to understand cause and effect. This level is referred to as *Collaborating* (AMR), *Alignment* (HP), *Predictive* (Gartner) *or Analytical Aspirations* (Davenport & Harris). Not only can companies now anticipate events, they can also understand the effect of that event and may even start thinking about event prediction. The organisation now starts to build

[13] C-Level executives are CEO, CFO, COO, CIO etc.

accountability and Key Performance Indicators (KPI's) into organisational strategy and measures all aspects of the business against these KPI's (Hagerty, 2006; Hribar Rajterič, 2010; Chuah and Wong, 2011). At stage 3 the consumers of data are no longer limited to executives and managers, instead extending now to front line staff and process actors (Muntean et al., 2011). With clear operational metrics, decision making is now far more collaborative as groups understand the dependencies they have on each other so planning also becomes far more integrated (Hagerty, 2006). These companies start to experience a real performance improvement related to their level of analytics maturity (Hagerty, 2006) and C-level executives start to take a more active interest as the value of data is easily visible either in value added or cost savings delivered (HP, 2009). Davenport & Harris (Davenport and Harris, 2017, p. 36) refer to these companies as having '*Analytical Aspirations*' and tend to "*use analytics to improve a distinct capability"*.

**Maturity Level 4**

AMR's *orchestrating* and Gartner's *prescriptive* shows some similarities with both the level 4 and 5 of the HP and Davenport and Harris models, which is why they are presented thus in Table 10. At level 4 the company is now "fostering business innovation and people productivity" and has turned its information into a significant and powerful asset (HP, 2007, p. 5). Level 4 is referred to as *Orchestrating* (AMR), *Empowerment* (HP) and *Prescriptive* (Gartner). Davenport and Harris refer to level 4 companies as *Analytical Companies*. The power users in each department may now be re-branded as an analytics team under a single analytics programme manager (Eckerson, 2007). The use of analytics is embedded across many layers of the organisation, information latency may be real time (Muntean et al., 2011) and the company is now interested in ensuring they have a "single version of the truth" (HP, 2007, p. 6). While the information is centralised, there still exists great flexibility in responding to changing business needs (HP, 2009, 2007). Analytics are now automated possibly even to the point of automating decision making and not alone does analytics support key business processes it now redefines and transforms them. Staff members are using the data to proactively predict business outcomes rather than just retrospectively understand them. The data governance and quality programme has matured to the level where all levels of the organisation accept that data quality issues get resolved at source and not "masked with downstream cleansing" (HP, 2007, p. 6). Data governance policies and procedures are strongly enforced. The presentation layer has moved from scorecards and dashboards towards data visualisations. Data initiatives are so important to, and aligned with,

organisational strategy that a formal analytics Programme Management Office (PMO) may exist and each data initiative is likely sponsored at C-level (HP, 2009). A company at level 4 has now moved from understanding what happened and why it happened to being able to make real time decisions on something as it is happening or even about to happen (Eckerson, 2007). A company at level 4 maturity is likely to have a top executive, such as CFO, COO or even the Chief Data and Analytics Officer (CDAO) as the analytics program sponsor (Gartner, 2010). A company at this level of maturity has sufficient descriptive, diagnostic and predictive modelling capability to be able to prescribe what will happen next. We know, based on our extensive modelling capabilities, if we do X then Y will happen, so we are going to do X as we want to prescribe Y happening. Davenport & Harris (Davenport and Harris, 2017, p. 36) refer to these companies as being '*Analytical Companies'* no longer just having analytical aspirations (as in level 3).

**Maturity Level 5**

Level 5 maturity, which HP refer to as "creating strategic agility and differentiation", is one which very few organisations reach. At this point pretty much all business processes are heavily dependent on data and most decision making may be automated. Rather than prohibiting business agility through the lack of information, information is now so readily accessible and reliable that it promotes and enables it (HP, 2007). No longer seen only as a powerful asset, the analytics service is now seen as key market differentiator providing competitive advantage in the market (HP, 2007). Information is integrated and highly available and is now treated as a service rather than a product. All users are able to access the information they need, when they need it without having to worry about where that information actually comes from. C-level executives now use data as a vehicle for organisational change and the company may even have a CDAO tasked with ensuring competitive advantage in the market place (HP, 2009). The CDAO is concerned with ensuring the technology set and solution are also leading edge as the competitive advantage cannot be lost. Davenport & Harris (Davenport and Harris, 2017, p. 36) describe these companies as now being '*Analytical Competitors*'.

While Davenport and Harris's model provides some useful descriptions for companies at each stage, it also provides a method to allow companies measure their maturity: called the DELTATA framework. Originally this measure was introduced in Analytics at Work

(Davenport et al., 2010, p. 19) as the 'DELTA' framework which listed five success factors (or maturity measures) required "*to put analytics to work in your business*":

**D** for accessible, high quality *data*. The argument being that without high quality and accessible data, analytics in an organisation would be impossible.

**E** for an *enterprise* orientation. An organisation which has an enterprise orientation, rather than silos and individual business units, is far more likely to be successful analytically.

**L** for analytical *leadership*. Organisations with senior leaders who rely on facts (rather than intuition) for decision making have an advantage over those organisations who lack such leaders.

**T** for strategic *targets*. This speaks to an organisation which sets targets and uses its analytics to measure performance against those targets is making good use of its resources and more likely to succeed.

**A** for *analysts*. The persons in an organisation who build and maintain the analytical models and also bring data to the people in the organisation who need it for decisions.

Davenport and Harris (2017) then added another two new success factor or maturity measures (*technology* and *analytical techniques*) moving the original DELTA framework to a DELTATA framework. These two new measures are detailed below:

**T** for *technology*. An organisation using integrated, sophisticated and enterprise wide technology to aid analytics has an added advantage over it's competitors who do not.

**A** for *analytical techniques*. Organisations using analytical techniques such as classification, clustering, predictive methods, sentiment analysis, deep and machine learning are also in a positon of greater analytics maturity and competitive advantage.

This new DELTATA framework is illustrated in Figure 9 which is interestingly (and helpfully) broken out in a matrix format showing increased maturity potential across all DELTATA framework success factors. This model allows an organisation to measure its analytics maturity across all of these seven success factors (or dimensions). This allows for the very important nuance, likely to happen in most organisations, where the organisation may be mature on one dimension (e.g. Data) and more/less mature on another dimension (e.g. Leadership).

| | Stage 1<br>Analytically Impaired | Stage 2<br>Localized analytics | Stage 3<br>Analytical aspirations | Stage 4<br>Analytical companies | Stage 5<br>Analytical competitors |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| **Data** | Inconsistent, poor-quality, and unstandardized data; difficult to do substantial analysis; no groups with strong data orientation | Standardized and structured data, mostly in functional or process silos; senior executives do not discuss data management | Key data domains identified and central data repositories | Integrated, accurate, common data in central repositories; data still mainly an IT matter, little unique data | Relentless search for new data and metrics leveraging structured and unstructured data (e.g., text, video); data viewed as a strategic asset |
| **Enterprise** | No enterprise perspective on data or analytics; poorly integrated systems | Islands of data, technology, and expertise deliver local value | Process or business unit focus for analytics; infrastructure for analytics beginning to coalesce | Key data, technology, and analysts managed from an enterprise perspective | Key analytical resources focused on enterprise priorities and differentiation |
| **Leadership** | Little awareness of or interest in analytics | Local leaders emerge but have little connection | Senior leaders recognize importance of analytics and developing analytical capabilities | Senior leaders develop analytical plans and build analytical capabilities | Strong leaders behave analytically and show passion for analytical competition |
| **Targets** | No targeting of opportunities | Multiple disconnected targets, typically not of strategic importance | Analytical efforts coalesce behind a small set of important targets | Analytics centered on a few key business domains with explicit and ambitious outcomes | Analytics integral to the company's distinctive capability and strategy |
| **Analysts** | Few skills are attached to specific functions | Unconnected pockets of analysts; unmanaged mix of skills | Analysts recognized as key talent and focused on important business areas | Highly capable analysts explicitly recruited, developed, deployed, and engaged | World-class professional analysts; cultivation of analytical amateurs across the enterprise |
| **Technology** | Desktop technology, standard office packages, poorly integrated systems | Individual analytical initiatives, statistical packages, descriptive analytics, database querying, tabulations | Enterprise analytical plan, tool and platforms; predictive analytical packages | Enterprise analytic plan and processes, cloud-based big data | Sophisticated, enterprise-wide big data and analytics architecture, cognitive technologies, prescriptive and autonomous analytics |
| **Analytical techniques** | Mostly ad hoc, simple math, extrapolation, trending | Basic statistics, segmentation, database querying, tabulations of key metrics are leveraged to gain insights | Simple predictive analytics, classification and clustering; dynamic forecasts | Advanced predictive methods deployed to discover insights; advanced optimization, sentiment analytics, text and image analytics | Neural nets and deep learning, genetic algorithms, advanced machine learning |

**Figure 9 - DELTATA framework: (Davenport and Harris 2017)**

*Conclusion*

This section has clarified what it means for an organisation to be data driven. The further an organisation is along the DELTATA maturity model will be a strong indicator of how data driven that organisation actually is. Interestingly, Davenport and Harris' model explicitly lists companies whose leaders make decisions based on facts rather than intuition as having an advantage in their market, which links back to Figure 8. This model provides a very tangible mechanism to measure analytics maturity within an organisation.

### 2.3.4 Concept 2 Conclusion

Section 2.2 has discussed the concept of student retention. As part of that discussion the intersection with the concept of being data driven arose. Being data driven as a concept in its own right has been discussed in section 2.3. Interestingly, the concept of being data driven has raised the intersection with decision-making and particularly those who typically make decisions: Senior Management and Leaders.

When considering these three concepts (student retention, data driven and leadership) it highlights some significant consistencies in existing research. The main consistency is the student, who is really the primary actor of the model. The predominant research to date has been consistently focused on the student, with the secondary actor (the leader) being used as part of the data driven concept to alter the behaviour of the student. This is largely expected, when one considers that the student is, and rightly should be, the primary focus of all educational institutions. In all of the research discussed above, the student is the subject of both risk identification data, risk mitigation data and subsequent monitoring. Student retention models aim to identify those students which are being flagged as a retention risk and thus need academic supports, environmental supports and/or institutional supports. The leader then consumes that data identifying those 'at risk' students, before finally putting in place and monitoring (again using data) interventions aimed at increasing student success among the 'at risk' cohort. While the student is the target and subject of the data, the leader is also a significant actor in the model. The model could be summarised by saying that the leader is an actor in a data driven approach to change the behaviour of the 'at risk' student.

Subsequently, another way of looking at this dynamic is the illustration in Figure 10, showing a data driven approach as the overarching concept containing two actors: students

and leaders. However, Figure 10 highlights the student for a reason. This is to show that the existing research (understandably) places the student as the actor of focus in all models.

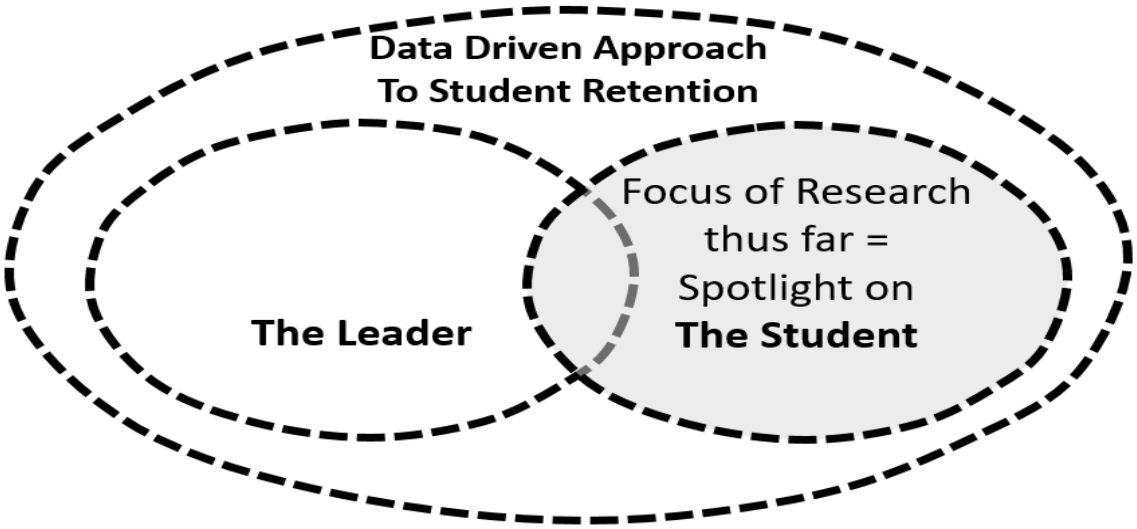



Figure 10 - Relationship between concepts and actors in existing literature

While the majority of retention initiatives are underpinned by a data driven approach, they are all focused on changing the behaviour of only one actor: the student. The leader is an actor involved in the overall relationship, but the student is the actor receiving all the focus, and the research, to date. This produces the research gap illustrated in Figure 11.

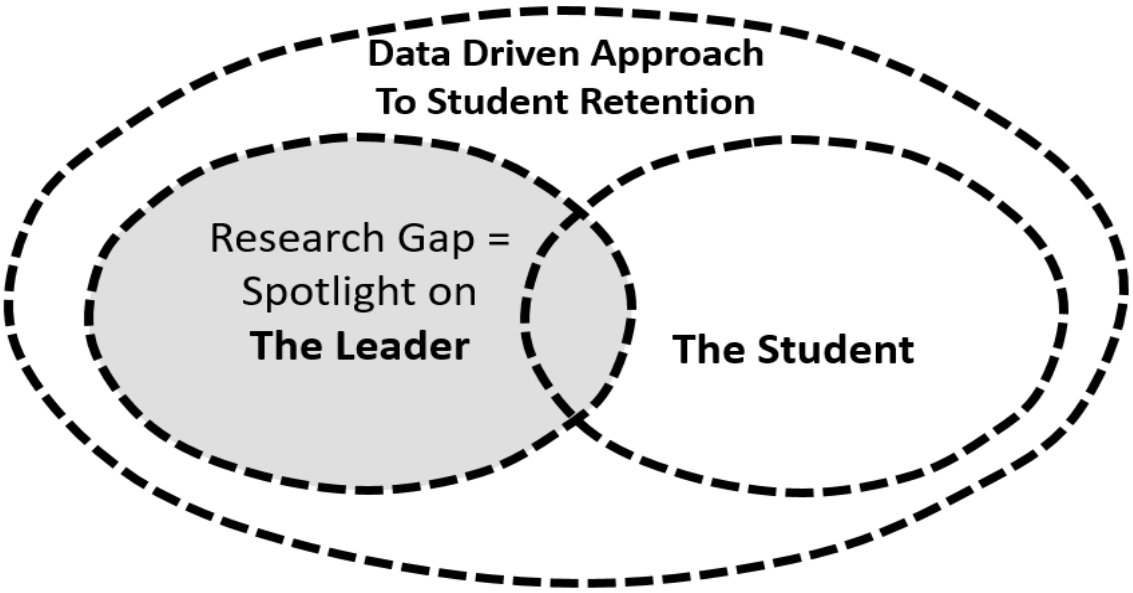



Figure 11 - Research gap: the leader as the actor of focus

There is little or no research placing the leader as the actor of focus in the above model. It raises some interesting questions. What impact does the student retention model have on the leader? The focus of the summary model, and the data driven approach, is on changing the

behaviour of the student. However, is it possible that this data driven approach could change the behaviour of the leader? None of the retention research found thus far looks at the impact a data driven approach has on the leader. For this reason, this research will use the same three concepts that have consistently been used, but this time move the focus. Leadership will be the primary focus, with 'the student' and 'a data driven approach' becoming the secondary actor and concept respectively. This research will aim to explore that gap. In order to explore that gap, however, a mechanism to measure change in a leader is required. The next section will explore leadership to see if such a mechanism exists.

## 2.4 Concept 3: Leadership

### 2.4.1 Introduction

Section 2.3 explored the concept of being data driven and also highlighted an intersection with leadership. Are there particular leadership theories that will allow the measurement of change in a leader? Section 2.4 will explore various leadership theories and whether any may be useful to exploring the impact on a leader.

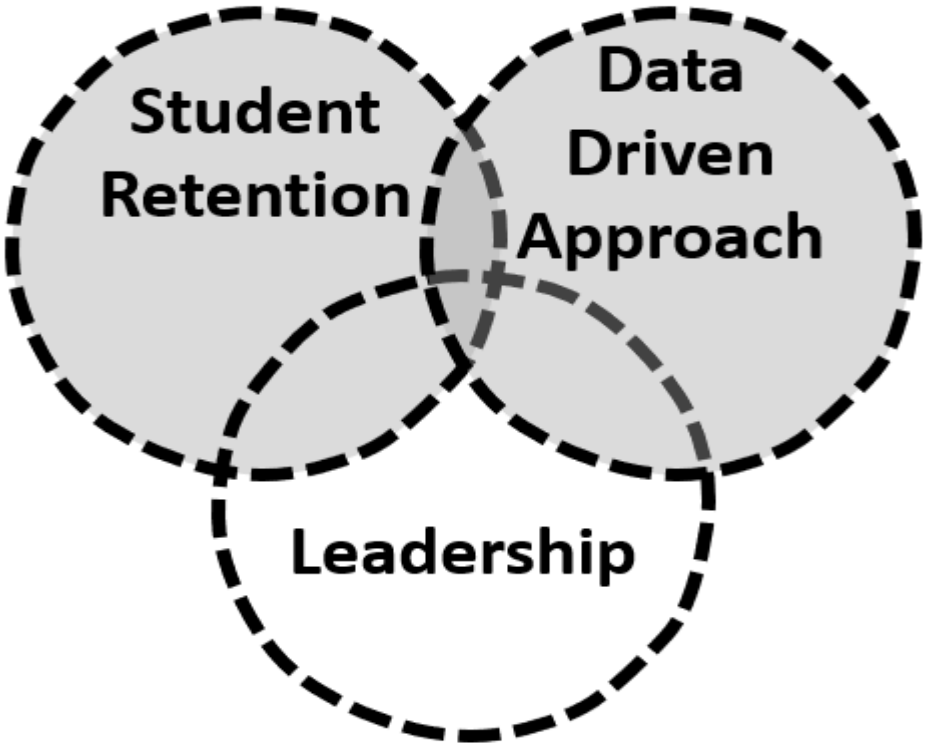



**Figure 12 - Third major literature review concept: leadership**

### 2.4.2 Leadership Theories Explored

*"From its infancy, the study of history has been the study of leaders – what they did and why they did it"* (Bass and Stogdill, 1990, p. 3)

What makes a good leader? Are the great leaders born or made? Are the great leaders successful because they happen to possess the golden combination of necessary traits or characteristics? Or is it possible that a pre-identified set of leadership skills can be trained into someone to make a great leader? This is a debate which has energised the research community for decades and one which still generates much disagreement.

"*I would argue that more leaders have been made by accident, circumstance, sheer grit, or will, than have been made by all the leadership courses put together*" (Bennis, 1989)

Respecting both sides of this debate, leadership can be classed as a property one can possess or a process one can follow (Jago, 1982). These different views are a suitable summary of what made up much of the early research into leadership which resulted in two main sets of leadership theories: the *trait theories* (a property which describes what leaders are) and the *behavioural theories (*a process which describes what leaders do*)*. Research concluding with findings supporting a trait theory found leadership as a characteristic, or set of characteristics, that the successful leader(s) in question possessed (Bass and Stogdill, 1990; DuBrin, 2007; Kirkpatrick and Locke, 1991; Lord et al., 1986; Mann, 1959; Northouse, 1997; Stogdill, 1948; Yukl, 2002). Other research however, concluded with findings suggesting that a leader did not need to possess a set of characteristics, and could instead, through displaying certain behaviours, influence a group of subordinates (or peers) to achieve a particular organisational goal (Bass, 1985; Blake and Mouton, 1964; Fayol, 1916; Fleishman et al., 1955; Kouzes and Posner, 1987; Likert, 1961; McGregor, 1960; Quinn and Rohrbaugh, 1983). These latter conclusions would have been from research supporting a behavioural theory. Both of these theory sets strived to identify the "best" set of traits or behaviours required to ensure great leaders.

This following section will discuss each of these theories in more detail, exploring various authors and their perspectives on the topic of leadership with a view to finding a particular leadership theory, or theories, which will assist with measuring change in a leader.

#### 2.4.2.1 "The Traits Theories" – What Leaders Are

**Introduction**

During the 20th century a set of leadership theories, commonly known as the "great man" theories, began to emerge from authors such as Stogdill (1948), Mann (1959), Bass and Stogdill (1990) and Kirkpatrick and Locke (1991). This moniker referred to the fact that these theories studied the traits of successful leaders trying to understand what made them successful, and in particular the traits that they possessed which non-successful leaders did not. In particular, the types of traits researched included physical characteristics (e.g. height, appearance), aptitudes (general intelligence, verbal fluency, creativity) and personality (e.g. self-esteem, dominance, emotional stability) (Yukl, 2002).

> *"The term trait refers to a variety of individual attributes, including aspects of personality, temperament, needs, motives and values. Personality traits are relatively stable dispositions to behave in a particular way" (Yukl, 2002, p. 175)*

These theories often suggested that not alone were great leaders born rather than made, but that the traits required for successful leadership were inherited (Kirkpatrick and Locke, 1991). Also adding to the *great man* moniker was the fact that these theories were at their most popular in the 19th and 20th centuries, at a time when most of the business leaders of the day were in fact men. By the early 20th century however, the "great man" theories evolved into what is now referred to as the "Trait Theories" of leadership.

The following section will chronologically explore those studies which focused on leadership traits or characteristics.

**Exploration of Trait Theories**

One of the earliest studies in the trait theory space was Stogdill (1948). He conducted a literature review of 124 studies which attempted to determine the traits or characteristics of leadership.

The results of the various studies and methods used allowed Stogdill to list a significant amount of traits that were associated with Leadership. However, that list was so significant that the author summarised the traits into six trait categories (*capacity, achievement, responsibility, participation, status, situation*) and used these categories to group the list of individual traits. This is illustrated in Table 11.

| Trait Category | Leadership Traits by Category | | | | | |
|---|---|---|---|---|---|---|
| **Capacity** | Intelligence | Alertness | Verbal Facility | Originality | Judgement | |
| **Achievement** | Scholarship | Knowledge | Athletic accomplishments | | | |
| **Responsibility** | Dependability | Initiative | Persistence | Aggressiveness | Self-confidence | Desire to excel |
| **Participation** | Activity | Sociability | Cooperation | Adaptability | Humour | |
| **Status** | Socioeconomic position | Popularity | | | | |
| **Situation** | Mental Level | Status | Skills | Needs and interests of followers | Objectives to be achieved | |

**Table 11 - Leadership Traits by Trait Category (After: Stogdill 1948)**

That Stogdill chose to group the traits into a more manageable set of trait categories gives an early indication to one of the most frequently cited weaknesses of the traits theories – their sheer quantity and variety. Another important finding from Stogdill was the influence situational factors had on leaders with the author suggesting that traits alone were not the only construct in determining leadership effectiveness. Stogdill found that once the "great man" traits were understood, matching those traits to the correct situation would significantly increase the effectiveness of leaders.

> *The following section, building on Stogdill (1948), will explore eight further studies which are significant in the leadership traits sphere, from Mann (1957) up to Dubrin (2007).*

Aware of the work of Stogdill, Mann (1959) subsequently conducted a literature review of all studies from the early1900s through October 1957. The author was trying to determine the relationships between an individual's personality traits and their performance in small groups. Mann didn't actually develop the eight personality traits in this case, rather he examined the empirical work of Cattell (1946, 1956) and French (1953). From these works, Mann took seven personality traits that he used for his work. These are listed in Table 12.

| Stogdill (1948) | Mann (1959) | Lord, DeVader and Alliger (1986) | Bass and Stogdill (1990) | Kirkpatrick and Locke (1991) | Northouse (1997) | Yukl (2002) | Dubrin (2007) | Daft (2007) |
|---|---|---|---|---|---|---|---|---|
| Capacity | Intelligence | Intelligence | Capacity | Cognitive Ability | Intelligence | | | Emotional Intelligence |
| Achievement | Masculinity | Masculinity | Achievement | | | | | |
| | | | | Business Knowledge | | Achievement oriented | | |
| Responsibility | Extraversion | | Responsibility | | | | | Extraversion |
| | | | | Self-Confidence | Self-Confidence | Self-Confidence | Self-Confidence | Self-Confidence |
| | Dominance | Dominance | | Drive | Determination | High energy level and stress tolerance | Assertiveness | Assertiveness |
| | | | | Motivation | | Socialized Power Motivation | | Passion |
| | | | | | | | Enthusiasm | Enthusiasm |
| | | | | Honesty/Integrity | Integrity | Personal Integrity | Trustworthiness | Trustworthiness |
| Participation | Adjustment | | Participation | Flexibility | | | | Flexibility |
| | | | | | | | Sense of Humour | Sense of Humour |
| | | | | | Sociability | Low need for affiliation | Extraversion | |
| Status | | | Status | Charisma | | | | |
| Situation | | | Situation | | | Emotional stability | Emotional stability | Emotional stability |
| | | | | | | Internal locus of control | | Internal Locus of Control |
| | | | | | | | | Courage |
| | Conservatism | | | | | | | |
| | Sensitivity | | | | | | | |
| | | | | | | | Warmth | Warmth |
| | | | | | | | Humility | Humility |

**Table 12 - List of major traits found up to 2007**

The table illustrates the traits found by both authors (Stogdill and Mann) and immediately highlights the significant variation across each authors' findings even though their objectives were quite similar. However, some similarities do exist and these include *capacity* and *intelligence* which is essentially both authors reaching the same conclusion while using different descriptors of their traits. Stogdill's category of responsibility finds consistency with two traits that Mann refers to as *extraversion* and *dominance*. Similarly, Stogdill's category of achievement refers to a trait of *athletic accomplishment* which shows some consistency with Mann's *masculinity*. The *adaptability* sub-category of Stogdill's *participation* shows some consistency with Mann's *adjustment* trait. Other than that, Stogdill's findings of *status and situation* show no relation to Mann's *conservatism* and *sensitivity*.

By the mid 80's, research was really emerging which started to question some of the earlier findings. Lord et al. (1986) re-examine the strength of correlation between personality traits and leadership success and conclude with a view contradictory to many previous studies. Using a more sophisticated data analysis procedure (validity generalization) than previous studies, the authors tested the strength of relationship between previously listed personality traits and leadership perception. Interestingly, their findings showed that previous studies (c.f. Stogdill, 1948; Mann, 1959; Muchinsky, 1983; Landy, 1985) in the trait theory sphere mis-interpreted results as showing a correlation between leadership traits and their effect on performance, when in fact the correlation was between personality traits and leadership emergence. The authors concluded that only three personality traits (intelligence, masculinity-femininity, dominance) showed this strong relationship as per their results. This conclusion was quite interesting in other ways, as narrowing the list of effective traits to three supports the notion that the number of traits developing across studies was becoming problematic. While Lord et al. reduced the number of traits significantly, the three traits they deem valid, *intelligence, masculinity and dominance*, show consistency with some of Mann's findings.

By the early 90's, not only were studies emerging which started to contradict traits based theory, some (Kirkpatrick and Locke, 1991) questioned if traits mattered at all. Questioning, but not entirely discounting, Stogdill's findings, Kirkpatrick and Locke posit that traits alone are insufficient for business leader success but they are a precondition. As well as possessing the necessary 'core' traits, a successful business leader takes certain actions in order to be successful. The authors placed significant value on what they called the 'core' traits and

believed that while the core traits did not guarantee leader success, they did help a leader start down a path for success. The core traits, Kirkpatrick and Locke suggested, helped a leader acquire the necessary skills, use those skills to formulate a vision for the organisation, develop an associated plan for pursuing that vision and take the necessary actions to implement that vision. After completing the literature review of all of the traits developed by other authors, Kirkpatrick and Locke summarised what they felt were the eight core traits found in successful leaders. Interestingly, the number of traits is significantly greater than Lord et al. again adding to the growing list and explaining why the authors' 'core' traits were actually trait categories rather than individual traits themselves. For example, drive encompasses achievement, ambition, energy, tenacity and initiative in a leader and motivation is the leader's strong desire to influence and lead others and the need for power.

Once these core traits are embedded into Table 12 and compared to the growing list, it is evident that although Kirkpatrick and Locke question the validity of traits theory, their findings show significant similarities with the work of Stogdill (1948) and Bass and Stogdill (1990). *Cognitive ability* is the same trait as *capacity* and *intelligence* found in previous studies. *Knowledge of the business* is consistent with the *knowledge* portion of Stogdill's *achievement* trait. Kirkpatrick and Locke list *self-confidence* as an important trait which is consistent with Mann's *extraversion* and the *self-confidence* sub-category of Stogdill and Bass and Stogdill's responsibility. Similarly, what both Mann and Lord et al. refer to as *dominance* shows consistency with Kirkpatrick and Locke's descriptions of their *drive* trait which are both consistent with the *initiative* sub-category of the responsibility trait found by Stogdill (1948) and Bass and Stogdill (1990). Both Stogdill (1948) and Bass and Stogdill (1990) list *desire to excel* as a sub-category of *responsibility* which is again consistent with Kirkpatrick and Locke's trait of *motivation*. Completing the responsibility category of Stogdill (1948) and Bass and Stogdill (1990), the dependability sub-category shows similarities with Kirkpatrick and Locke's *honesty and integrity* trait. Kirkpatrick and Locke list *flexibility* as an important trait which can be aligned with the *adaptability* sub-category of *responsibility*. Finally, they list *charisma* as important which is consistent with the *socio-economic position* and *popularity* sub-categories of Stogdill's *status* trait.

However, while there are strong similarities and consistencies, what is evident from Table 12 is the confusion which arises from traits of previous studies now appearing under a different name. Stogdill used the phrase 'capacity' to describe the trait that Mann and Lord et al. referred to as 'intelligence' while Kirkpatrick and Locke called this 'cognitive ability'.

This confusion is again highlighted by Northouse (1997), who again used literature review, raising concerns with the ever increasing number of traits each study was producing. In attempting to separate the wood from the trees, Northouse found that five traits stood out as more important than others as they were more frequently occurring in the studies he explored. Northouse's five traits are listed below.

While it may be encouraging to see the number of traits again reduced to more manageable levels, this feeling is short lived. Yukl (2002), again after conducting a literature review, concluded with a list of what he felt were the most relevant and 'important' personality traits for effective leadership in large organisations. This points to another weakness of the trait theories, the subjectivity of each author's determination of what are the most 'important' traits. All authors conducting literature reviews conclude by distilling the traits found into the "most important" list of traits. However, rarely do two authors agree on that list.

More recent theories have failed to resolve this situation with Dubrin (2007) categorising the high number of traits (14) into *general personality traits* and *task-related personality traits*.

1) General Personality Traits

"A general personality trait is a trait that is observable both within and outside the context of work. That is, the same general traits are related to success and satisfaction in both work and personal life" (DuBrin, 2007, p. 34)

2) Task-Related Personality Traits

Dubrin (2007) categorises personality traits closely associated with task accomplishment as task-related personality traits.

Particularly interesting again is that Dubrin's list of traits has increased to fourteen, and unsurprisingly the author decided to provide some form of categorisation.

**Conclusion**

This section has explored in some detail the "Traits" or "Great Man" Theories. While this set of theories has significant relevance to leadership, it is evident that the set is focused on what leaders 'are'. What traits, or characteristics, they possess. How those characteristics are relevant to leadership and in particular their correlation to leadership effectiveness. What is also evident is that characteristics typically do not change. Some of the earlier studies highlighted by Bass and Stogdill (1990) list traits such as height, sex and social status as

having a correlation to leadership effectiveness. These are traits that one either has or has not. They are very unlikely to change. Therefore, if we are to measure change in a leader, the trait theories of leadership will be less suitable. However, another set of leadership theories exist; "*The Behavioural Theories*". These theories may be more suitable because behaviours can change. This next section will explore the behavioural theories to understand if any could be used to measure change in a leader.

#### 2.4.2.2 "Behavioural Theories" – What Leaders Do

**Introduction**

The behavioural theories took a different view on leadership than their trait counterparts. If the trait theories can be summarised by the phrase "*What Leaders Are*", then the behavioural theories could be described as "*What Leaders Do*". Rather than focus on a leader's characteristics, behavioural theories instead focused on the behaviours of a leader and in particular those behaviours which influence the performance of subordinates (Brooks, 2009). The following section will chronologically explore those studies which focused on leadership behaviours to understand if any could be used in the context of student retention.

**Exploration of Behavioural Theories (up to 1960)**

Table 13 lists some of the main leadership behaviour studies up to 1960 and the leadership behaviours that they found. The following section will explore these studies in further detail.

| Fayol (1916) | OHIO State Leadership Studies (1955 – 1960) | McGregor (1960) Theory X Behaviours | McGregor (1960) Theory Y Behaviours |
|---|---|---|---|
| Plan | Initiating Structure | | |
| Organise | | | |
| Command | | Authoritarian | |
| Co-Ordinate | | | |
| Control | | Tight Control | |
| | Consideration | | Delegation |
| | | | Decentralisation |
| | | | Enabling |
| | | | Trusting |
| | | | Participation |
| | | | Consultation |

**Table 13 - Leadership behaviours found up to 1960**

Henri Fayol (1916) conducted a significant amount of research in the area of management, and in particular established the *14 principles of management* which had a profound influence on how organisations were managed. Though the principles are of lesser

importance to this research, Fayol also developed what he felt were the *functions/elements of management*. Fayol (1916) posits that the functions/elements of management are to: Plan, Organise, Command, Coordinate and Control.

A number of years later the Ohio State Leadership Studies commenced and have formed the basis for much of the subsequent research on leadership behaviour. Initially the researchers focused on identifying categories of behaviour and developing questionnaires to describe that behaviour (Yukl, 1994). A number of authors have contributed to, or built upon, research which formed part of the 'Ohio State Leadership Studies'. These include

- Fleishman et al. (1955) produced the Leadership Opinion Questionnaire
- Halpin and Winer (1957) produced the Leader Behaviour Description Questionnaire
- Stogdill and Coons (1957) produced another updated edition of the Leadership Opinion Questionnaire
- Halpin (1970) produced the Leader Behaviour Questionnaire
- Fleishman (1970) produced the Supervisor Behaviour Description Questionnaire

All studies had basis in the original work of Fleishman et al. (1955) entitled "Leadership and supervision in industry; an evaluation of a supervisory training programme". The objective of the study was to determine the impact first line supervisor behaviour might have on employee morale, absenteeism, productivity and retention. The research subjects were production line supervisors in the motor industry. Subordinates were asked to evaluate their foreman's behaviour by responding to a "Leadership Opinion Questionnaire". The foremen themselves were also asked for their opinion on how they should interact with their group. This study found that two dimensions of behaviour were evident in successful leadership:

a) *Consideration* which was a behaviour displayed by leaders showing concern, respect and trust for subordinates. House (1971) suggested evidence of this behaviour could be seen when a leader created a supportive environment by being friendly and approachable, by caring for the welfare of his/her employees welfare and being mindful of the effects of change on employees.
b) *Initiating Structure* which was a behaviour displayed which showed a desire to ensure that work gets done to an acceptable level and that the organisation is efficient and effective. This behaviour can be seen when a leader assigns tasks, provides specific procedures to be followed, clarifying expectations and

scheduling work (House, 1971). House (1971) categorises this type of leader as one who plans, organises, directs and controls.

Fleishman (1955) concluded that leaders practice varying degrees of both people focus (consideration) and task focus (initiating structure) behaviours but the most successful leaders practiced both. Illustrated in Figure 13, Fleishman et al.'s most successful leaders would be in the upper right quadrant practicing high levels of people focus and also high levels of task focus (Northouse, 2012).

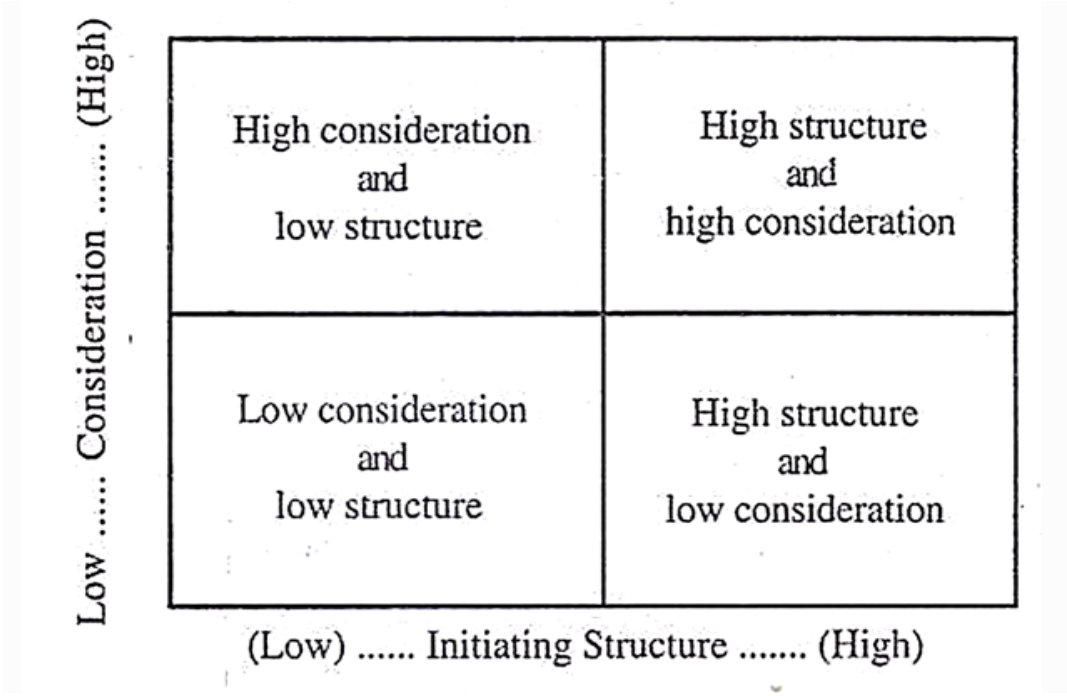



**Figure 13 - Ohio State leadership dimensions (Source: Fleishman et al. 1955)**

Brooks (2009, p. 167) provides a little more insight into the above behaviours by suggesting that consideration "*includes behaviours which encourage collaboration and focus on supportive networks, group welfare and the maintenance of job satisfaction*" and that initiating structure "*refers to behaviour which focuses on the achievement of objectives and includes clear supervision and role clarification, planning of work and a results orientation*". This is important as the words underlined, while not explicitly mentioned by Fleishman et al. will arise again in subsequent studies discussed later in this section.

Stogdill and Coons (1957), also part of the Ohio State Leadership group, validated these findings in their own experimental study. *Consideration* and *Initiating Structure* became central to many subsequent leadership behaviour studies which will be explored further in this section.

McGregor (1960), illustrated in Figure 14, identified the “Theory X” manager as someone who assumes all employees are lazy, don’t like their work, need incentives just to perform, resist change, can be disloyal and need to be controlled. McGregor refers to this type of managerial style as the conventional, historical view, where management feels it has to keep a watchful eye over employees to control their actions. McGregor suggests that this conventional view, or that of the ‘Theory X’ manager, can be deemed flawed when one considers the subject of motivation. Man has physiological, safety, social, ego and self-fulfillment needs which man ranks hierarchically by their salience (McGregor, 1960; Brooks, 2009). Once lower order needs (physiological) are satisfied then man moves on to try and satisfy the next set of needs on the hierarchy (safety) and moves through the hierarchy thus. McGregor makes a direct causal link between employee motivation and employee behaviour (or performance). Once man satisfies a need then that need no longer becomes a behavioural motivator. When the physiological (food and water), safety and social needs are satisfied then man is motivated to seek satisfaction from ego and self-fulfillment needs and these can be met through independence, achievement, status, recognition, self-development and creativity. McGregor posits that these types of needs can never be met when working for a ‘Theory X’ manager who is over controlling and micro managing. In fact, McGregor makes the point that the style adopted by the ‘Theory X’ manager may not be an effect of employee disengagement, dishonesty and demotivation but rather a cause of it.

McGregor’s ‘Theory Y’ managers, on the other hand, believe that employees are inherently honest, work hard, want to be involved and take responsibility, embrace change, have good ideas and generally make a very positive contribution. The ‘Theory Y’ manager is responsible for harnessing these positive motivations among employees to align with organisation needs.

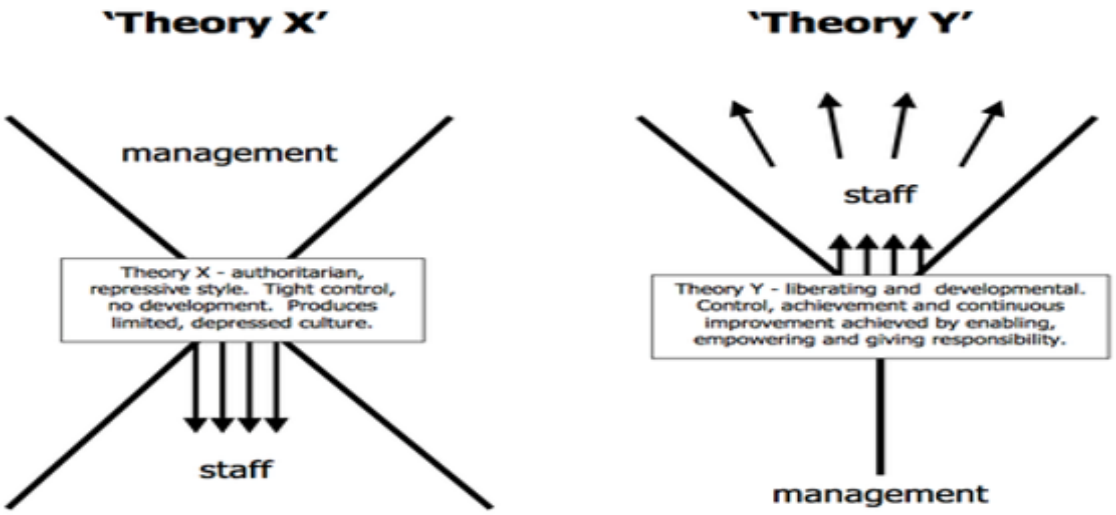



**Figure 14 - McGregor's Theory X and Theory Y (From: Dudovskiy 2014)**

The really interesting part of McGregor's research is his suggestion that while there is a causal link between employee motivation and employee behaviour, there is also a causal link between managerial behaviour and employee motivation. McGregor (1960) posits that if a 'Theory Y' manager can exhibit certain behaviours then this would offer their sub-ordinates opportunities to satisfy some of their own higher order needs. The 'Theory Y' manager's essential tasks involve

"*arranging organisational conditions and methods of operation so that people can achieve their own goals best by directing their own efforts towards organisational objectives*"(McGregor, 1960, p. 169)

While McGregor accepts at the time that his conclusions need further testing, he does reference some leadership behaviours (illustrated in Table 14), consistent with his 'Theory Y' manager, which were showing success at the time.

| Leadership Behaviour | Description |
|---|---|
| Decentralisation and Delegation | This leadership behaviour encourages less control of the employee, offers degrees of freedom to allow them direct their own activities, allow employees assume responsibility, thus allowing them to satisfy their egoistic need (McGregor, 1960). |
| Job Enlargement | This leadership behaviour encourages acceptance of responsibility by employees providing opportunities for satisfying social and egoistic needs (McGregor, 1960). |
| Participation and Consultative Management | This leadership behaviour encourages employees to direct their "creative energies" towards organisational objectives and also allows employees to participate in decisions which affect them again potentially satisfying social and egoistic needs (McGregor, 1960). |

**Table 14 - Leadership behaviours 'Theory Y' manager (from: McGregor 1960)**

Based on these descriptions of McGregor's behaviours, the table of behaviours could be redrawn to categorise each of the Theory Y behaviours as behaviours which are all *concerned for people*. If this were the case then the consistencies with the Fleishman et al. findings become more recognisable.

**Exploration of Behavioural Theories (post 1960)**

Table 15 lists some of the main leadership studies from 1961 - 1980 and the leadership behaviours that they found.

<table>
<tr><th>Likert (1961)</th><th>Blake and Mouton (1964)</th><th>Fiedler (1967)</th><th>Bass (1985)</th><th>Yukl et al. (2002)</th><th>Hartnell et al (2011)</th></tr>
<tr><td rowspan="2">Employee Orientation</td><td rowspan="2">Concern for People</td><td rowspan="2">People Oriented</td><td rowspan="2">Transformational (Charisma, Inspiration, Intellectual Stimulation, Individual Consideration)</td><td>Relations Oriented (Developing, Supporting, Consulting, Recognizing, Empowering)</td><td>Human Affiliation (Teamwork, Participation, Employee Involvement, Open Communication)</td></tr>
<tr><td>Change Oriented (Visioning, Intellectual Stimulation, Risk-Taking, External Monitoring)</td><td>Change (Risk Taking, Creativity, Adaptability)</td></tr>
<tr><td rowspan="2">Product Orientation</td><td rowspan="2">Concern for Production</td><td rowspan="2">Task Oriented</td><td rowspan="2">Transactional (Contingent Reward, Management By Exception (active), Management By Exception (passive), Laissez-Faire</td><td rowspan="2">Task Oriented (Clarifying, Monitoring, Short-Term Planning)</td><td>Achievement (Gathering customer and competitor information, Goal-setting, Planning, Task Focus, Competitiveness, Aggressiveness)</td></tr>
<tr><td>Stability (Conformity, Predictability)</td></tr>
</table>

**Table 15 - Leadership behaviours found post 1960**

The following section will explore these studies in further detail. During the 40's and 50's, Rensis Likert conducted a series of leadership studies that were published in 1961 and became known as "The Michigan Studies". Likert was interested in determining the leadership behaviours that led to employee productivity, employee job satisfaction and effective group performance. Similar to Fleishman et al. (1955), Likert (1961) also identified two types of leadership behaviours and while the behaviours were named differently (to Fleishman) they were essentially the same. Likert's successful leaders showed either an **employee orientation** or a **production orientation** and is illustrated in

Figure 15. Leaders showing an employee orientation recognised the value of interpersonal relations which was consistent with Fleishman's *consideration* behaviour. Similarly, the production orientation behaviour, being concerned with the technical aspects of the job and ensuring the work was done showed recognisable similarities with the *initiating structure* behaviour from Fleishman.

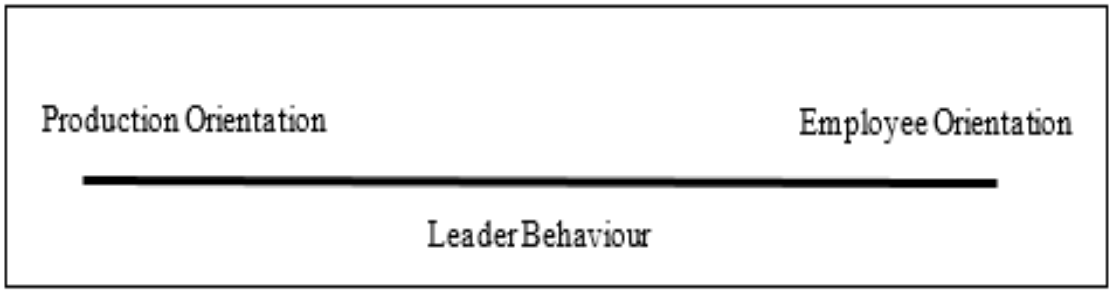



**Figure 15 - Likert's single dimension of leader behaviour (From Likert 1961)**

Figure 15 shows that Likert positioned these behaviours on a single dimension making them mutually exclusive. Likert felt that leaders could be one or the other and were identifiable at a single point on that dimension. This was in contrast to Fleishman et al. who felt that leaders could display varying degrees of each behaviour along two separate dimensions.

Blake and Mouton (1964) built on the OHIO State and Michigan studies and at this point some real consistencies began to emerge. Using experimental methods with over 5000 managers, Blake and Mouton, like the earlier studies, set out to identify how a manager's behaviour impacted upon performance of employees. The authors used managers from industry and government in different organisational settings, various sectors and across multiple countries. Blake and Mouton's leadership behavioural model was based on two constructs: *concern for people* and *concern for production*. In their *Managerial Grid*, Figure 16, Blake and Mouton's graded each behaviour along a scaled axis of 1-9, allowing leaders to display varying degrees of each behaviour. For example, a leader showing high degrees of 'concern for people' but low degrees of 'concern for production' was classed as a "Country Club Manager" (1,9). Whereas, a leader with a high score on each axis, or a score of 9,9, could be classed as a "Team Manager". Blake and Mouton conclude that 9,9 is the best type of manager. With a strong leaning towards believing "leaders can be made rather than are born", Blake and Mouton subsequently came up with a training program designed to turn any willing participants into a 9,9 manager. One of the main findings however, was

that the managerial grid "avoids the argument of one extreme vs the other and shows the possibilities in various blends of leadership styles" (Blake and Mouton, 1964, p. v).

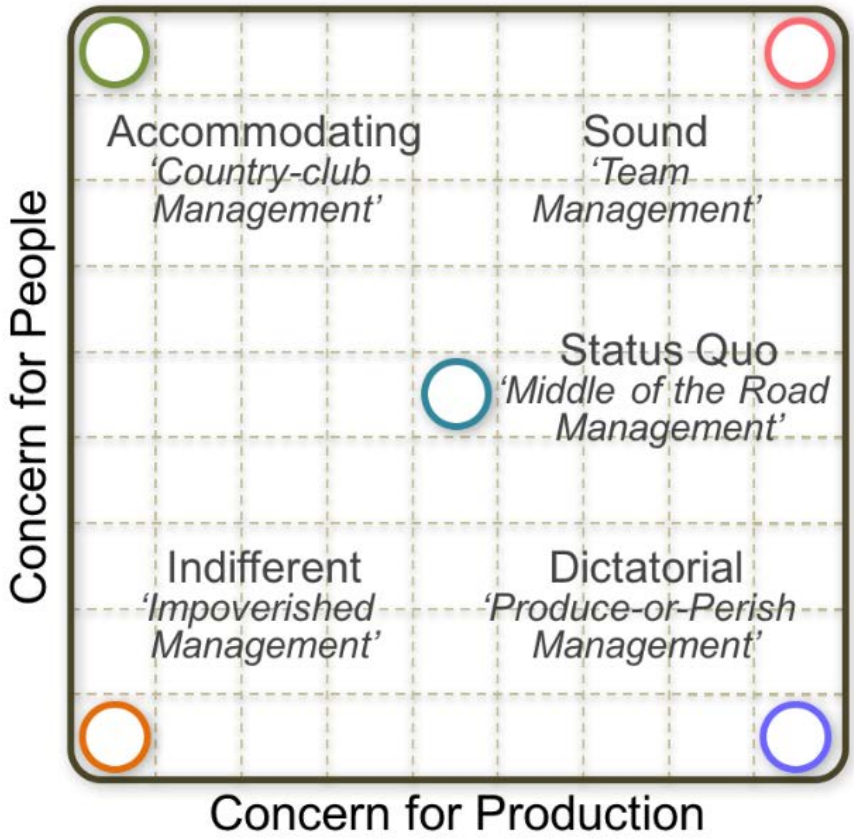



**Figure 16 - Blake and Mouton's Managerial Grid (From Clayton (2017))**

Blake and Mouton's behaviours show strong similarities to those of Fleishman et al. and Likert. The constructs all three studies were more or less the same with the main difference being that Likert's study concluded that the constructs were mutually exclusive, whereas Fleishman et al. and Blake and Mouton both felt that an individual leader could display varying degrees of each construct.

Fiedler (1967) published "*A Theory of Leadership Effectiveness*" which dominated much of leadership research for the remainder of the 60s and 70s. Fiedler introduced the importance of the situation as a variable in determining leadership effectiveness. Up to this point, much of the research focused on what personal characteristics correlated with leadership success and did some have a stronger correlation than others. Fiedler, however, concluded that not only were characteristics important but the situation in which they were used was also important. He posits that the effectiveness of 'task-oriented' and 'people-oriented' leaders is contingent on the situation in which they are leading. While the importance of situation is highly important in determining effectiveness, this study is interested in the behaviours

themselves and not the impact the situational variable. After analysing the biographical works of various political leaders, Burns (1978) proposed the *transformational* and *transactional* leader constructs. Bass (1985) furthered this work while attempting to measure and assess leadership styles and developed what became known as the MultiFactor Leadership Questionnaire (MLQ) (Lowe et al., 1996). While primarily interested in the transformational leader, Bass uses the transactional leader as a contrasting counterbalance to illustrate his point. Figure 17 is an illustration of Bass' findings which he used to characterise transformational and transactional leaders and provides a description of each of the behaviours that he found under each construct.

Transformational Leader
*Charisma*: Provides vision and sense of mission, instills pride, gains respect and trust.
*Inspiration*: Communicates high expectations, uses symbols to focus efforts, and expresses important purposes in simple ways.
*Intellectual Stimulation*: Promotes intelligence, rationality, and artful problem solving.
*Individualized Consideration*: Gives personal attention, treats each employee individually, coaches, and advises.

Transactional Leader
*Contingent Reward*: Contract exchange of rewards for effort, promises rewards for good performance, recognizes accomplishments.
*Management by Exception (active)*: Watches and searches for deviations from rules and standards, takes corrective action.
*Management by Exception (passive)*: Intervenes only if standards are not met.
*Laissez-Faire*: Abdicates responsibility, avoids making decisions.

**Figure 17 - Leadership behaviours (After Bass 1990)**

What is noticeable however, is that not all those listed above might qualify as a behaviour in its literal sense. For example, in contrast to the other authors listed above, Quinn and Rohrbaugh (1983) include cohesion, morale and readiness as behaviours. These might be better described as outcomes of particular behaviours rather than behaviours themselves. It is difficult to describe someone as "doing" either cohesion, morale or readiness. Unfortunately, further studies in the area of behaviour theory served to create similar confusion with the proliferation of behaviours as happened with traits theories. Yukl et al. (2002) recognised the problem this proliferation was creating and set out to create a conceptual framework of integrated leadership behaviours aimed at addressing the research gap due to lack of agreement about which behaviours were relevant and meaningful. Up to this point most research on leadership behaviour focused on two main meta-categories (*relations-oriented behaviour* and *task-oriented behaviour*). Yukl et al. posit that a third

category had been overlooked (*change-oriented behaviour*). Their objective was to evaluate whether these three meta-categories provided the basis for developing an integrative taxonomy of leadership behaviour. While the authors commenced by using meta-categories as the main descriptor, they wisely moved to describe their behaviour sets as dimensions rather than categories. This highlighted that behaviours could be observable across multiple dimensions and not confined to a single meta-category. For example, a leader providing recognition for significant contributions has a primary objective which is relations-oriented but a secondary objective which is task-oriented (as the contribution was likely to some organisational task). Using dimensions rather than categories allowed the authors highlight this important nuance. Reviewing prior research on effective leadership which provided evidence for particular leadership behaviours, the authors were then very selective in what behaviours they selected for their own taxonomy of leadership behaviours. In making these selections, the authors used three further criteria:

1. The behaviour had to be directly observable, as opposed to outcome based only
2. The behaviour had to be applicable to all types of organisational leaders
3. The behaviour had to have a primary relevance to one of the above three dimensions

Table 16 illustrates the primary findings from Yukl et al. which concluded with a taxonomy of 12 main leadership behaviours. Interestingly, this taxonomy offers a concrete measurement opportunity. These 12 behaviours are clearly categorised but more importantly very well defined, making them highly measurable.

| **Category** | **Behaviour** |
|---|---|
| Task Oriented | Short-Term Planning |
| | Clarifying Roles |
| | Monitoring Operations |
| Relations Oriented | Supporting |
| | Recognizing |
| | Developing |
| | Consulting |
| | Empowering |
| Change Oriented | External Monitoring |
| | Envisioning Change |
| | Encouraging Innovative Thinking |
| | Taking Risks for Change |

**Table 16 - Leadership behaviours (After Yukl et al. 2002)**

**Conclusion**

This section explored the be the behavioural theories of leadership. Where the trait theories are described as "*What Leaders Are*", it is evident that the behavioural theories description, "*What Leaders Do*", is also accurate. Rather than focus on a leader's characteristics, behavioural theories instead focused on the behaviours of a leader and often those behaviours which influence performance of subordinates and / or performance of the organisation (Brooks, 2009). In terms of being used as a concrete measurement tool to measure leadership behaviour, Hartnell et al.'s behaviours are valuable though not as appealing as Yukl et al. Yukl et al.'s list of behaviours are clearly categorised into dimensions, with each behaviour clearly defined making it an ideal measurement tool to measure leadership behaviour, and in particular any change in leadership behaviour.

### 2.4.3 Concept 3 Conclusion

Section 2.4 has explored the concept of leadership. Initially the concept of leadership vs management was explored and then the leadership theories were explored. Initially this exploration focused on the trait theories of leadership and then the behavioural theories of leadership. The behavioural theories would appear to be extremely suitable for this area of research as they focus on what leaders do, rather than what leaders are. The primary reason for their being suitable would be that what leaders do has the potential to change over time, or as a result of another variable, however, what leaders are (traits) is far less likely to change. Also, the taxonomy of leadership behaviours found in Yukl et al. (2002) provide an ideal measurement tool to measure leadership behaviour over time, and in particular the measurement of any change in leadership behaviour.

## 2.5 Chapter Conclusion

This literature review has confirmed three key concepts as the focus of this research: *being data driven*, providing data to *leaders* so they may intervene and provide supports to students with a view to improving *student retention*. These concepts are illustrated in Figure 18.

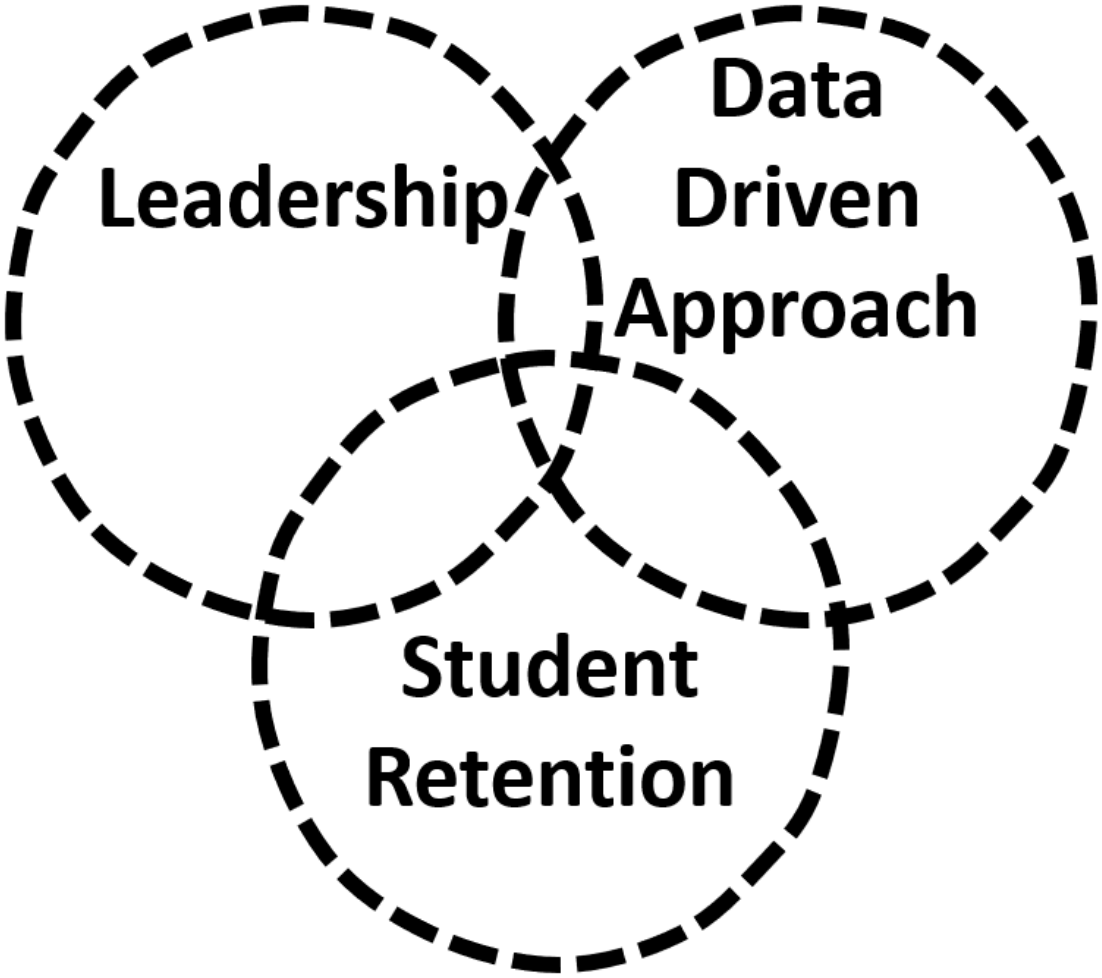



**Figure 18 - 3 key concepts in this research**

These three concepts allow the illustration of a student retention model at a summary level. What is interesting about this graphic is that it highlights some significant consistencies in existing research. The main consistency is the student, illustrated as the primary actor of the model. The predominant research to date has been consistent with being largely focused on the student as the actor of focus, with the secondary actor (the leader) being used as part of the data driven concept to alter the behaviour of the student. This is largely expected, when one considers that the student is, and rightly should be, the primary focus of all educational institutions. In all of the research discussed above, the student is the subject of both risk identification data, risk mitigation data and subsequent monitoring. The student is the

primary focus in the summary student retention model. The model aims to identify those students which are being flagged as a retention risk and thus need academic supports, environmental supports and/or institutional supports. The leader then consumes that data identifying those highlighted students, before finally putting in place and monitoring (again using data) interventions aimed at increasing student success among the 'at risk' cohort. While the student is the target and subject of the data, the leader is also a significant actor in the model. The model could be summarised by saying that the leader is an actor in a data driven approach to change the behaviour of the 'at risk' student.

Subsequently, another way of looking at this dynamic is the illustration in Figure 19, showing a data driven approach as the overarching concept containing two actors: students and leaders. However, Figure 19 highlights the student for a reason. This is to show that the existing research (understandably) places the student as the actor of focus in all models. It was earlier mentioned that this literature review revealed three concepts: a data driven approach, students and leaders. In fact, it is more accurate to define these as one concept (a data driven approach) involving two actors (students and leaders).

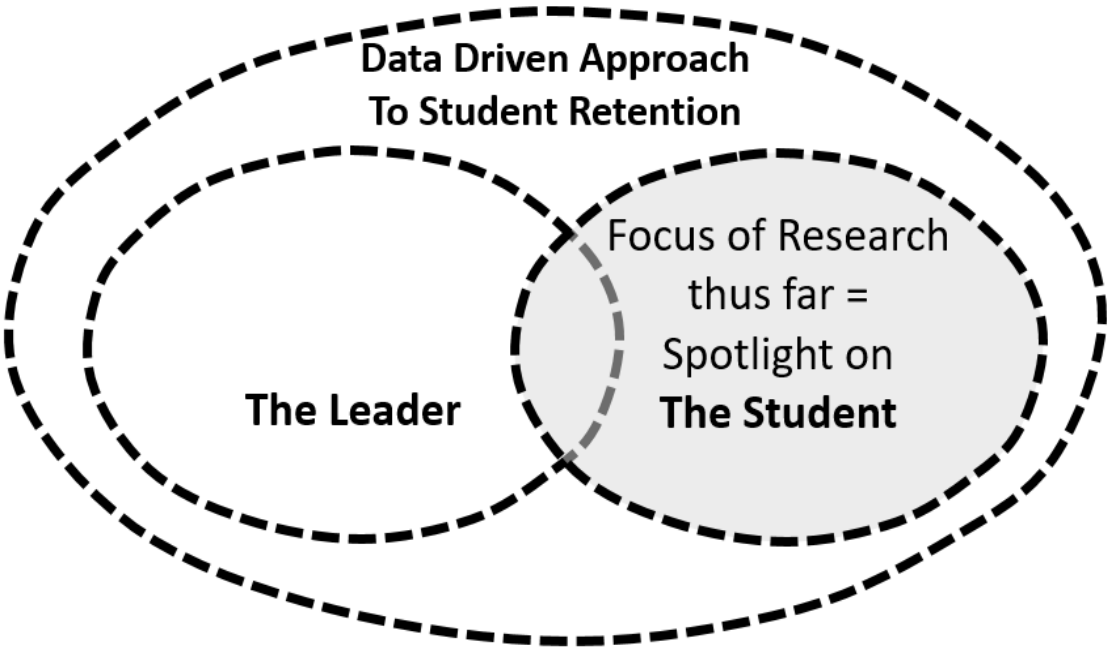



**Figure 19 - Relationship between concepts and actors in existing literature**

While the majority of retention initiatives are underpinned by a data driven approach, they are all focused on changing the behaviour of only one actor: the student. The leader is an actor involved in the overall relationship, but the student is the actor receiving all the focus, and the research, to date. This produces the research gap illustrated in Figure 20.

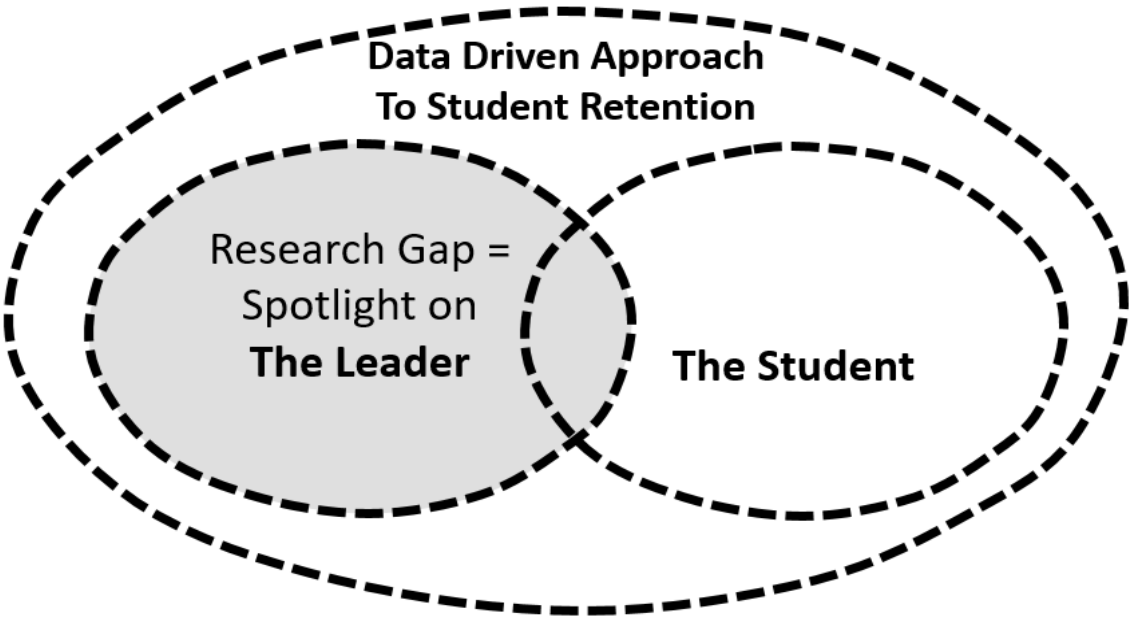



Figure 20 - Research gap: The perspective of the leader

There is little or no research placing the leader as the actor of focus in the above model. It raises some interesting questions. What impact does the student retention model have on the leader as an actor? The focus of the summary model, and the data driven approach, is on changing the behaviour of the student. However, is it possible that this data driven approach could change the behaviour of the leader? None of the retention research found thus far looks at the impact a data driven approach has on the leader. For this reason, this research will use the same three concepts that have consistently been used, but this time move the focus. Leadership will be the primary focus, with 'the student' and 'a data driven approach' becoming the secondary actor and concept respectively. This research will aim to explore that gap. Also, when this research gap is married to the data driven programme being led in CIT, it provided a unique opportunity to exploit that gap as part of applied research. The data driven programme will provide lots of data to leaders. As someone who is also a member of the senior leadership team, the researcher will be afforded significant access to the research population. This now presented a fantastic opportunity to test hypotheses involving leadership behaviour and in particular any change in that leadership behaviour as a result of the data driven programme. The next section will discuss the methodology used to exploit this research gap.

# 3. Chapter 3: Research Methodology

## 3.1 Chapter Introduction

With an understanding of the research gap identified this chapter will begin by introducing the research objective and associated questions that will allow me to exploit that gap. Then the most appropriate research design for that objective and set of questions will be discussed. In the context of research design, the researcher's ontological and epistemological positions will be clarified. A distinction will be made between building and testing theory and the resource constraints that currently influence the choice of a research design will also be introduced. Following that the various options of research designs will be explored before choosing the most appropriate design for this research. The case study protocol for that design will then be clarified before concluding with further detail on the data gathering and analysis techniques to be used in this study.

## 3.2 Research Objective and Questions

The literature review highlighted a research gap, illustrated in Figure 20, that little focus has been placed on the leader in the context of student retention to date. With this in mind, this chapter will focus on clarifying the research objective and associated questions which will explore this research gap. The importance of the research objective and questions in choosing the research design cannot be underestimated (Yin, 2009). This section will merely introduce the research title, objective and associated questions to provide a grounding for later discussion. These will all be focused on exploring the leader as the actor of focus in the student retention model.

Entitled "To explore the impact of a data driven approach on leadership behaviour in the context of student retention" this researcher's study will have the following research objective and questions.

**Research Objective**: "To explore the impact of a data driven approach on leadership behaviour in the context of student retention"

**Research Question 1**: What characterises leadership behaviour in a typical[14] student retention model?

**Research Question 2:** What is the impact of a data-driven approach on leadership behaviour in a typical student retention model?

This section will now discuss each of the research questions in a little more detail.

**Research Question 1**: What characterises leadership behaviour in a typical student retention model?

The purpose of this research question is to determine what leadership behaviours are evident in leaders involved in a typical student retention model, a model generally dependent on HIPPO decisions, opinions, biases and anecdotes as illustrated in Figure 8. How do leaders behave in this type of model? A model where decisions may have high uncertainty as a result of a decision-making style which has not made an effort to systematically measure student retention. The measure for leadership behaviour will be Yukl et al.'s (2002) taxonomy of leadership behaviours. This question will be answered by taking a snapshot of leadership behaviour at the beginning of the research. This snapshot will be taken through interviews, survey and observations. In order to properly explore the research gap and objective, this research question must be answered in advance of any significant organisational data driven approach. Ideally, this research question should be answered in an organisation which is concerned with student retention but may be classed as '*Stage1: Analytically Impaired*' as per the Davenport and Harris framework.

**Research Question 2**: What is the impact of a data driven approach on leadership behaviour in a typical student retention model?

Having answered Research Question 1, the focus can then move to the impact, if any, a data driven approach may have on the leader's behaviour. The same population will be interviewed, surveyed and observed in the initial and latter stages of the data driven journey. Leadership behaviour will be documented again with the additional possibility of comparing behaviours before, during and after the data driven journey to understand if that journey has had any impact. To answer this research question, the Davenport and Harris DELTAA framework (section 2.3.4.2) will be used to measure data analytics maturity in the

[14] A typical student retention model is one which may rely heavily on opinions, biases and anecdotes i.e. (non data-driven). It also focuses on 1st year full time students, which is also the primary focus of this research.

organisation. In order to confirm the presence of a data driven approach, the organisation should be seen to move further to the right of the DELTAA framework i.e. to stage 2+ at a minimum. Once the presence of a data driven approach can be confirmed, this research question will then help to understand the impact a data driven approach to student retention may have on the behaviour of the leaders. Referring back to Figure 8, do the leaders making decisions based on data behave differently to those who make decisions based on opinions, biases and anecdotes?

## 3.3 Research Design

In exploring research design options, the researcher's epistemological and ontological positions will be clarified. A brief discussion on the appropriateness of building vs testing theory will be discussed in the context of the objective and questions. Also the influence resource constraints can have on the selection of a research design will be discussed.

There are a number of varying descriptions of what a research design is. For example, Thomas (2010, p. 92) discusses seven different research designs; Action research, Case study, Comparative study, Evaluation, Experiment, Longitudinal study, Cross-sectional study. Yin (2009) describes a research design as having five main components: A study's questions, its propositions, its unit of analysis, the logic linking the data to propositions, the criteria for interpreting the findings. However, Bryman (2012, p. 35) explicitly lists five different types of research designs as "*Experimental, Cross-Sectional, Longitudinal, Case Study and Comparative*". Bryman's definition will be used as the basis to discuss research design options available with a view to choosing the most appropriate design.

### 3.3.1 Epistemology

As a researcher, I would class myself as an interpretivist. This has a base in the fact that the research is in the social, rather than natural, sciences and studies in the social sciences must reflect the distinctiveness of humans (Cohen et al., 2011; Bryman, 2012). This is also influenced by the researcher's employment background (IT), where dealing with people and the importance of people to the success of IT systems is forefront in the minds of IT professionals. It is rare to see an IT system introduced where people were not the primary deciding factor in its successful adoption. This contributes to a significant presence of subjectivity in this area leading to a relativist ontological position. Choosing an interpretivist

epistemology may then favour the selection of qualitative over quantitative data collection methods as the primary methods to be used.

### 3.3.2 Building Theory or Testing Theory

This research will be building theory. The theory relating to the student in the student retention model has been well built and tested and re-tested. However, a gap exists to build theory relating to the leader in the student retention model. The research objective and associated research questions listed above clarify that this research is building theory and exploratory in nature rather than explanatory or descriptive. In attempting to build theory, the researcher is exploring the occurrence of behaviours and the impact of a data driven approach on those behaviours. If this study was testing theory, rather than building it, a descriptive or explanatory approach may have been more appropriate. Also, while research questions of a "how" and "why" nature are more suited to an explanatory focus, the preponderance of research questions of a "what" nature lend themselves to an exploratory study (Yin, 2009).

### 3.3.3 Resource Constraints

Another important influencer on research design are the resource constraints of time and money, and access to the people relevant to your study (Thomas, 2010). One cannot use large scale data collection methods if there is insufficient funding to support it. One cannot choose to experiment on large groups of people if access to those people is not possible. One cannot choose a longitudinal study spanning 10-12 years unless one is happy to accept that the research will take that long. This researcher, employed as a head of department in an Irish higher education institution, has significant access to the decision maker cohort of senior management in the institution. Also, the researcher being part of the decision maker cohort itself lends itself to including an ethnographical element to the study. Finally, the researcher was also leading a data driven programme for the Institute which provided an opportunity for applied research.

### 3.3.4 Choice of Research Design

While taking previous sections into account, the next sections will discuss the various research designs considered by the author. This discussion will also explore each design for

suitability to the researcher's research objective, questions and constraints to arrive at the most suitable research design for this research and how it was chosen.

*Exploratory longitudinal design using quantitative techniques to collect data*

This combination of research design and data collection techniques was employed by (Kuh et al., 2008b) and also by Aime et al. (2010). They used positivist data collection techniques which are in contrast to the epistemological position of this researcher. It is exploratory in nature which is consistent with the research objective and questions and also with building theory. Longitudinal studies are interested in studying individuals, or groups of individuals, over a long period of time to examine the effects of time on the variable or variables of interest (Thomas, 2010). While there is a time element to the researcher's objective, it is merely to allow for some interventions to move the organisations towards a more data driven culture. The time element merely allows for comparison of the before and after data. So while time is involved, it is not the crucial element, the leader is. However, resource constraints would not have precluded the selection of a longitudinal design. Therefore, for epistemological and research objective and questions reasons the longitudinal design would not be appropriate.

*Exploratory experimental design using quantitative techniques to collect data*

This combination of research design and data collection techniques was employed by (Gomez, 2013), (Agudo-Peregrina et al., 2014) and (Hayashi et al., 2010). While experiments are unusual in sociology they are not unheard of as they are often used as the standard by which non-experimental research is measured (Bryman, 2012). They are unusual primarily because an experiment requires the manipulation of the independent variable which is challenging for social researchers (Bryman, 2012) e.g. if interested in the effects of gender or social class in a research situation, it is not possible to manipulate the variable of gender or social class. In contrast to a case study, a researcher using an experimental design typically seeks to maintain control over behavioural events (Yin, 2009). As this researcher is seeking to observe and study behaviours, controlling them in an experiment would not be appropriate. The researcher's epistemological position does not lend itself to quantitative data collection methods. Also, in the context of the research objective and questions, as the researcher is building theory rather than testing it, the experimental design was deemed less appropriate. For these reasons an experimental design was ruled out.

*Explanatory experimental design using quantitative techniques to collect data*

This combination of research design and data collection techniques was employed by (Delen, 2010) and (Lee et al., 2011). All of the reasons in the previous section apply here except that this design was explanatory rather than exploratory. As this design is explanatory it is seeking to test theory in contrast to the research objective and questions which are seeking to build theory. Therefore, this design would be inappropriate to the researcher's study for epistemological, research objective and theory building vs testing reasons.

*Exploratory cross-sectional design using quantitative techniques to collect data*

This combination of research design and data collection techniques was employed by Yu and To (2013). The exploratory focus of the study is consistent with research seeking to build theory. However, the methods are positivist in nature in contrast to that of the researcher. Cross-sectional studies typically study individuals, or groups of individuals, at a point in time as a snapshot (Thomas, 2010). The research objective of studying changes in behaviour before and after a system implementation does not lend itself to a cross-sectional design with its point in time snapshot requirement. In this case, the resource constraints would not have precluded the selection of a cross-sectional design. However, for epistemological and research objective and questions reasons the cross-sectional design would not be appropriate.

*Exploratory case study design using quantitative techniques to collect data*

This combination of research design and data collection techniques was employed by (Eckles and Stradley, 2012), (Romero-Zaldivar et al., 2012), (Fritz, 2011) and (Othman and Suleiman, 2013). It being exploratory in nature is consistent with the research objective of building theory. Also, with the researcher employed in an Irish higher education institution, the access to the required resources is ideal for a case study. However, as it uses quantitative methods the positivist nature is epistemologically inconsistent with that of the researcher. Also, the quantitative methods do not lend themselves to the research objective of studying behaviours. Therefore for epistemological and research objective reasons the exploratory case study with quantitative techniques would not be appropriate.

*Exploratory case study design using qualitative techniques to collect data*

This combination of research design and data collection techniques was employed by (He, 2013) and (Vukšić et al., 2013). It is exploratory in nature so is consistent with the

researcher's requirement of building theory. The case study design will also take advantage of the researcher being employed in the area being studied. The qualitative techniques are consistent with the research objective of studying behaviours. Resource considerations of cost and access to resources are consistent with this design as it does not cost anything to collect data other than the time to interview the participants and as the researcher is part of the cohort this should provide significant access to the cohort being studied. This level of access also lends itself to the selection of participant observation as a data collection technique which might otherwise not have been possible. However, as the number of senior managers in the group is significant and the researcher is working full time during the research, the time required to interview all senior managers would not be feasible. Therefore, the design will include, along with participant observation, both interviews and survey as data collection techniques to ensure that full representation is achieved.

**Why choose a case study design for this research?**

This section provides a justification for choosing a case study design.

> *"Case research is particularly appropriate for certain types of problems: those in which research and theory are at their early, formative stages, and sticky, practice-based problems where the experiences of the actors are important and the context of action is critical" (Benbasat et al., 1987, p. 369)*

Benbasat et al. (1987, p. 370) posit that a drawback to traditional IS research is that researchers can "often find themselves trailing behind practitioners in proposing changes or in evaluating methods for developing new systems. The authors posit that one response to this is that case study research is a very suitable method to capturing practitioner knowledge while developing theory from same. As discussed in section 1.2, the primary researcher also being a practitioner therefore complements the use of a case study design.

Aside from the practitioner element, the case study design is very suitable to developing theory (Eisenhardt, 1989; Harris and Sutton, 1986; Yin, 2003) which is also what this research sets out to achieve. Eisenhardt (1989) refers to this as the likelihood of generating novel theory from case study research. A common misconception of case study research is that it is limited by researcher pre-conceptions, however the opposite is actually true (Eisenhardt, 1989). Creating insights from juxtaposing contradictory evidence often has the impact of 'unfreezing' thinking and thus contributing to developing theory. Having a research objective aimed at exploring the impact of a data-driven approach on leadership

behaviour, developing theory is central to the objective makes a case study design appropriate.

Case study research also allows the researcher to understand the "*nature and complexity of the process taking place*" (Benbasat et al., 1987, p. 370) which is also consistent with the research objectives and questions of this research.

Benbasat et al. (1987) also argue that case study research is a very suitable way to research to research an area in which has seen little or no research in the past. The design allows the examination and exploration of phenomena in their natural setting, very consistent with what the researcher is attempting to achieve in this case. In this case it would be extremely difficult to study the phenomena of leadership behaviour in the context of student retention outside its natural setting. When assessing the case study design for suitability, the authors propose 4 key questions:

1. Can the phenomenon of interest be studied outside its natural setting?
2. Must the study focus on contemporary events?
3. Is control or manipulation of subjects or events necessary?
4. Does the phenomenon of interest enjoy an established theoretical base?

This research requires a natural setting and a focus on contemporary events (both essential criteria for case research according to Benbasat et al.). Also, this research area does not enjoy an established theoretical base nor would it require the manipulation of subjects (both also critical for case study research according to the authors).

Single case study is suitable at the outset of theory generation and late in theory testing (Yin, 1981). This research, being very early in the theory development stage is consistent with Yin's suitability recommendations for single case research. The opportunity for, and benefits of, practitioner research also contributes to the selection of a single case. Practitioner research aims to "bridge the divide" (Nagle et al., 2016) between research and practice. There are many ways in which to bridge this divide, practitioner research being only one. However, the practitioner's role in CIT, and in particular the access that role provided to all the leadership of CIT while leading a programme of work involving that same leadership, a case study offered another unique opportunity to really explore the research objective and questions.

Therefore, an exploratory case study using qualitative data collection techniques, is the most appropriate design as it is consistent with the researcher's epistemological position, will support the research objective and the answering of the research questions and will not have any unmanageable resource constraints. This design will allow full exploration of the leader actor in the new summary retention model. It will allow the exploration of what impact, if any, the existing model (and in particular data) may be having on the leader.

Having selected an appropriate research design, the following section will explore recommended literature for this particular design.

### 3.3.5 Case Study Protocol

Having chosen a research design, the next section will introduce the concept of a case study protocol. Significant weight will be placed on the theory of Eisenhardt (1989) who provides a case study protocol for building theory from case study research. Eisenhardt's recommended activities will be provided before elaborating on the relevant activities chosen in building the appropriate case study protocol for this research.

Eisenhardt (1989) breaks her theory into nine distinct stages: ***getting started*** in a way that provides focus, accuracy and protection against bias; ***selecting cases*** to control extraneous variation and increase generalizability; ***crafting instruments and protocols*** so that findings are more grounded, synergistic and triangulated; ***entering the field*** efficiently, ***analysing within case data*** to protect against being overwhelmed by a data deluge; ***searching for cross case patterns*** to provide a better understanding of findings, ***shaping hypotheses*** with increased validity; ***enfolding literature*** to increase confidence in findings and finally ***reaching closure*** no sooner or later than when theoretical saturation is reached.

Table 17 is based on the case study protocol designed by Eisenhardt (1989). It summarises Eisenhardt's stages and recommended activities along with a clarification of the benefits of those recommended activities to a researcher building theory from case study research. The final column then provides detail on each of the specific activities to be used in this research with a view to meeting the Research Objective and answering the research questions of this research. This detail aims to explore the leader, in particular the behaviour of the leader as part of the data driven approach to student retention proposed in Figure 20.

Having introduced and discussed the case study protocol to be used, the next sections will provide further detail on the data gathering and analysis techniques. Each section will discuss

the characteristics of the techniques to be used along with the strength and weaknesses of each technique and in particular how each technique was used to explore the behaviour of the leader.

| Stage | Recommended Activities | Benefits of Recommended Activities | Activities To Be Used |
|---|---|---|---|
| Getting started | a) Broadly define the research question early<br>b) A priori-specification of constructs<br>c) Begin as close as possible to the ideal of no theory under consideration | a) Without this the volume of data may become overwhelming<br>b) For more accurate construct measures<br>c) This avoids bias and limiting findings | a) Clearly defined research questions<br>b) Adoption of Yin's 12 behaviours<br>c) Focus on will behaviours change, not pre-judging if or how they may change |
| Selecting cases | a) Select an appropriate population<br>b) Consider using theoretical sampling | a) Helps control extraneous variation and gives more generalizable findings<br>b) To replicate / extend emergent theory | a) Population includes entire population of CIT Senior Management.<br>b) Not using sampling |
| Crafting instruments and protocols | a) Combine multiple data collection methods<br>b) Combine quantitative and qualitative evidence<br>c) Use multiple investigators | a) Triangulation of evidence<br>b) Can be highly synergistic<br>c) Enhances creative potential and gives more grounded findings | a) Using interviews, participant observation, questionnaire<br>b) Using qualitative data<br>c) Single investigator only |
| Entering the field | a) Use field notes to overlap data analysis with data collection<br>b) Use flexible, opportunistic data collection | a) Can speed up analysis<br>b) Allows emerging themes influence further data collection | a) Using researcher's journal<br>b) Initial interviews will be used to refine further questionnaires and interviews |
| Analysing within case data | a) Employ detailed case study write-ups for each site | a) Helps researchers to cope early in the analysis process with the often enormous volume of data | a) Will constantly analyse all data against the 12 behaviours across all data sources |
| Searching for cross-case patterns | a) Look for within-group similarities and inter-group differences within selected cases<br>b) List the similarities and differences between each pair of selected cases<br>c) Separate data by data source | a) Can move beyond initial impressions<br>b) Can lead to better understanding<br>c) Exploits unique insights possible from different types of data, can also lead to better grounded findings | a) Analyse evidence of each data source against constructs to understand similarities and differences emerging<br>b) Only a single case being used<br>c) All evidence to be separated by data source |
| Shaping hypothesis | a) Sharpen constructs by refining their definition and build evidence by which they can be measured<br>b) Verify any construct relationships can be supported by evidence in each case | a) Helps establish construct validity<br>b) Enhances confidence in relationship validity and allows an opportunity to refine and/or extend the theory in relationships disconfirmed | a) Will ensure construct definitions are refined and sharpened<br>b) Will ensure all construct relationships are fully supported by case evidence |
| Enfolding literature | a) Examine literature which conflicts with and supports the emergent theory | a) Increases confidence in findings. Can lead to a deeper insight into emergent theory / conflicting literature | a) Will examine literature which supports and conflicts with any emergent theory |
| Reaching closure | a) Understand when to stop adding cases and when to stop iterating between theory and data | a) Theoretical saturation is reached and marginal improvements are minimal | a) Only a single case being used and will ensure to stop iterating between theory and data when theoretical saturation is reached |

**Table 17 - Case study protocol (After Eisenhardt 1989)**

### 3.3.6 Data Gathering

The data gathering techniques used in this study included interviews, participant observations and questionnaires. This section will first discuss the characteristics of each of these techniques and then elaborate on further detail of how each was used in this study.

*Data Gathering Techniques (A General Discussion)*

**Interviews**

| Technique | Characteristics |
|---|---|
| Interview | a) Conversations, often structured, with someone from whom you are trying to get some information (Yin, 2009; Thomas, 2010)<br>b) Information may be facts, opinions, attitudes or combinations of all three (Thomas, 2010)<br>c) Can be open-ended / focused / formal survey (Yin, 2009)<br>d) Can be structured / semi-structured / unstructured (Thomas, 2010)<br>e) Can be done face to face or over telephone (Thomas, 2010) |

**Table 18 - Characteristics of interviews**

Table 18 introduces the characteristics of interviews. Interviews are a qualitative form of data collection involving conversations, often structured, with someone from whom you are trying to get some information (Yin, 2009; Thomas, 2010). The information sought from interviews can be facts, opinions, attitudes or combinations of all three (Thomas, 2010). There are three types of interviews; un-structured, semi-structured and structured (Thomas, 2010; Bryman, 2012). Yin (2009) describes these three types open-ended , focused and formal survey. Whereas Cohen et al. (2011) describe the types as informal conversational, standardized open ended and finally closed interviews. An open-ended or un-structured interview is characterised by the respondent being asked questions about a particular topic and then letting the conversation develop without any pre-defined script (Yin, 2009). The respondents opinions may prompt the interviewer to pose more probing, but unforeseen questions, giving the interview the "unstructured feel" (Yin, 2009). The formal or semi-structured interview also allows for open ended questions but in this type of interview the interviewer is following a pre-defined line of inquire, often derived from the case study protocol (Yin, 2009). The third type of interview, the structured or formal survey interview, will likely ask a very set list of questions with very few if any open ended questions or opportunities for the respondent to deviate. An interview can be completed either face to face, also known as in-person interviews, or over telephone (Thomas, 2010). Interviews are

used frequently for data collection in case studies as they provide the "human account" (Yin, 2009) that can give real depth to a social science study, particularly for interpretivist researchers. A common issue that with interviewers have to address is the question of how to record the interview (Yin, 2009). It can be recorded manually by the interviewer in real time, or an audio or video recording device can be used (Yin, 2009). However, a recording device should not be used when a) an interviewee refuses permission b) no listening and/or transcription plan exists c) the investigator is not comfortable with the device to the point of causing distraction or d) the recording becomes a substitute for listening (Yin, 2009).

| Technique | Strengths | Weaknesses |
|---|---|---|
| Interview | a) Targeted (Yin, 2009; Thomas, 2010)<br>b) Insightful (MacNealy, 1997; Yin, 2009)<br>c) Encourages better candidate participation (MacNealy, 1997; Thomas, 2010)<br>d) Allows collection of non-verbal feedback during face to face interviews (Thomas, 2010)<br>e) Can bring standardisation to data collection (structured interviews) (Bryman, 2012) | a) Interviewer Bias (MacNealy, 1997; Yin, 2009)<br>b) Participant Bias (Yin, 2009)<br>c) Inaccuracies due to poor recall (Yin, 2009)<br>d) Reflexivity [15] (Yin, 2009)<br>e) Threat to validity (MacNealy, 1997)<br>f) Time Consuming (MacNealy, 1997)<br>g) May be too subjective (Bryman, 2012)<br>h) May be difficult to replicate (Bryman, 2012)<br>i) May bring generalizability issues (Bryman, 2012) |

**Table 19 - Strengths and weaknesses of interviews**

Interviews as a data collection method have many strengths. They can be targeted, especially once properly structured, and can ensure that the researcher is asking for exactly the information he/she is seeking (Yin, 2009; Thomas, 2010). They can also be insightful in that interviewers can learn, through further probing, insights that might otherwise not be possible if the interviewer were not present (MacNealy, 1997; Yin, 2009). They encourage better participation, in particular over self-completing questionnaires, as it is more difficult for a participant to refuse the interviewer in person than it is to discard a faceless questionnaire (Yin, 2009; Thomas, 2010). Also, as the interviewer is present, interviews allow the collection of non-verbal feedback such as body language, tone of voice and facial expressions that would not be possible using other methods (Thomas, 2010). Interviews, in particular structured interviews, can bring standardisation to the data collection method (Bryman, 2012).

[15] Participant may be providing answers he/she feels the interviewer wants to hear

On the other hand, when collecting data using interviews, researchers need to be aware of some of the weaknesses. One of the primary weakness of this method is bias, both on the part of the interviewer (MacNealy, 1997; Yin, 2009; Bryman, 2012) and the interviewee (Yin, 2009). There is a risk that the interviewer hears what he/she wants to hear and also that the interviewee is saying what he/she feels the interviewer wants to her. Yin (2009) also refers to this type of participant bias as reflexivity. Interviewer bias can also manifest itself in the interviewer affecting the conditions or the environment which in turn may have an effect on the interviewees responses (Cohen et al., 2011). How the interview is recorded can present a number of weaknesses, in particular if a recording device is not used and the interviewer tries to take notes while interviewing. This can result in inaccuracies due to poor attention during the interview and poor recall afterwards (Yin, 2009). Interviews can be time-consuming in particular their transcription (MacNealy, 1997). While the appeal of transcription software may provide a reduction in time, the loss of context and real learning with such a method would rule it impractical and counter-productive (Yin, 2009).

### Participant Observation

| Technique | Characteristics |
|---|---|
| Participant Observation | a) Method of ethnographic research (Bryman, 2012)<br>b) Mode of observation where researcher is not a passive observer (Yin, 2009)<br>c) Frequently used in anthropological studies of social or cultural groups (Yin, 2009)<br>d) The extended involvement of the researcher in the social life of those he or she studies (Bryman, 2012)<br>e) Can be overt and covert (Bryman, 2012)<br>f) "Researcher makes regular observations of the behaviours of the members of that setting" (Bryman, 2012, p. 402) |

**Table 20 - Characteristics of participant observation**

Participant observation is a mode of ethnographic research (Bryman, 2012) in which the researcher is not merely a passive observer (Yin, 2009). Instead the researcher assumes one or more roles in the study allowing him/her to become a participant in as well as an observer of events of the study (Yin, 2009; Bryman, 2012). The following roles are listed as examples of participant observers in a case study:

- "being a resident in a neighbourhood that is the subject of a case study
- taking some other functional role in a neighbourhood, such as serving as a storekeepers assistant
- service as a staff member in an organisational setting
- being a key decision maker in an organisational setting" (Yin, 2009, p. 87)

This technique is frequently used in anthropological studies of social or cultural groups but can also be used in organisational settings (Yin, 2009). In comparison to other data collection techniques, participant observation can provide new opportunities to collect data such as access to events or groups that may be otherwise inaccessible or the ability to have an internal viewpoint (Yin, 2009). Bryman (2012) describes this as the extended involvement of the researcher in the social life of those he or she is studying. Participant observation can be overt or covert (Bryman, 2012). Overt is when the researcher discloses the fact that he or she is a researcher to the people being studied whereas covert participant observation does not disclose this fact to the study group (Bryman, 2012). Bryman (2012) describes participant observation as a research method in which the researcher :

- "*is immersed in a social setting for an extended period of time*
- *Makes regular observations of the behaviour of members of that setting*
- *Listens to and engages in conversations*
- *Interviews informants on issues that are not directly amenable to observation or that the ethnographer is unclear about*
- *Collects documents about the group*
- *Develops an understanding of the culture of the group and people's behaviour within the context of that culture*
- *And writes up a detailed account of that setting*"

| Technique | Strengths | Weaknesses |
|---|---|---|
| Participant Observation | a) Reality (Yin, 2009)<br>b) Contextual (Yin, 2009; Bryman, 2012)<br>c) Insightful (Yin, 2009)<br>d) Provides ability to gain access to events or groups that are otherwise inaccessible to a study (Yin, 2009; Bryman, 2012)<br>e) Ability to perceive reality from the viewpoint of someone inside the study (Yin, 2009; Bryman, 2012)<br>f) "Can learn the local language" (Bryman, 2012, p. 465)<br>g) More visibility to non-verbals (Bryman, 2012) | a) Time-Consuming (Yin, 2009)<br>b) Selectivity (Yin, 2009)<br>c) Reflexivity (Yin, 2009)<br>d) Cost (Yin, 2009)<br>e) Observer Bias (Yin, 2009)<br>f) "Does not readily permit clear-cut generalizations" (Bryman, 2012, p. 401) |

**Table 21 - Strengths and weaknesses of participant observation**

Participant observation, like direct observation, provides the advantage of observing events in real time (Yin, 2009). It also has the advantages of context with the researcher being an observing participant in the event (Yin, 2009). This method can typically give the researcher access to groups and events that may otherwise be inaccessible to the study (Yin, 2009;

Bryman, 2012). This method can provide real insight as the researcher can see a viewpoint as someone inside the study rather than someone externally observing (Yin, 2009; Bryman, 2012). Like interviewing, participant observation allows the participant to read the non-verbals of tone, body language and facial expression. Bryman (2012) also discusses the advantage participant observers have of learning the local language or the 'argot', which is the special uses of words or slang that can be important to be accepted into the culture.

However, this method is not without its drawbacks. Some issues are not amenable to observation and cannot be understood or collected without asking a question (Bryman, 2012). It is also possible that the presence of the researcher in an observational capacity, in particular with overt observation, will have an impact on the people being observed. This bias, which is a major drawback of participant observation, is something Yin (2009) calls reflexivity while Bryman (2012) refers to it as reactive effects. This method can also have the dis-advantage of being intrusive in people's lives due to the observer being immersed in the situation (Bryman, 2012). There is also a risk that the participant role outweighs the observer role to the detriment of the study's objectives (Yin, 2009). Broad coverage of events can be difficult, in particular if there is only a single observer. Finally, this method can be time-consuming and costly, in particular in terms of resource costs of the hours required by the observer (Yin, 2009).

### Questionnaire

| Technique | Characteristics |
|---|---|
| Questionnaire | a) Respondents answer questions by reading and completing a questionnaire themselves (Bryman, 2012)<br>b) Can come in several different forms (mail, email, online) (Bryman, 2012)<br>c) Can be self-administered (Bryman, 2012)<br>d) Tend to have fewer open questions than interviews (Bryman, 2012)<br>e) Have easy to follow designs to make it easier for respondents (Bryman, 2012)<br>f) Are usually shorter than interviews to reduce risk of respondent fatigue (Bryman, 2012) |

Table 22 - Characteristics of questionnaires

While there can be some confusion to the use of the word questionnaire, with some referring to a structured interview as potentially being a survey or questionnaire (Yin, 2009), in this case the use of questionnaire is used as per the definition of (Bryman, 2012) which is defined as a self-completion questionnaire or postal questionnaire. The main difference between the self-completion questionnaire and a structured interview is the presence of the researcher in the latter (Bryman, 2012). Owing to the absence of the interviewer and in order to increase response rates, researchers try to ensure their questionnaires have an easy to follow design

to ensure the respondent understands and answers all questions (Bryman, 2012). With a self-completion questionnaire respondents complete the questionnaire themselves which can come in many forms such as postal, e-mail, online or in person (Bryman, 2012). Postal typically involves the respondent receiving the questionnaire through the post and responding either by post or dropping the completed questionnaire off at an agreed location. Email questionnaires are usually received and responded to by email as are online questionnaires. In person questionnaire are typically used when a researcher or delegate hands out a questionnaire in person and receives the responses there and then (Bryman, 2012). Questionnaires tend to have fewer open questions than interviews, owing to the fact that elaboration by the respondent can be more difficult to manage and categorise (Bryman, 2012). Questionnaires also tend to be shorter than interviews to reduce the risk of what Bryman (2012, p. 217) calls "respondent fatigue". This is described as the possibility of a respondent of a questionnaire who becomes "fatigued" of the questions to toss the response in the bin which is at increased risk with a questionnaire as the interviewer is not present.

| Technique | Strengths | Weaknesses |
|---|---|---|
| Questionnaire | a) Cheap to administer (Bryman, 2012)<br>b) Quick to administer (Bryman, 2012)<br>c) Absense of interviewer affects (Bryman, 2012)<br>d) Attractive formats can be achieved (Bryman, 2012)<br>e) Can have mixed administration e.g. (Bryman, 2012) postal / online / email responses (Bryman, 2012)<br>f) Can extend reach to geographically dispersed population (Bryman, 2012)<br>g) Can be truly anonymous e.g. online (Bryman, 2012)<br>h) Convenience for respondents (Bryman, 2012) | a) Unsuitable for complex questions due to misinterpretation risk (Bryman, 2012)<br>b) Mis-Interpretation or varied interpretation can cause inconsistencies (Bryman, 2012)<br>c) Cannot prompt (Bryman, 2012)<br>d) Cannot probe (Bryman, 2012)<br>e) Some participants may not be able to fill in a questionnaire e.g. no online access (Bryman, 2012)<br>f) Can have low response rates (Bryman, 2012)<br>g) May require incentive to complete (Bryman, 2012)<br>h) Open to abuse e.g. multiple responses by same person (Bryman, 2012) |

**Table 23 - Strengths and weaknesses of questionnaire**

One of the major advantages of the self-completing questionnaire is that it is cheap and quick to administer (Bryman, 2012). Also, the researcher effects, presenting as interviewer bias in interviews and reflexivity in participant observation, are not present with questionnaires (Bryman, 2012). The potential for variation of responses due to the presence of an interviewer is not a risk with this method of data collection (Bryman, 2012). The format of the questionnaire can be made to look attractive and appealing leading to increased response rates (Bryman, 2012). There are a number of options for administering

questionnaires; email, post, online, in person, which all offer more options to the researcher. Finally, this method of data collection can be very convenient for respondents as they can generally complete the questionnaire at their own convenience and pace (Bryman, 2012). This method of data collection also has its disadvantages however. The ability to prompt a confused interviewee is not possible with a self-completing questionnaire making the necessity for simplicity all the more vital (Bryman, 2012). As a result, this method is unsuitable for complex questions. Neither is it possible to probe further into an area of interest or ask the respondent to elaborate on an interesting answer (Bryman, 2012). It is also vital to keep questions salient, as respondents who become bored with a self-completing questionnaire can skip a question or choose not to respond at all (Bryman, 2012). It is also possible for the respondent to read the entire questionnaire before answering any questions which can introduce the risk of question order effects (Bryman, 2012). Unfortunately, it is impossible to be certain of who is actually responding to this method, while unlikely, it could be the targeted respondents mother, father or sibling responding. Some respondents may not be able to complete some types of questionnaires, for example online questionnaires (Bryman, 2012). Finally, this method has the risk of low response rates (Bryman, 2012).

### *Data Gathering Techniques (How they were used in this study)*

Consistent with epistemology and design, the primary sources of data collected were interviews, participant observation and questionnaire (survey) as documented in Table 24. There was also project related documentation collected and analysed. A total of 34 interviews were conducted across the 59 leaders. However, as the number of leaders in the group was so significant it was not planned to interview all 59, but to engage a representative sample at various points in time. Therefore, to increase representation, the design also collected data through participant observation and questionnaire.

| | **Interviews** | **Questionnaire** | **Observations** |
|---|---|---|---|
| Design | Semi-structured to identify presence, or otherwise, of the 12 leadership behaviours | Anonymous. Structured to identify presence, or otherwise, of the 12 leadership behaviours | Structured to identify presence, or otherwise, of the 12 leadership behaviours |
| Timing re data programme | Pre + During + Post | Pre + During + Post | Pre + During + Post |
| Media | Audio Recordings and subsequent transcriptions. 32 interviews and a total of 17-18 hours of recordings | Online Survey of all 59 leaders. 3 surveys with 75% - 82% participation. | Observations lead to informal discussions and subsequent note taking. Participants were aware of observations. |

**Table 24 - Summary of data gathering process**

Early in the study, the interviews used were exploratory and would be best categorised as semi-structured and open-ended. These initial interviews then led to the creation of a very focused and semi-structured interview protocol and questionnaire protocol aimed at identifying the presence, or otherwise, of the 12 leadership behaviours being studied. Interview questions took an open-ended form, for example "*Tell me about the approach to student retention in your department*", with the interviewer then probing for evidence of particular leadership behaviours: e.g. evidence of a plan (*Short-Term Planning*), clearly defined roles (*Clarifying Roles*), any relations oriented behaviours such as empowering, developing, consulting or evidence of the approach being changed in the past? A subsequent interview question then included "*tell me about your experience with the additional data sets you have been given*" with the interviewer then further probing for evidence of any impact the data sets might have had on the types of leadership behaviours and styles being used. Figure 21 provides an illustration of the data gathering timeline. Data returned from the three primary sources were used for corroboration and triangulation. Interviews ran from early 2014 through until late 2016. Interviews were always 1-1. A total of 3 questionnaires were conducted with the same population; a baseline in 2014, an interim in 2015 and a final questionnaire in 2016. As a member of the senior management team, the researcher also used participant observation as a data gathering technique from mid-2014 up to late 2016 and all observations were documented using a personal notebook file structured around the 12 leadership behaviours. The three data gathering techniques facilitated the collection of very relevant data sets on the leader involved in student retention. This section will first discuss the characteristics of each of these techniques and then elaborate on further detail of how each was used in this study.

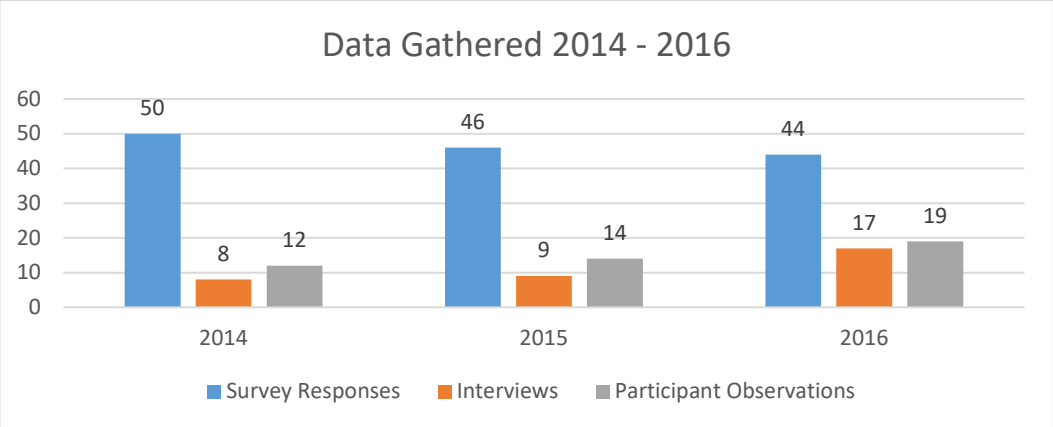



**Figure 21 - Data gathering timeline**

To protect their anonymity, each leader was assigned a unique subject code. All data were collected against these subject codes. A separate, password protected and encrypted file, only accessible to the researcher, contained the mapping of subject codes to subject names.

**Research Question 1: What characterises leadership behaviour in typical a student retention model?**

The purpose of this research question is to determine what leadership behaviours are evident in leaders involved in the student retention model. This question will explore how this actor (the leader) behaves in the student retention model. What are the typical behaviours that will characterise this actor in the model?

This question will be answered by taking a snapshot of leadership behaviour at the beginning of the research and only in the context of student retention. Figure 22 illustrates this more clearly by removing the data driven concept from the overall student retention model. This question will focus on the leader, how the leader behaves in the student retention model independent of the data driven concept.

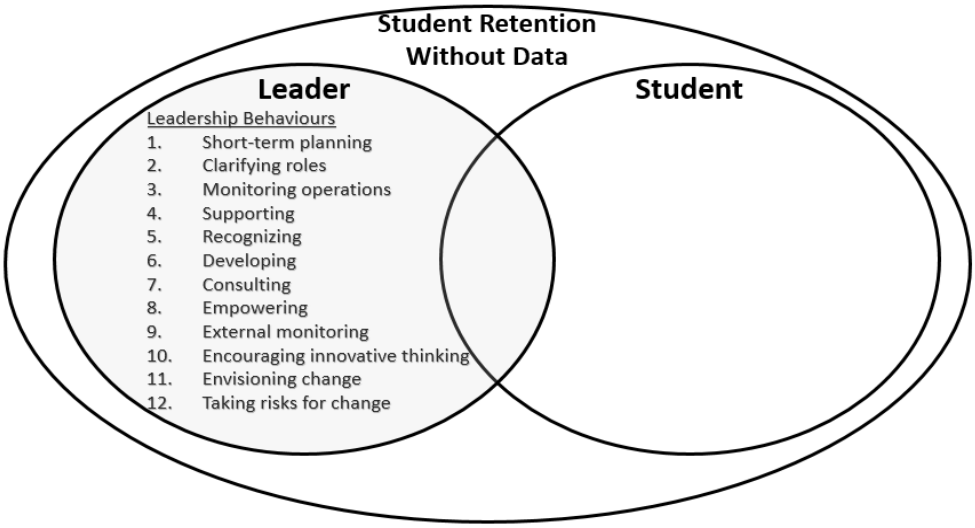



Figure 22 - Focus of Research Question 1

The leader will be observed, interviewed and surveyed to understand how he/she engages with the student retention model with a particular focus on how the leader behaves. What behaviours become evident as more and more leaders are observed, interviewed and surveyed? How does the leader behave in the absence of the data driven concept? How does the leader engage with the other actor (the student) in the model? This snapshot of data collected for Research Question 1 is summarised in Figure 23.

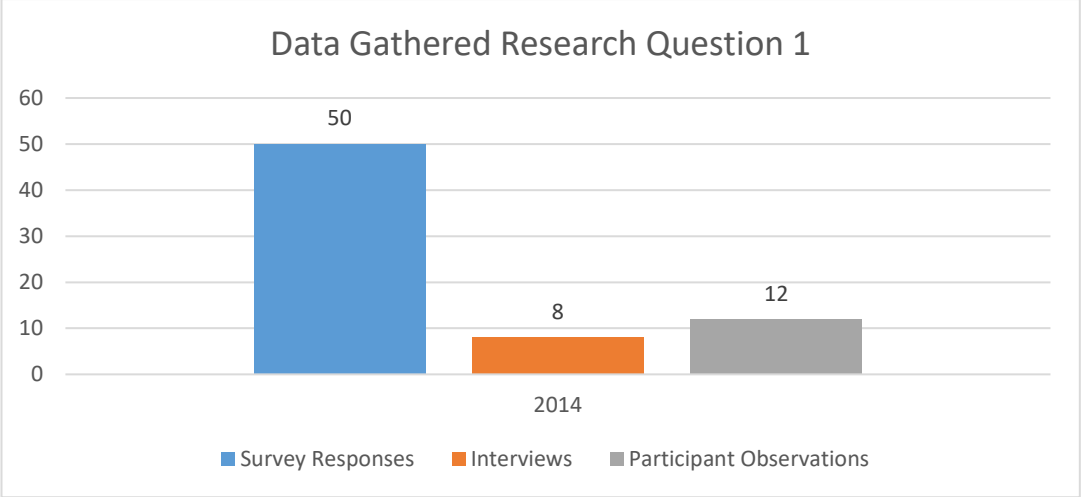



**Figure 23 - Data gathering Research Question 1**

### *Data Gathered (Interviews)*

To answer Research Question 1, initial (2014) interviews were structured and aimed at identifying the presence, or otherwise, of any of Yin's 12 leadership behaviours. They are explicitly aimed at understanding the behaviour of the leader in the student retention model. Appendix 7.1 shows the letter that was sent to all members of the research population [16] inviting them to participate in the research by interview. Included in this letter were all questions that would be included in the interview. Appendix 7.2 then shows the interview protocol form used by the researcher. This includes some standard information to take the name, date and participants details but also included a coding table to help the interviewer take notes in a way that helped subsequent coding of interviews. Interview notes were captured in a number of ways: first using the interviewer notes template shown in Appendix 7.2; and then through listening back to each interview in conjunction with the interviewer notes template to ensure accuracy of existing notes and also to add any additional notes. These notes were then added to an excel template to track the occurrences of each behaviour found. A total of 8 interviews were conducted during 2014 with various leaders in the population group. An invite was sent to all 59, seeking an interview, all 8 who responded at that time were interviewed.

[16] CIT Senior Management

### *Data Gathered (Observations)*

As a member of the senior management team, the researcher also used participant observation as a data gathering technique from 2014 up to late 2016 and all observations were documented using a personal notebook file structured around Yukl et al.'s 12 leadership behaviours. The participant observation template shown in Appendix 7.3 was used to capture data from any observations made by the participant. Copies of this template were carried with the researcher at all times during the working day. Then, during group meetings, 1-1 meetings, chats over coffee etc, as leadership behaviours were observed by the participant notes were taken. Each observation was discussed with the leader in question to ensure they agreed with the observation and that it was accurate. During 2014 all observations contributed to the baseline of leadership behaviours that could be seen in the context of student retention. These notes were then added to an excel template to track the occurrences of each behaviour found. A total of 12 observations were made during 2014.

### *Data Gathered (Questionnaires)*

The questionnaire had 38 questions which are all shown in Appendix 7.4. All questions were written to correspond to Yukl et al.'s 12 leadership behaviours. Questions were designed to identify the presence, or lack thereof, of those 12 leadership behaviours among questionnaire respondents. The questionnaire tool used was LimeSurvey. The questionnaire was published in 2014 as a baseline of what characterises leadership behaviour around student retention in CIT. Each question has the corresponding leadership behaviour in square parentheses, though these behaviours were not visible to any participants. The email sent to all participants inviting their participation is shown in Appendix 7.5.1. A total of 59 senior managers made up the leadership population of CIT and all 59 were sent the questionnaire at the end of 2014 to capture the types of leadership behaviour which existed at that time. A total of 56 responses were received of which 6 were incomplete. This left a total of 50 valid responses to the initial 2014 questionnaire. Data were stored in LimeSurvey and then exported to Excel in advance of analysis.

**Research Question 2: What is the impact of a data-driven approach on leadership behaviour in a student retention model?**

The purpose of this research question is to determine if a journey towards a data driven culture has an impact on leadership behaviour. There are a number of components of interest to this research question and these are illustrated in Figure 24. The leader behaviours of a

leader operating in a student retention model without data are to be caught with Research Question 1. Then the leader behaviours of a leader operating in a data driven student retention model will be caught in Research Question 2. These results will be compared to provide answers to the impact a data driven approach has on leadership behaviour in a student retention model.

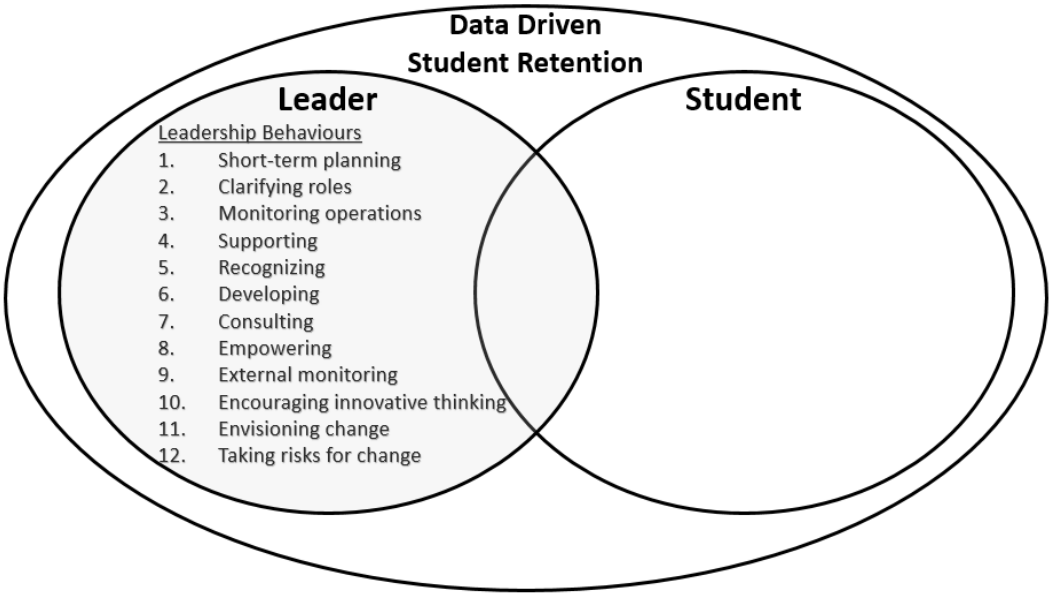



**Figure 24 - Focus of Research Question 2**

### *Data Gathered (Questionnaires)*

The questionnaire shown in Appendix 7.4 and used as the baseline data set aimed at answering Research Question 1, was again used in a questionnaire published in 2015 and again in 2016. The questionnaire, published again using LimeSurvey, was sent again to all participants in September 2015. The email sent to all participants inviting participation is shown in Appendix 7.5.2. The same 38 questionnaire questions, used in 2014, were again used in 2015 and 2016. On this occasion, a total of 46 valid responses were received for the 2015 questionnaire and 44 valid responses for the 2016 questionnaire. Responses were again stored in LimeSurvey and all data was exported to Excel for each questionnaire. A single Excel file was then created with all 2014, 2015 and 2016 questionnaire data to allow analysis of responses over those 3 years.

### *Data Gathered (Interviews)*

The interviews in 2015 and 2016 again followed the interview protocol form shown in Appendix 7.2. Interview questions were far broader and less specific than those in the

questionnaire. This was aimed at getting open dialogue from each interviewee, teasing out their views on student retention while trying not to bias any opinions with leading questions. All interviews were recorded with the interviewee's permission and prior knowledge. An invite letter, shown in Appendix 7.1, was sent to each interviewee in advance of each interview. Interview notes were captured in a number of ways: first using the interviewer notes template shown in Appendix 7.2; and then through listening back to each interview in conjunction with the interviewer notes template to ensure accuracy of existing notes and also to add any additional notes. These notes were then added to an excel template to track the occurrences of each behaviour found. All of the initial interviews were also conducted during 2014 to take a baseline snapshot of leadership behaviour at that time. A total of 9 and 17 interviews were conducted in 2015 and 2016 respectively. Each year an invite was sent to all 59 leaders again, seeking an interview, all those who responded each time were again interviewed.

#### *Data Gathered (Observations)*

As a member of the senior management team, the researcher also used participant observation as a data gathering technique in 2015 and 2016, with all observations again documented using a personal notebook file structured around Yukl et al.'s 12 leadership behaviours. The participant observation template shown in Appendix 7.3 was used to capture data from any observations made by the participant. Copies of this template were carried with the researcher at all times during the working day. Then, during group meetings, 1-1 meetings, chats over coffee etc, as leadership behaviours were observed by the participant notes were taken. Each observation was discussed with the leader in question to ensure they agreed with the observation and that it was accurate. A total of 14 observations were made in 2015 and 19 in 2016. These notes were then added to an excel template to track the occurrences of each behaviour found.

### 3.3.7 Data Analysis

The data analysis techniques used in this study included coding, constant comparison and thematic analysis. This section will first discuss the characteristics of each of these techniques and then elaborate on further detail of how each was used in this study.

## Coding

Table 25 shows a summary of the characteristics of coding as a data analysis technique.

| Grouping of Technique | Technique | Characteristics |
|---|---|---|
| Qualitative: | Coding | Process of assigning meaning to data by putting "tags, names or labels" against pieces of the data (Thomas, 2010, p. 199). Assists with the discovery of regularities or commonalities in the data (Thomas, 2010; Bryman, 2012). Indexes the data (Thomas, 2010). Labelling and categorising the collected data (Thomas, 2010; Bryman, 2012). |

**Table 25 - Characteristics of coding**

Coding is the process of assigning meaning to data by putting "tags, names or labels" against pieces of the data (Thomas, 2010, p. 199). Bryman (2012) lists the three types of coding practice as Open Coding, Axial Coding and Selective Coding. Coding essentially indexes the data which makes storage and retrieval more productive (Thomas, 2010). This then also contributes to the development of themes and identification of patterns (Thomas, 2010). It is essentially labelling and categorising the collected data (Thomas, 2010; Bryman, 2012). Following the collection of qualitative data, such as interviews or observation notes, the researcher analyses these notes to find patterns or categories, and it is the documentation of these patterns or categories which is effectively coding the data (Westbrook, 1994). The principal of saturation is also critical to coding, and a category can be considered saturated when no new information develops about the category (Westbrook, 1994).

## Constant Comparison

| Grouping of Technique | Technique | Characteristics |
|---|---|---|
| Qualitative: | Constant Comparison | Contributes to the development of themes and patterns (Thomas, 2010). Going through the data again and again, comparing each element (Thomas, 2010). Assists with developing themes (Thomas, 2010), concepts (Bryman, 2012) or constructs (Punch, 2005). |

**Table 26 - Characteristics of constant comparison**

The constant comparative method, created by Glaser and Strauss (1967) and illustrated in Table 26, is generally recognised as the most effective means of content analysis (Lincoln, 1985; Mellon, 1990; Westbrook, 1994). One of the most common analysis methods for an interpretive researcher, this involves going through the data again and again, coding, analysing and comparing each element to gradually form categories (Thomas, 2010; Westbrook, 1994). The researcher goes through several cycles (constant) of comparison to ensure that the coding scheme is accurate and useful (Westbrook, 1994). An aspect of

grounded theory (Bryman, 2012), this method can assist with the development of themes (Thomas, 2010), concepts (Bryman, 2012) or constructs (Punch, 2005) which summarise the data. Once themes are developed, the researcher can then move onto exploring any interconnections that may exist between the themes (Thomas, 2010). This method ensures that theory develops from the data (Westbrook, 1994).As part of grounded theory, there are many strengths to coding and constant comparison. They are very transparent methods and often referred to as an objective method of analysis (Bryman, 2012). The technique lends itself to conducting longitudinal analysis with relative ease as it allows the researcher to track changes over time (Bryman, 2012). It is also quite flexible as they can be applied to a wide variety of data regardless of its structure (Bryman, 2012). A further benefit of this method is that while the analysis commences with raw data, the technique of constant comparison will generally assist with theories emerging (Punch, 2005). This of course is important as insights are of no use to the researcher unless they are converted into an element of theory, otherwise they are merely anecdotes (Glaser and Strauss, 1967).This technique is not without its weaknesses, however. Coding can only be as good as the underlying data itself. If the underlying data is questionable for various reasons (authenticity, credibility, representativeness) then any coding of this data will also be questionable (Bryman, 2012). This technique lends itself to researcher bias, as any coding technique devised is likely to have some interpretation on the part of the coder (Bryman, 2012). It is often difficult to answer "why" questions with this technique (Bryman, 2012). A further drawback of this method is that it can be very labour intensive and time consuming (Punch, 2005).

### Thematic Analysis

| Grouping of Technique | Technique | Characteristics |
|---|---|---|
| Qualitative: | Thematic Analysis | No identifiable heritage or widely agreed definition (Bryman, 2012). Development of a framework or matrix to construct the central and sub-themes of the data (Bryman, 2012). |

Table 27 - Characteristics of thematic analysis

This technique, illustrated in Table 27, offers significant flexibility to the researcher (Bryman, 2012). It is a non-complex technique and is easy to learn and undertake, making it ideal for even inexperienced researchers (Cohen et al., 2011). This technique can highlight differences and similarities across the data and can also generate unanticipated insights (Bryman, 2012). This technique also has the advantage of being able to analyse coded data in context (Joffe and Yardley, 2004). While coding may categorise data and put significant structure and order on it, there is a risk that without further analysis, such as thematic

analysis, appropriate context may be lacking leading to inaccurate findings (Joffe and Yardley, 2004). While all analysis techniques are heavily dependent on the quality of data collection, this technique is also heavily dependent on quality in data analysis, given it is often dependent on the results of coding of data (Cohen et al., 2011). While flexibility is certainly an advantage of this technique, it can also prove to be a disadvantage as it can drag out and cloud the research progress (Bryman, 2012)

*Data Analysis Techniques (How they were used in this study)*

**Coding**

#### CODING OF INTERVIEWS

In this research coding was a central part of analysing the interview data. Using the interview protocol form in Appendix 7.2, all interviewer notes were taken against the leadership behaviours in the form. As the interviewee spoke, anything which suggested evidence of a leadership behaviour was noted in the appropriate column and used to subsequently recheck the recording for confirmation. Interviews were then coded in Excel using the structure outlined in Appendix 7.3. Each mention of an action which was consistent with any of the 12 leadership behaviours, resulted in an additional 1 being added to the corresponding cell. Participants could then display evidence of particular leadership behaviours multiple times during the same interview.

#### CODING OF OBSERVATIONS

Similar to interviews, observations used the participant observation template in Appendix 7.4, to code observations against leadership behaviours. During the research period, the researcher attempted to always carry a number of copies of this form with him at all times. Participants were observed in meetings, discussions and even over coffee. Typically, as leadership behaviours were observed notes were either immediately or retrospectively recorded against the observation template. Like interviews, observations were also coded in Excel using the structure outlined in Appendix 7.4. Each mention of an action which was consistent with any of the 12 leadership behaviours, resulted in an additional 1 being added to the corresponding cell. Participants could then display evidence of particular leadership behaviours multiple times and/or multiple behaviours during the same observation increasing the strength of that observable behaviour.

### CODING OF QUESTIONNAIRES

While the results of each questionnaire were coded differently from the interviews and observations, there were similarities in that the aim and 12 behaviours were consistent. All of the questionnaire data was exported to Excel. Then an additional 12 columns were added to that Excel file, one for each leadership behaviour. Table 28 shows the formulae used to populate each of the leadership behaviour columns.

| Leader Behaviour | Related Questions |
|---|---|
| Short-Term Planning | If Q13 = Yes and Q14 has sufficient detail on the plan |
| Monitoring Operations | If Q10 = Yes and Q11 has sufficient detail on how student retention is monitored |
| Clarifying Roles | If Q5 = Yes and Q6 has sufficient detail on the roles |
| Supporting | If Q29 = Yes and Q30 has sufficient detail on the support mechanisms |
| Developing | If Q7 = Yes |
| Consulting | If Q31 = Yes and Q32 has sufficient detail on the roles consulted |
| Recognizing | If Q8 = Yes and Q9 has sufficient detail on the recognition mechanism |
| Empowering | If the answer to Q15 or Q17 = 'By staff who are empowered to use their own discretion' |
| External Monitoring | If Q33 = Yes and Q34 has sufficient detail to describe knowledge of the external environment |
| Encouraging Innovative Thinking | If Q37 = Yes or Q38 = Yes |
| Envisioning Change | If Q22 = Yes or Q26 = Yes |
| Taking Risks for Change | If Q36 = Yes |

Table 28 - Coding of questionnaires

#### Constant Comparison

In this study, much of the comparisons were done within Excel. Interview data were compared to other interview data at a number of levels. Leadership behaviours were compared to each other across other interviews. Leadership behaviours were compared to other leadership behaviours in the same interview and across interviews. Similarly, interview data were compared to observation data and questionnaire data. Observation data were compared to questionnaire data at an individual behaviour level across observations, and across behaviours within observations. Questionnaire data were more dense than observation and interview data, and as a result took more time to compare both to itself and across other techniques.

#### Thematic Analysis

While this is a common approach to qualitative data analysis, this technique does not have an identifiable heritage or widely agreed definition (Bryman, 2012) with aspects of this

technique clearly evident in the two techniques discussed directly above. This type of analysis involves the development of a framework or matrix to construct the central and sub-themes of the data (Bryman, 2012). Bryman's (2012) description of this technique as the "product of a thorough reading and re-reading of the transcripts or field notes that make up the data" again highlights the similarities with constant comparison. Braun and Clarke (2006) list the six phases of thematic analysis as:

1. Familiarise yourself with your data

2. Generating initial codes

3. Searching for themes

4. Reviewing themes

5. Defining and naming themes

6. Producing the report

In this research, thematic analysis was done across all three techniques: interviews, observations and questionnaires. As each of the techniques collected data in a structured fashion, the thematic analysis was predominantly focused on the presence, or lack thereof, of particular leadership behaviours. Some analysis was done on the themes emerging of leadership behaviours by job role and leadership behaviours over time (central to the research questions).

## 3.4 Chapter Conclusion

This chapter began by introducing the research objective and associated questions. Then the most appropriate research design for that objective and set of questions was discussed. To add further detail to the choice of research design, clarification was provided on the researcher's ontological and epistemological positions will be clarified. A distinction was made between building and testing theory and the resource constraints that currently influence the choice of a research design was introduced. Following that the various options of research designs was explored before choosing the most appropriate design for this research. The case study protocol for that design was then clarified before concluding with further detail on the data gathering and analysis techniques used in this study.

# 4. Chapter 4: Case Analysis and Findings

## 4.1 Chapter Introduction

This chapter will focus on the data that were gathered and analysed as part of this research. Section 4.2 will provide some contextual information on the case so the reader has an appropriate background. This context will include a background to the institute's history, information on the student and leader profiles and information on a student retention review in one of the schools which precipitated much of the student retention work across CIT. Section 4.3 will discuss how CIT's leaders recognise the data gap which exists across CIT in conjunction with an analytics maturity assessment in 2014 using the DELTATA framework from Davenport and Harris (2017). This maturity assessment quantifies how poor analytics (and data) maturity was in CIT at the time. Section 4.4 then discusses the leadership response which was the run a data driven programme and this section is concluded with another maturity assessment (2016) using DELTATA but this time after the data driven programme has been running for 2 years. Sections 4.5 and 4.6 detail the case analysis against Research Questions 1 and 2 respectively. Section 4.7 then discusses the case findings which arose from the above analysis.

## 4.2 Background to the Institute

This section will discuss Cork Institute of Technology (CIT) itself, providing some background for the reader on the history of the institute, its student and leadership profiles and also the importance of student retention within the Institute. In particular, this will provide context for the link between students, leaders and behaviours from the perspective of CIT. This will help set the context (and case) in which the research was conducted.

### 4.2.1 The Institute's History

CIT and its antecedents have been associated with education in Cork and the broader region since the 1830s (CIT, 2012a). The Institute offers a wide range of flexible full-time and part-time higher education courses (at all levels up to and including PhD) in art & design, business, engineering, humanities, music, maritime studies, and science & information technology (ibid).

The main CIT campus is located in Bishopstown, Cork. The CIT Crawford College of Art and Design and the CIT Cork School of Music are both located at campuses in Cork city centre. The National Maritime College of Ireland (NMCI) is located on the shores of Cork Harbour in Ringaskiddy (ibid).

CIT's student population of more than 15,000 (CIT, 2018) enjoys excellent support, social and sporting facilities, including a purpose-built student centre, sports stadium, gymnasium, medical centre and learning support centre (ibid).

CIT has a number of vibrant and successful research, innovation, knowledge exchange and enterprise support centres which have had many notable achievements, and have been successful in attracting Irish, EU and international funding. Among these are the Rubicon business incubation centre, the Genesis enterprise support programme, the NIMBUS research centre and the CIT Extended Campus (CIT, 2018).

Many CIT graduates and alumni occupy senior management and executive positions across a range of indigenous and multinational enterprises while others are successful entrepreneurs founding enterprises and creating employment at home and abroad. CIT's staff, students and graduates make many notable contributions to public bodies, cultural and community organisations and in the world of sport locally, nationally and internationally. CIT was awarded the Sunday Times Institute of Technology of the Year in 2007, 2010 and again in 2015, and CIT students have won numerous national and international academic, citizenship and sports awards.

### 4.2.2 The Institute's Student Profile

This section will now discuss the student profile in CIT, providing a little background on the student numbers, the breakdown of full-time vs part-time and any associated trends that can be observed.

CIT has seen some fluctuations in its student enrolment population, somewhat in line with national economic challenges from 2011-2014, as can be seen in Table 29.

| | 2011/12 | 2012/13 | 2013/14 |
|---|---|---|---|
| Total Full Time | 7,328 | 7,499 | 7,694 |
| Total Part Time | 7,066 | 6,344 | 6,424 |
| Overall Total | 14,394 | 13,793 | 14,118 |

Table 29 - CIT student enrolments 2011-2016 (after CIT 2015)

When viewing the trend of full-time vs part-time, Figure 25 shows that there is a relatively even breakdown between full and part-time students with the breakdown in 2011/12 being 50.91% full-time and 49.09% part-time. This changed to 54.36% and 45.64% in 2012/13 and then to 54.5% and 45.5% in 2013/14. With the overall numbers of student enrolments increasing a trend can be observed showing a moderate increase in the full-time cohorts at the same time as a moderate decrease in part-time, in particular from 2011/12 to 2012/13 which highlights the gap that starts to appear between the two.

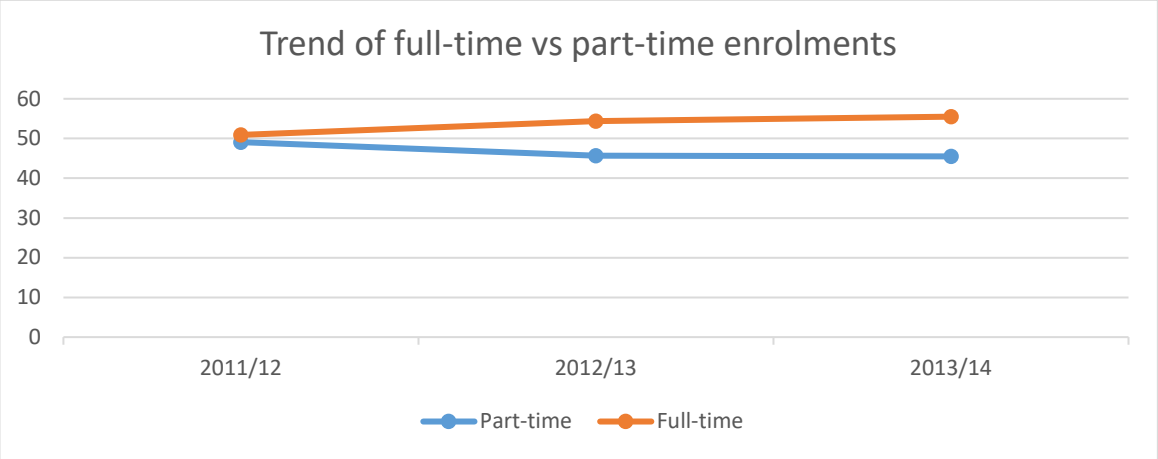



Figure 25 - Trend of CIT enrolments 2011-2016 (after CIT 2012a)

### 4.2.3 The Institute's Leadership Profile

With the student profile discussed, this next section will first discuss the general staff profile before providing additional detail on the leadership profile by discussing the senior management team. This senior management team, which meets monthly during academic term, can be seen in Figure 26.

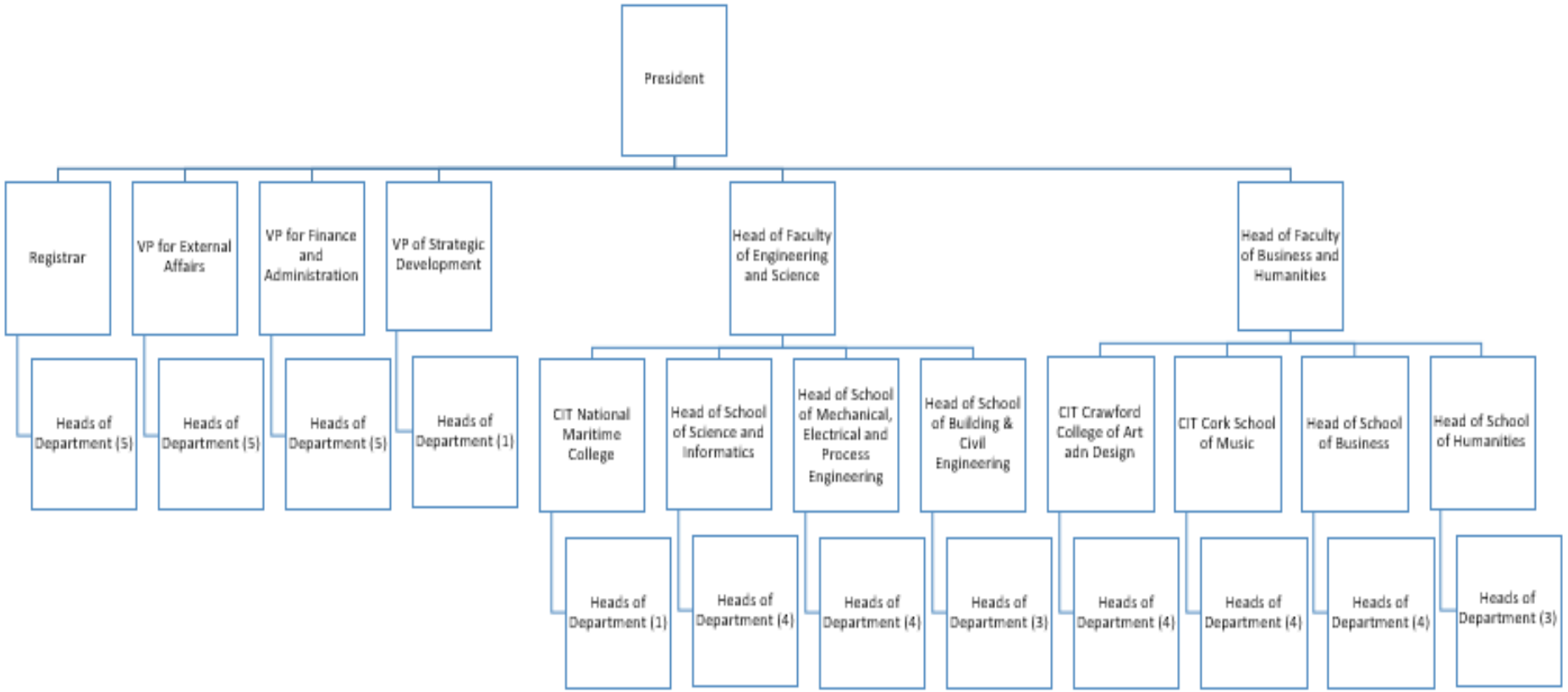



**Figure 26 - CIT's senior management team**

From the org chart in Figure 26, one can see that there are a total of 58 persons on CIT's Senior Management Team. This is made up of:

- 7 persons on the Institute Executive Board (including the President)
- 5 Heads of School
- 3 Heads of College
- 43 Heads of Department

This group makes up CIT's leadership team. The group meets once a month and there is an observable culture of collegiality across the Institute which is fostered by this leadership team. To maintain academic quality standards, one of the key objectives of each of these leaders, in particular those leading academic functions, is to lead the completion of a programmatic review of all programmes at least once every 5 years.

One of the many responsibilities which fall to this leadership team includes *Programmatic Review*. This is a statutory five-yearly quality process in which peer evaluators analyse the effectiveness of the suite of programmes of a CIT faculty, college or school, with an emphasis on quality and flexibility of response to changing needs. This is a significant piece of work for each leader and each *Programmatic Review* is conducted in two phases: Phase 1 looks at strategic and high-level issues; Phase 2 is devoted to a detailed programme review. Externally, *Programmatic Review* contributes to the enhancement of public confidence in the Institute and its awards. Internally, it is an important 'way stage' in a continuous quality improvement cycle which affords the opportunity to step back from the ongoing business of programme delivery to reflect on the current status and future direction of a faculty/college or school and its programme portfolio. The reason it is of particular importance to this section is that CIT's programmatic reviews generally tend to be the catalyst for student retention initiatives and creates a tangible link between CIT's leadership team and student retention. The next section will discuss student retention if further detail.

### 4.2.4 A Retention Review: School of Science & Informatics (2011)

One of the key themes of all programmatic reviews in CIT is 'Student Retention'. Increased student retention, or reduced attrition, is important to CIT due to:

- Attrition is often at a huge personal cost to students (and their families/significant others): loss of confidence, loss of face and loss of faith in the educational system.

- Cost to classmates... morale of class groups may be negatively impacted by disengaged students / high attrition.
- Impact on faculty: staff morale may be impacted by disengaged students.
- Significant financial impact; for student who leaves, for institutes and taxpayer.

In placing a strong emphasis on student retention, CIT aims to achieve:

- Greater numbers of students coming into CIT and increasing diversity of student population.
- Probability of non-completion decreased.
- More 'first generation' higher education students.
- Enhancement of student engagement, progression and success

This section will provide some detail on the response to a programmatic review of the school of science and informatics which had a particular emphasis on student retention.

As part of this programmatic review, Loftus and McGlynn (2012) prepared a report for the review panel on CIT's school of Science & Informatics which focused on how students in the school progressed. Interestingly the authors also highlight at this early stage the importance of clearly defining retention factors and proceeded to provide the following definitions which became the first set of data definitions for retention in CIT:

- **Year** – the calendar year in which the academic year under analysis concluded
- **Pass** – the total number of students who passed their examinations and progressed to the next stage of the programme
- **Repeat/Defer** – the total number of students who repeated the academic year or deferred their examinations, based on the November census following the academic year under analysis
- **Transfer** – the total number of students who transferred to another CIT programme of study, based on the November census following the academic year under analysis
- **Left** – the total number of students from the cohort under analysis for whom no record of continued study could be found in the November census following the academic year under analysis
- **Total** – the total number of students in the cohort under analysis
- **Pass%** = Pass / Total
- **Repeat/Defer%** = (Repeat/Defer) / Total

- **Transfer%** = Transfer / Total
- **Left%** = Left / Total

| Year | Pass | Repeat/ Defer | Transfer | Left | Total | Pass% | Repeat/ Defer% | Transfer% | Left% |
|---|---|---|---|---|---|---|---|---|---|
| **2009** | 467 | 74 | 37 | 101 | 679 | 68.8% | 10.9% | 5.4% | 14.9% |
| **2010** | 572 | 105 | 27 | 123 | 827 | 69.2% | 12.7% | 3.3% | 14.9% |
| **2011** | 700 | 81 | 31 | 132 | 944 | 74.2% | 8.6% | 3.3% | 14.0% |

**Table 30 - Student progression trends School of Science & Informatics**

Thus, one can see from Table 30 that relative to the number of students registered on the School's programmes at the beginning of the relevant academic years:

- 68.8% - 74.2% of the School's students passed their examinations during the academic year in which they were first undertaken
- 8.6% - 12.7% of the School's students repeated or deferred their examinations following the academic year in which they were first undertaken
- 3.3% - 5.4% of the School's students transferred to other programmes of study operated by CIT on completion of the academic year
- 14.0% - 14.9% of the School's students were not present in the Institute following completion of the academic year

This report refers to an important reference to the views of the Chairman of the Programmatic Review Panel:

> *"Subsequent to the first visit of the Programmatic Review Panel in 2011, the Chairman of the panel indicated that he would have liked to have seen a different approach adopted by the school in relation to the analysis of retention data." (Loftus and McGlynn, 2012, p. 1)*

This view contributes to a reshaping of the internal approach to retention within CIT, confirmed by the following quote:

> **"***Taking this feedback on board, the School has prepared a comprehensive analysis of data available for the academic years 2008-2009, 2009-2010 and 2010-2011. The analysis focuses on these years because CIT has been operating the fully modularised and semesterised approach during these years and data is available from CIT systems for this period in a format which is quite suitable for analysis and comparison with sector-wide data provided by the HEA in its 2010 report" (Loftus and McGlynn, 2012, p. 1)*

All of this led directly to the conclusion that CIT could do better on student retention. The external review panel even made this specific recommendation:

> ***"Recommendation**: Given the current emphasis on retention in the third level sector in general, and computing in particular, the Panel recommends that the Department considers its approach to, development and management of the various retention initiatives being discussed*." (CIT, 2012b)

When considering this recommendation in conjunction with the data provided in Table 30, it is evident that CIT was in possession of some data, but the usefulness of that data was questionable. It was very high level, not at all focused at department let alone programme or module level which was all contributing to CIT's retention problem. CIT was asking leaders to manage student retention without any real data supports. In effect, CIT was largely forcing leaders to make decisions based on intuition and anecdotes. CIT was facilitating (if not creating) a culture of HIPPO decision making.

To counteract this, CIT needed a programme of work that would provide data to the decision makers and lead to student retention decisions being grounded in fact and data rather than hearsay and intuition. The following section will discuss this new data driven programme, how that commenced in 2012 and still runs today.

## 4.3 Institute Leaders & Data in 2014

In 2011 CIT's Head of Faculty of Engineering and Science and the IT Department worked on the development of a data warehouse that would capture and store all of CIT's main data elements related to student recruitment, progression and retention. The comprehensive analysis of data for the above report and programmatic review was the catalyst for CIT investing in the creation this new data warehouse.

### 4.3.1 Leaders Recognise the Data Gap

By 2013 the data flowing into the data warehouse was proving to be particularly helpful to the Faculty of Engineering and Science. However, other than the Head of Faculty, all other users, including those outside the faculty, relied upon the data warehouse architect to provide them with any data they needed, if they felt they needed data at all. At this point it was evident that there was some really good data in the data warehouse but the warehouse itself

was proving inaccessible to most leaders as without some database skills leaders could not connect to and/or extract data from the warehouse. This meant the leadership's ability to self-serve was extremely limited. Requests for data would come through the data warehouse architect and would be fulfilled only if and when workload permitted. Without the assistance of the architect, a proficiency with ODBC and database connectivity techniques was required to access the data warehouse. Also, there were some data gaps in the warehouse. For example, data on student performance was not available at module level which significantly hindered real analysis and trending of student performance across an entire programme. As the new Head of the IT Department, and in advance of any PhD research commencing, the researcher met with a subset of the senior management team to understand how they were using the data warehouse. Some really interesting feedback from various stakeholders was received at this point. While there is some sense of frustration among the leadership team:

> "*I feel like I am sticking my finger in a dam…..We don't really know for sure who we have and who is a retention risk….There is no top-down cascade of decision making or criteria for same…. We haven't even got a CIT definition of retention so how could we be consistent… It has never worked properly because it is not driven from the top down*"

there is also evidence of proactivity:

> "*I like to separate the actively failing vs passively failing but that is just my method….I review how programmes are being marketed, delivered and resourced and use data to measure how I can improve in each area*"

Some of the factors that had been driving student retention related activity also come to the fore:

> "*It is mostly programmatic review time when I really have to worry about retention*"

as do the entities driving retention: "*The HEA drives our executive and our executive drives me …. If my exec doesn't ask me for it I don't go looking for it*"

While proactivity is mentioned above, even at this early stage there is also evidence of apathy among this leadership team with quotes such as:

> "*There is neither recognition nor repercussion no matter what I do in this space…I rely on my head of school for that information… Our faculty executive pulls statistics and feeds them to me*"

It is observable that the leadership team really cares about the effects of student retention issues "*Losing students has a really bad effect on staff and student morale*" and it is also evident that there are measures being taken to try and remedy these issues:

> "*I rely on attendance, leaving cert results and assignment performance to identify risks…I speak with my course co-ordinators to see who is at risk*"

It is also evident that the leadership team has an awareness of what is going on with their peers internal and external to CIT:

> "*I only have time to look at things sporadically and I know that this is not scientific or factual enough….I have one way of looking at it but I know my peers have a totally different way, we are very inconsistent in our approach*"

Subsequent to those informal meetings, the researcher concluded the following:

1) The data warehouse had some extremely powerful data sets
2) There was an issue with requests for data coming, for the most part, only to the data warehouse architect, which proved to be a bottleneck
3) There was very limited usage of this data as access required particular skill sets
4) There was also limited awareness of the power of this data due to above factors
5) While there was some excellent data in our data warehouse, there were still some major data gaps, for example module data
6) There was a really inconsistent approach to making decisions
7) There was no Institute wide, agreed definition of retention in CIT

NB: These seven issues, arising from the researchers 2014 review, are revisited as part of the contributions section. The contribution in section 5.3.1 speaks to how each of these seven issues was challenged by the data driven programme and provides an update on each, from the researcher's perspective in late 2016.

While the researcher concluded that the above seven issues warranted focus and time, some further assessment was required before a large programme of work could be commenced and funded. With this in mind the data driven maturity of CIT was assessed using the DELTATA framework from Davenport and Harris (2017). This maturity assessment is described in section 4.3.2.

### 4.3.2 An Assessment of Data Driven Maturity in CIT (2014)

Figure 27 is based upon the DELTATA framework from Davenport and Harris (2017). This framework includes a number of criteria, across which an organisation's analytics (or data driven) maturity can be measured. This section will be used to measure CIT's maturity in 2014 to understand if CIT has become more data driven. This measure will be based on the primary researcher's perspective but also supported by interview evidence from various interview subjects. The blue squares outline CIT's level of maturity in 2014. Interviews with CIT's leaders provided supporting evidence that contributed to this maturity assessment. This supporting evidence is interspersed with the discussion after the maturity diagram.

| 2014 | Stage 1<br>Analytically Impaired | Stage 2<br>Localized analytics | Stage 3<br>Analytical aspirations | Stage 4<br>Analytical companies | Stage 5<br>Analytical competitors |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| **Data** | Inconsistent, poor-quality, and unstandardized data; difficult to do substantial analysis; no groups with strong data orientation | Standardized and structured data, mostly in functional or process silos; senior executives do not discuss data management | Key data domains identified and central data repositories | Integrated, accurate, common data in central repositories; data still mainly an IT matter, little unique data | Relentless search for new data and metrics leveraging structured and unstructured data (e.g., text, video); data viewed as a strategic asset |
| **Enterprise** | No enterprise perspective on data or analytics; poorly integrated systems | Islands of data, technology, and expertise deliver local value | Process or business unit focus for analytics; infrastructure for analytics beginning to coalesce | Key data, technology, and analysts managed from an enterprise perspective | Key analytical resources focused on enterprise priorities and differentiation |
| **Leadership** | Little awareness of or interest in analytics | Local leaders emerge but have little connection | Senior leaders recognize importance of analytics and developing analytical capabilities | Senior leaders develop analytical plans and build analytical capabilities | Strong leaders behave analytically and show passion for analytical competition |
| **Targets** | No targeting of opportunities | Multiple disconnected targets, typically not of strategic importance | Analytical efforts coalesce behind a small set of important targets | Analytics centered on a few key business domains with explicit and ambitious outcomes | Analytics integral to the company's distinctive capability and strategy |
| **Analysts** | Few skills are attached to specific functions | Unconnected pockets of analysts; unmanaged mix of skills | Analysts recognized as key talent and focused on important business areas | Highly capable analysts explicitly recruited, developed, deployed, and engaged | World-class professional analysts; cultivation of analytical amateurs across the enterprise |
| **Technology** | Desktop technology, standard office packages, poorly integrated systems | Individual analytical initiatives, statistical packages, descriptive analytics, database querying, tabulations | Enterprise analytical plan, tool and platforms; predictive analytical packages | Enterprise analytic plan and processes, cloud-based big data | Sophisticated, enterprise-wide big data and analytics architecture, cognitive technologies, prescriptive and autonomous analytics |
| **Analytical techniques** | Mostly ad hoc, simple math, extrapolation, trending | Basic statistics, segmentation, database querying, tabulations of key metrics are leveraged to gain insights | Simple predictive analytics, classification and clustering; dynamic forecasts | Advanced predictive methods deployed to discover insights; advanced optimization, sentiment analytics, text and image analytics | Neural nets and deep learning, genetic algorithms, advanced machine learning |

Figure 27 - 2014 CIT data driven maturity assessment

In 2014, CIT would have been at stage 1 maturity – analytically impaired across all seven categories. The following section will discuss this across each of the 7 categories of the DELTATA framework in the context of CIT's maturity score.

*Data = Stage 1:* In 2014 a number of significant issues existed in relation to CIT's data. These included; poor data quality, inconsistent data across systems and in particular a lack of any data dictionary to standardise data definitions. Definitions of data were inconsistent across the Institute and as a result the ability to do any consistent analytics was significantly affected. While a data warehouse was built, data definitions used were not agreed or governed across the Institute.

> *"The frustrating thing for me Jonathan is that we have lots of data (maybe of questionable quality), you know we do, I know we do, but very few other people know we do. How can we make progress when we don't have any standard approach to data"* (Subject #1, 2014)

*Enterprise = Stage 1:* In 2014 CIT as an Institute did not have a data focus. While data elements were requested at a national level, HEA returns etc, the value of data to CIT as an enterprise was not realised or considered outside of a select few. Integration of systems at an enterprise level was done with a functional and operational focus. Integration from a strategic and/or data driven perspective was not being considered. This is also supported by the interview quote from subject #1 above.

*Leadership = Stage 1:* While a data warehouse existed, many leaders were either unaware of it or unable to access it. In 2014, only one member of CIT's leadership was able to access data from the data warehouse. Below are some of the typical questions being asked of the data warehouse in 2014:

- ✓ What schools are the students coming from by year?
- ✓ What is the regional / geographical dispersion?
- ✓ What Leaving Certificate Grades by student by course by year?
- ✓ What are the min CAO points per course per year?
- ✓ What are the leaving cert grades per student per year?
- ✓ What students are not achieving a desired outcome?

While there was only limited engagement between leaders and data in 2014, the questions being asked point to the retrospective nature of the focus, looking in hindsight and being descriptive in nature.

*Targets = Stage 1:* Consistent with the Enterprise category, targets were not being set at an Institute level for which data could be a measure.

*Analysts = Stage 1:* While one member of the IT Department was part-dedicated to the administration of the date warehouse, he was also the sole person at the time used to provide data. However, this was less than 5% of his time allocation, so in effect there were no analysts institutionally let alone within functions.

> *"How could we really expect this to start growing when we don't have anyone assigned to work on it. It really is only <individual named> from your department who does this in his spare time."* (Subject #1, 2014)

*Technology = Stage 1:* Leadership could not access the warehouse unless they understood how to create ODBC connections against SQL databases and pull data into Excel. This would arguably not even be categorised as desktop technology in that only one member of the leadership was using same.

> *"The cube is great. It has great data in there but it is a dark art as far as I am concerned. Anytime I need something I have to ask <same individual named> and he provides what I need. That is not really a scalable model for an Institute our size, is it?"* (Subject #21, 2014)

*Analytical Techniques = Stage 1:* The only technique being used by the single member of the leadership team was to spot trends in the data.

> *"Really all I would like is a simple report telling me what my retention numbers are, by module and programme and then see that trend over a number of years."* (Subject #4, 2014)

As a result of the seven issues outlined earlier and this maturity assessment, it became clear that leadership decision making in CIT was not informed by any consistent set of data. Methods used to make decisions varied greatly and most of the senior management team were crying out for help. This led directly to the creation of a data driven programme of work described in section 4.4.

## 4.4 The Institute's Response: A Data Driven Programme

Arising from the seven issues found in 2014 and the low level of data driven maturity found in 2014 a new programme of work, co-sponsored by the Head of IT and Head of Faculty of Engineering and Science, was commenced to deliver a new data analytics solution, initially to CIT's senior management team, and aimed at addressing the above issues. The mission for this programme was to "get the right data to the right people at the right time". A new system would be developed which would have to have:

- An agreed set of data definitions
- An easily accessible portal through which all main data sets could be published
- An interactive, graphical system which did not require data warehouse or technical knowledge for consumption
- Additional data sets added to the data warehouse
- A major awareness campaign to inform senior management of the potential
- An alignment of senior decision making with institute objectives
- A championing of the value of information led decision making
- A solution where non tech-savvy users could self-serve the data they required

### 4.4.1 Plugging the Data Gap: The Data Driven Programme

By mid-2014 the plan to address the gaps highlighted above was largely being finalised. A technology set (SharePoint, PowerBI, Excel Services) was selected that would allow the programme team to achieve two things:

1) Provide an accessible, visual presentation layer that would make CIT data more accessible to leaders
2) Provide a mechanism for CIT's IT team to build data visualisations easily facilitating future momentum with providing data to leaders

The programme timeline is provided in Figure 28 and largely commenced in mid-2014 when a procurement exercise was then undertaken to select a partner who could assist with building a solution using the preferred [17] technologies. In late 2014 the programme mission

[17] Sharepoing, PowerBI and Excel Services were preferred technologies as they provided a mix of new functionality and feature sets with some pre-existing complementary competencies within the internal IT team.

was adopted: "*Get the Right Information to the Right People at the Right Time*" with a view to assisting leadership decision making across the Institute. Then by early 2015 the formal and well-established procedures within the Institute's IT Helpdesk were engaged to provide some structure around the data provision requests being received from across the Institute. By February 2015 the programme was ready to provide the first visualisations to leaders and these visualisations were based upon a data dictionary formally adopted by the governance group a few months later. Leader training was provided so leaders could use the data provided to them and this training continued for as long as leaders requested it. As new data sets were brought the value to CIT's leaders were increasing. These new data sets included module level data and programme level data and the overall engagement methodology was starting to work well. Leaders understood how to request training and or new data and started to become more familiar and comfortable with the new presentation layer showcasing the rich data sets available. As the spotlight was being shone strongly on CIT data, with many eyes now scrutinizing that data, data quality issues with source systems started to emerge. While frustrating for some, this proved hugely beneficial as it led to the adoption of a data quality improvement methodology which was based on Tom Redman's *Friday Afternoon Measure* [18].

[18] The Friday Afternoon Measure is described in more detail in section 5.3.6

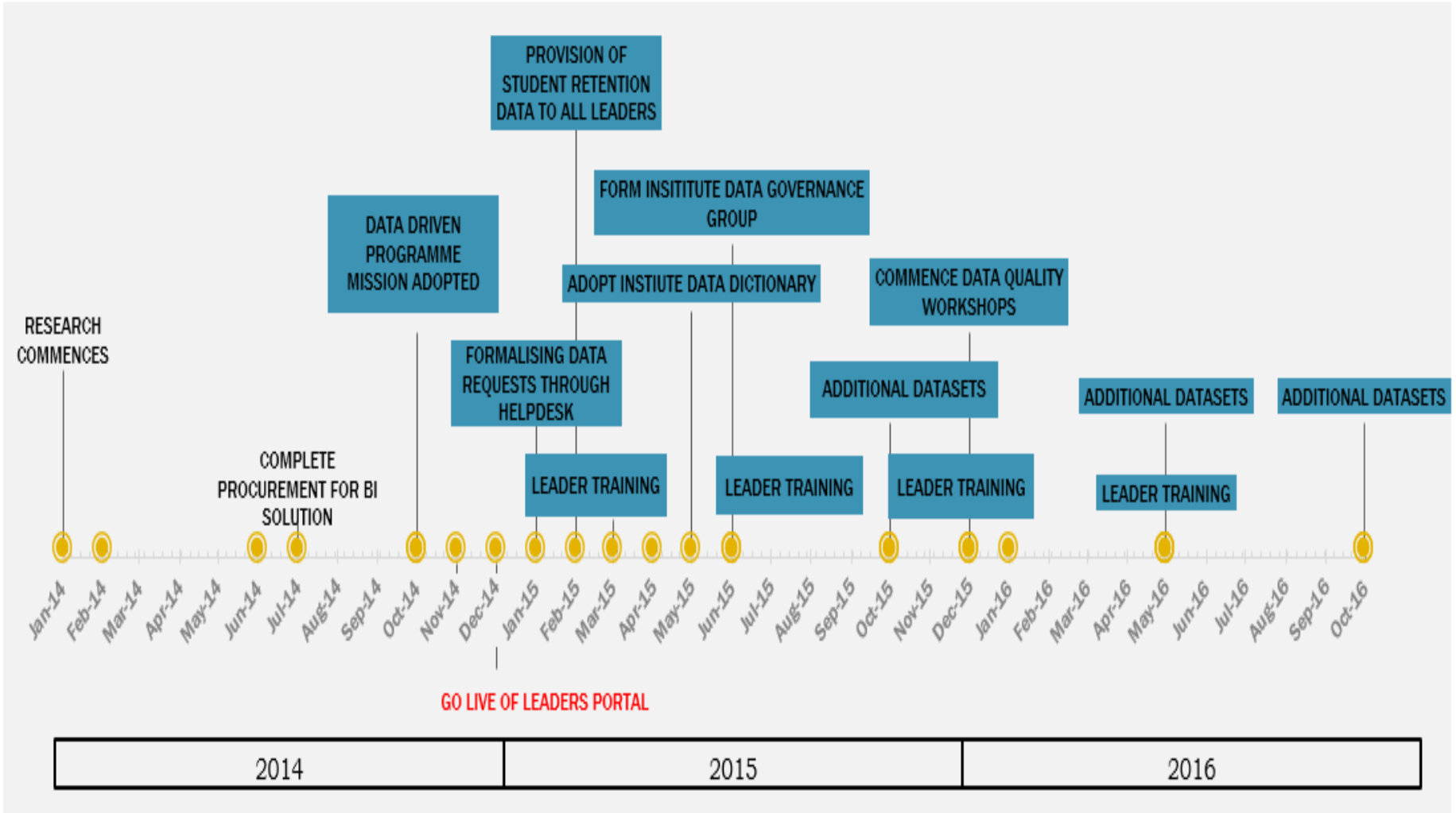



Figure 28 - Timeline of data driven programme

Figures 29-31 illustrate some of the visualisations provided to the leader which are student retention specific. Figure 29 is a visualisation of *Year 1 Retention Rates*. This was provided to each Head of Department (leader) for their own department. It provided an insight into how well each department was performing in the context of student retention and, while retrospective in nature, provided the leader with explicit measures upon which performance could be trended year on year.

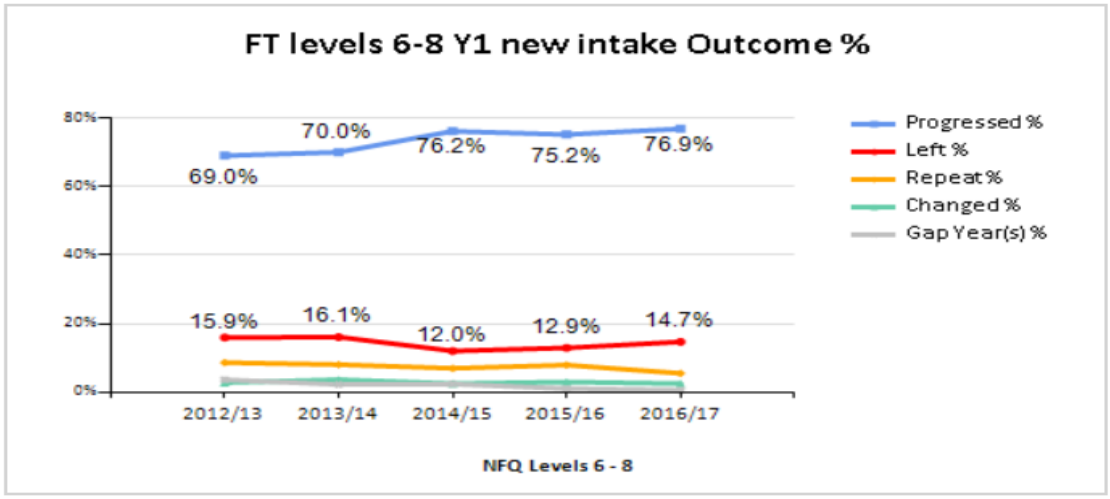



Figure 29 - Year 1 retention rates

Once overall retention statistics were understood at the department level, the leader would then turn to visualisations such as that in Figure 30. This visualisation provided each leader with an insight into what proportion of incoming students had completed honours vs ordinary level English in their Leaving Certificate. As this visualisation was provided over multiple years, trends could be observed by the leader before semester commencement.

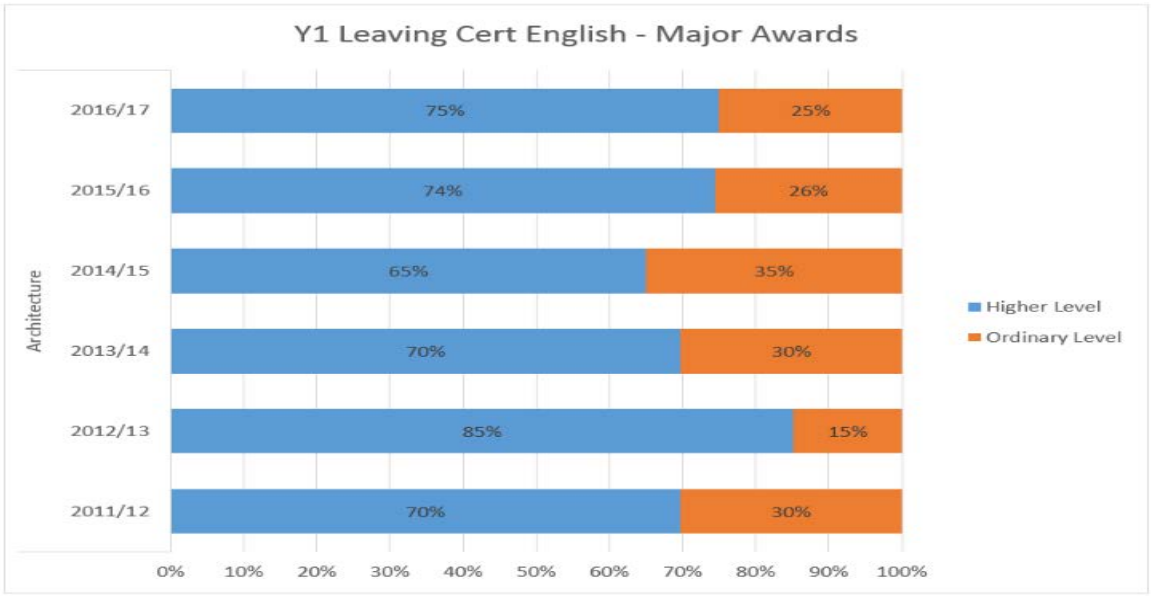



Figure 30 - Breakdown of English paper sat in leaving certificate

An example of the next level of detail for the leader is then provided in Figure 31. This visualisation is at the student level of detail and shows, for each student in the leader's department, the CAO points, Leaving Cert Mathematics and Leaving Cert English results. The leader could look at this visualisation up to 4 weeks in advance of week 1 and would be able to see the Leaving Cert Results columns populated. As Semester 1 results started to come in (week 15+), this right hand side of this visualisation would then start to populate.

A number of months after the go-live of these visualisations the following is a quote received from one CIT leader:

*"The solution is helping us provide rich information to our faculty management team in a timely, consistent and interactive manner. Ultimately, this is enabling us to understand the student experience in detail and create a platform for maximising student achievement and retention by identifying previously unseen opportunities for continuous improvement. It will become even more important over time as it is used to integrate wider data sets and support cross-process decision making and predicting outcomes" (Subject #1, 2016)*

Having discussed the data driven programme in CIT, and in particular the visualisations provided to the leaders, the next section will take a temperature check of data driven maturity in CIT in 2016 which can be used to compare to that taken in 2014 (see section 4.3.2). This will provide an insight into how CIT's data driven maturity moved along over the course of the data driven programme.

| | Leaving Cert Results | | | | Sem 1 Results Summary | | | | Sem 1 Results | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Student | CAO Type | CAO Pts | LC Maths | LC English | avg score | 0-34% | 35-39% | 40-100% | module 01 | | module 02 | | module 03 | | module 04 | | module 05 | |
| Student Details Redacted | standard | 351 | O3 | O3 | 49 | 0 | 1 | 4 | code redacted | 36 | code redacted | 57 | code redacted | 43 | code redacted | 54 | code redacted | 53 |
| Student Details Redacted | standard | 422 | O3 | H4 | 60 | 0 | 0 | 5 | code redacted | 50 | code redacted | 53 | code redacted | 60 | code redacted | 78 | code redacted | 57 |
| Student Details Redacted | standard | 351 | O5 | H4 | 36 | 3 | 0 | 2 | code redacted | 18 | code redacted | 14 | code redacted | 21 | code redacted | 72 | code redacted | 53 |
| Student Details Redacted | standard | 315 | O4 | H4 | 48 | 0 | 0 | 2 | code redacted | 56 | | | code redacted | 40 | | | | |
| Student Details Redacted | standard | 301 | H7 | O5 | 67 | 0 | 0 | 5 | code redacted | 56 | code redacted | 68 | code redacted | 53 | code redacted | 94 | code redacted | 62 |
| Student Details Redacted | standard | 404 | H6 | H3 | 38 | 3 | 0 | 2 | code redacted | 21 | code redacted | 6 | code redacted | 86 | code redacted | 29 | code redacted | 47 |
| Student Details Redacted | non-standard | | O5 | O3 | 19 | 5 | 0 | 0 | code redacted | 12 | code redacted | 7 | code redacted | 18 | code redacted | 32 | code redacted | 28 |
| Student Details Redacted | standard | 370 | O2 | O5 | 55 | 0 | 0 | 5 | code redacted | 44 | code redacted | 54 | code redacted | 55 | code redacted | 71 | code redacted | 53 |
| Student Details Redacted | standard | 316 | O4 | H5 | 47 | 0 | 1 | 4 | code redacted | 37 | code redacted | 42 | code redacted | 42 | code redacted | 60 | code redacted | 56 |
| Student Details Redacted | standard | 416 | H4 | H3 | 42 | 2 | 1 | 2 | code redacted | 30 | code redacted | 27 | code redacted | 38 | code redacted | 60 | code redacted | 53 |
| Student Details Redacted | standard | 409 | O5 | H4 | 56 | 0 | 0 | 5 | code redacted | 54 | code redacted | 47 | code redacted | 51 | code redacted | 73 | code redacted | 55 |
| Student Details Redacted | standard | 405 | H6 | O2 | 63 | 0 | 0 | 5 | code redacted | 55 | code redacted | 63 | code redacted | 61 | code redacted | 77 | code redacted | 61 |
| Student Details Redacted | standard | 292 | O4 | O3 | 62 | 0 | 0 | 5 | code redacted | 45 | code redacted | 61 | code redacted | 61 | code redacted | 78 | code redacted | 64 |
| Student Details Redacted | standard | 291 | O4 | H5 | 59 | 0 | 1 | 4 | code redacted | 55 | code redacted | 59 | code redacted | 35 | code redacted | 81 | code redacted | 63 |
| Student Details Redacted | standard | 409 | O2 | H4 | | 0 | 0 | 0 | code redacted | NONE | code redacted | W | code redacted | W | code redacted | W | code redacted | W |
| Student Details Redacted | standard | 298 | O3 | H5 | 57 | 0 | 0 | 5 | code redacted | 55 | code redacted | 49 | code redacted | 48 | code redacted | 67 | code redacted | 65 |
| Student Details Redacted | standard | 298 | O4 | H6 | 55 | 0 | 0 | 5 | code redacted | 41 | code redacted | 49 | code redacted | 64 | code redacted | 64 | code redacted | 55 |
| Student Details Redacted | standard | 298 | O2 | O3 | 17 | 2 | 0 | 0 | code redacted | 8 | code redacted | NP | code redacted | 26 | | | | |
| Student Details Redacted | standard | 425 | O3 | H5 | 14 | 3 | 0 | 0 | code redacted | 15 | code redacted | 5 | code redacted | 21 | code redacted | NP | code redacted | NP |
| Student Details Redacted | standard | 348 | O3 | H5 | | 0 | 0 | 0 | code redacted | NONE | code redacted | W | | | | | | |
| Student Details Redacted | standard | 377 | H7 | H5 | 68 | 0 | 0 | 5 | code redacted | 60 | code redacted | 61 | code redacted | 70 | code redacted | 86 | code redacted | 65 |
| Student Details Redacted | standard | 377 | O4 | H4 | 54 | 0 | 0 | 5 | code redacted | 40 | code redacted | 49 | code redacted | 57 | code redacted | 66 | code redacted | 59 |
| Student Details Redacted | standard | 368 | O2 | H5 | 48 | 0 | 0 | 5 | code redacted | 47 | code redacted | 46 | code redacted | 49 | code redacted | 58 | code redacted | 40 |
| Student Details Redacted | non-standard | | H4 | O3 | 64 | 0 | 0 | 5 | code redacted | 55 | code redacted | 64 | code redacted | 82 | code redacted | 62 | code redacted | 57 |
| Student Details Redacted | non-standard | | O5 | O4 | 47 | 0 | 1 | 4 | code redacted | 35 | code redacted | 47 | code redacted | 40 | code redacted | 66 | code redacted | 46 |
| Student Details Redacted | standard | 298 | O4 | O2 | 52 | 0 | 0 | 5 | code redacted | 46 | code redacted | 56 | code redacted | 46 | code redacted | 50 | code redacted | 62 |
| Student Details Redacted | standard | 441 | O1 | H3 | 69 | 0 | 0 | 5 | code redacted | 69 | code redacted | 74 | code redacted | 80 | code redacted | 58 | code redacted | 66 |
| Student Details Redacted | non-standard | | O4 | O2 | 31 | 4 | 0 | 1 | code redacted | 25 | code redacted | 17 | code redacted | 30 | code redacted | 61 | code redacted | 22 |

Figure 31 - CIT year 1 non-progression indicators

### 4.4.2 An Assessment of Data Driven Maturity in CIT (2016)

Figure 32 illustrates CIT's level of data driven maturity as per 2016 and after the data driven programme had been running for two years, with the 2014 measure in grey and the 2016 measure in blue. This is useful as it compares CIT's data driven maturity before (2014) and after (2016) the data driven programme. This assessment is discussed in the context of the categories of the DELTATA framework.

*Data = Stage 3:* By late 2016, the spotlight of data had shone bright enough to foster some real change across CIT. By now, the data contained in the data warehouse was guided and standardised by an institute wide data dictionary, governed by an institute data governance group. This in turn contributed to further reviews of other data repositories that were also surfaced to leadership through the enterprise reporting portal. However, data, and in particular the notion of a data driven culture was still primarily being led by IT.

Some evidence to support the establishment of the data dictionary is provided from the following discussion between the practitioner (in his practitioner role leading the data programme and subject #45 in a 2016 interview):

> Subject #45: "*Jonathan I have a real issue with your definition of a retained student*"
>
> Practitioner: "*…it is important to note though that this is not my definition of a retained student, this is the definition of the data governance group and therefore CIT's definition…*"
>
> Subject #45: "*So how do I get it changed?*"
>
> Practitioner: "*Well we can maybe get you invited to the next data governance meeting to discuss this definition, in the context of the data dictionary, however it might make sense to chat with <Head of Faculty> (subject #45's line manager) first to get his thoughts*"
>
> The practitioner subsequently followed up with subject #45 who confirmed that the definition would stand and while she disagreed with it she understood why it was defined as it was and accepted it.

*Enterprise = Stage 3:* By late 2016, with all leaders now having access to data for over 18 months, different business units have shown considerable interest in data for their business

unit. The data governance group has seen significant, and healthy, debate on the definitions of particular data elements. Different business units had different perspectives on certain definitions, e.g. student retention, and eventually came to agreement on an enterprise wide definition. See above exchange for further evidential support of this.

| 2014<br>2016 | Stage 1<br>Analytically Impaired | Stage 2<br>Localized analytics | Stage 3<br>Analytical aspirations | Stage 4<br>Analytical companies | Stage 5<br>Analytical competitors |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| **Data** | Inconsistent, poor-quality, and unstandardized data; difficult to do substantial analysis; no groups with strong data orientation | Standardized and structured data, mostly in functional or process silos; senior executives do not discuss data management | Key data domains identified and central data repositories | Integrated, accurate, common data in central repositories; data still mainly an IT matter, little unique data | Relentless search for new data and metrics leveraging structured and unstructured data (e.g., text, video); data viewed as a strategic asset |
| **Enterprise** | No enterprise perspective on data or analytics; poorly integrated systems | Islands of data, technology, and expertise deliver local value | Process or business unit focus for analytics; infrastructure for analytics beginning to coalesce | Key data, technology, and analysts managed from an enterprise perspective | Key analytical resources focused on enterprise priorities and differentiation |
| **Leadership** | Little awareness of or interest in analytics | Local leaders emerge but have little connection | Senior leaders recognize importance of analytics and developing analytical capabilities | Senior leaders develop analytical plans and build analytical capabilities | Strong leaders behave analytically and show passion for analytical competition |
| **Targets** | No targeting of opportunities | Multiple disconnected targets, typically not of strategic importance | Analytical efforts coalesce behind a small set of important targets | Analytics centered on a few key business domains with explicit and ambitious outcomes | Analytics integral to the company's distinctive capability and strategy |
| **Analysts** | Few skills are attached to specific functions | Unconnected pockets of analysts; unmanaged mix of skills | Analysts recognized as key talent and focused on important business areas | Highly capable analysts explicitly recruited, developed, deployed, and engaged | World-class professional analysts; cultivation of analytical amateurs across the enterprise |
| **Technology** | Desktop technology, standard office packages, poorly integrated systems | Individual analytical initiatives, statistical packages, descriptive analytics, database querying, tabulations | Enterprise analytical plan, tool and platforms; predictive analytical packages | Enterprise analytic plan and processes, cloud-based big data | Sophisticated, enterprise-wide big data and analytics architecture, cognitive technologies, prescriptive and autonomous analytics |
| **Analytical techniques** | Mostly ad hoc, simple math, extrapolation, trending | Basic statistics, segmentation, database querying, tabulations of key metrics are leveraged to gain insights | Simple predictive analytics, classification and clustering; dynamic forecasts | Advanced predictive methods deployed to discover insights; advanced optimization, sentiment analytics, text and image analytics | Neural nets and deep learning, genetic algorithms, advanced machine learning |

Figure 32 - 2016 CIT data driven maturity assessment

*Leadership = Stage 3:* No longer is CIT now seeing data being sought and accessed by only a single leader. Now, all leaders have access to data sets for their own areas of responsibility. While it cannot be said that all leaders are now data driven, there are certainly some of the leadership now being driven by data. To give an indication of this, some of the questions now being asked include:

- ✓ What if we raise the entry requirements for a course
- ✓ What if we lower the entry requirements for a course
- ✓ What if we run recruitment drives in particular locations
- ✓ What if we offer assistance to particular students
- ✓ What if we intervene with particular students
- ✓ What if we don't intervene with particular students

Interestingly, these types of questions are now more predictive than descriptive and more foresight than hindsight.

The practitioner asked a member of the IT team to audit the logs of the new system to confirm what level of engagement existed among the leadership team with the new solution. Within 3 months of going live 100% of leaders had logged in at least once. During this 3 month period the audit logs also confirmed that 85% of the leadership cohort had logged in more than 7 times.

Leadership has an integral role in all organisations, but when it comes to data there is an additional responsibility. The data to be consumed, to assist decision making, is integrally linked to the policy shaped by organisational leadership and in particular the top leader (President in the context of HE). Written another way, *"policy shapes evidence use"* (Honig and Coburn, 2008, p. 578) clarifying the importance of the role the President plays in any HE data driven programme.

*Targets = Stage 2:* Consistent with different business unit leaders asking for data relevant only to them, targets are concerned with individual business units rather than any enterprise wide strategic targets.

This is confirmed with both heads of faculty, while being heavily engaged with the new solution, had their own versions of a faculty dashboard. While there were significant similarities, the two heads of faculty had created two separate versions of a faculty dashboard rather than a single Institute wide faculty dashboard.

*Analysts = Stage 3:* The executive has made a decision to recruit a dedicated data scientist and put him/her working with the existing data warehouse architect. This would equate to a significant increase from the less than 0.05% of an FTE (as per 2014) to now having 1.8 FTE's allocated to presenting and analysing data for CIT as well as making it even easier for leaders to consume the data stored in the data warehouse.

*Technology = Stage 2/3:* An enterprise wide reporting portal is now in place that presents and slices data sets to and for all leaders. New data requests are governed at an enterprise level and data requests are provided to all leaders rather than just to pockets of business units. All leaders log into the portal to consume their data, regardless of its source. Often, leaders are unaware (and need not be aware), that data presented to them is coming from multiple systems and data sources as that is all done consistently in the background. However, some individual initiatives also still exist, hence this category being classed as between stage 2 and 3.

A number of months after the go-live of these visualisations the following is a quote received from one CIT leader:

*"The solution is helping us provide rich information to our faculty management team in a timely, consistent and interactive manner. Ultimately, this is enabling us to understand the student experience in detail and create a platform for maximising student achievement and retention by identifying previously unseen opportunities for continuous improvement. It will become even more important over time as it is used to integrate wider data sets and support cross-process decision making and predicting outcomes" (Subject #1, 2016)*

*Analytical Techniques = Stage 2:* Lots of trending is being used, tabulations of key metrics is also frequently consumed with some predictive analytics being used.

Section 4.4 has clarified that, as a result of the data driven programme, CIT has in fact become more data driven between the years of 2014 and 2016 and its data analytics maturity has certainly increased. However, what does this mean for the leaders? Now that section 4.4 has clarified that the data driven programme has had an impact on CIT's data analytics maturity, what impact has it had, if any, on CIT's leaders? As per the objective of this research: "*To explore the impact of a data driven approach on leadership behaviour in the context of student retention*", section 4.5 will now explore the impact this maturity shift has had, if any, in the context of each of the associated research questions

- Research Question 1: What characterises leadership behaviour in a typical student retention model
- Research Question 2: What is the impact of a data-driven approach on leadership behaviour in a student retention model

## 4.5 Case Analysis: Research Question 1

The purpose of this section is to analyse the 2014 data using Yukl's 12 leadership behaviours. Figure 33 illustrates that this research question will explore which of Yukl et al.'s leadership behaviours are evident in the 2014 CIT leader (pre the data driven programme). The 2014 leaders make decisions based on intuition and tacit knowledge.

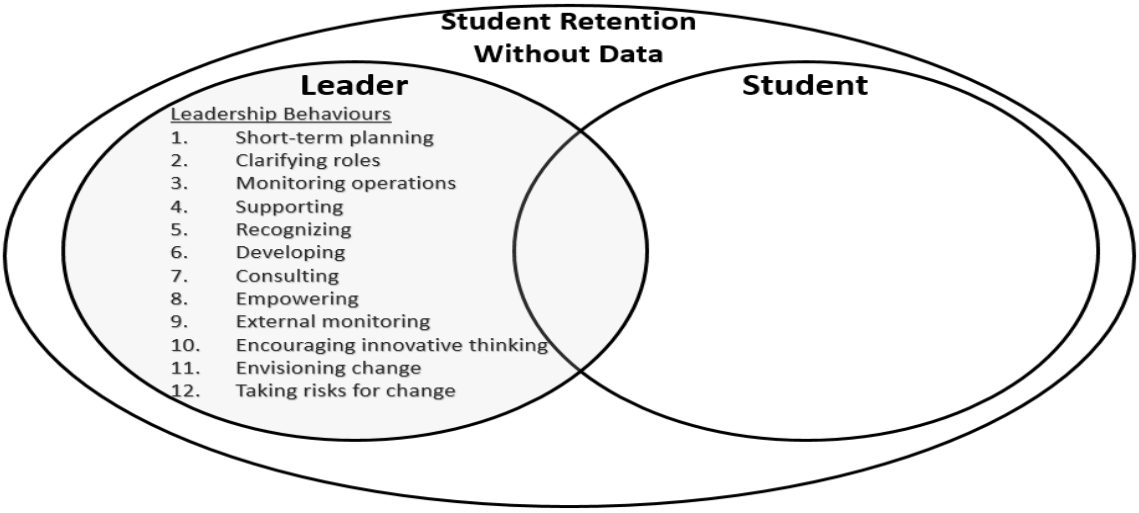



**Figure 33 - Student retention without data**

Effectively, Research Question 1 [19] is focused on the characteristics of the leader in a student retention model, but pre-dating the data driven programme. This question will focus on the leader, and in particular which of Yukl et al's 12 behaviours are evident in the context of a student retention model operating without data. Looking back at the timeline of the data driven programme (Figure 28), Research Question 1 can be answered in late 2014 after the initial survey, interview and observation data has been collected but before the data driven programme has commenced.

[19] What characterises leadership behaviour in a typical student retention model?

The following three sections will provide a detailed analysis of the leader behaviour data gathered using three techniques, namely: interviews, questionnaires and participant observations.

### 4.5.1 RQ1: Unit of Analysis = Percentage of Overall Mentions

Percentage of overall mentions is the unit of analysis utilised for this analysis. This unit of analysis will speak to what really characterises leadership behaviour among the CIT leadership population engaged in the study. While many behaviours may be found, this unit of analysis will clarify which behaviours are most prevalent, most favoured among the group and as a result, this unit of analysis will best describe what characterises leadership behaviour in the target group. An example of this can be provided in the context of the *Supporting* leadership behaviour, in Figure 34. To calculate the percentage of overall mentions for the supporting behaviour, for example from the questionnaire data, the sum of all mentions of the *Supporting* behaviour (#Instances) is divided by the sum of all mentions of all 12 leadership behaviours (∑#Instances). This clarifies which behaviours are most prominent among leaders.

$$Percentage\ of\ Overall\ Mentions = \frac{\#\ Instances(i)}{\sum_{i=1-12} \#\ Instances}$$

**Figure 34 - Formula for calculating percentage of overall mentions**

For example, using the data in Table 31, the calculation of percentage of overall mentions for the *Short-Term Planning* behaviour would be as follows:

$$Short-Term\ Planning = \frac{35}{\sum[35,42,43,35,24,38,7,29,18,10,6]} = \frac{35}{307}\ 11.40\%$$

**Figure 35 - Formula for calculating percentage of overall mentions (an example)**

| Style | Leadership Behaviour | # Instances[20] | Percentage of Overall Mentions |
|---|---|---|---|
| Task Oriented | Short-Term Planning | 35 | 11.40% |
| | Monitoring Operations | 42 | 13.68% |
| | Clarifying Roles | 43 | 14.01% |
| Relations Oriented | Supporting | 35 | 11.40% |
| | Developing | 24 | 7.82% |
| | Consulting | 38 | 12.38% |
| | Recognizing | 7 | 2.28% |
| | Empowering | 29 | 9.45% |
| | External Monitoring | 18 | 5.86% |

[20] This value is the number (#) of instances a particular behaviour is mentioned within a survey/interview/participant observation. For example, if a leader mentions he/she has a mechanism for monitoring operations of student retention then that is 1 instance of the monitoring operations behaviour. If he/she has more than one mechanism for this monitoring, or is monitoring more than one thing then that can equate to multiple instances of the same behaviour from the same leader

| | | | |
|---|---|---|---|
| Change Oriented | Encouraging Innovative Thinking | 20 | 6.51% |
| | Envisioning Change | 10 | 3.26% |
| | Taking Risks for Change | 6 | 1.95% |
| | **Totals** | **307** | **100%** |

**Table 31 - RQ1: analysis of questionnaire data (2014)**

Similar analysis was conducted for interviews and observations which allowed the triangulation of evidence as per Table 32. The percentage of overall mentions was averaged across questionnaires, interviews and observations. This average then allowed a ranking of leadership behaviours, from most prevalent to least prevalent, i.e. 'Short-Term Planning' was the most prevalent (ranked 1st) leadership behaviour evident in CIT's 2014 Leader. This ranking, and averaged percentage of overall mentions allows the researcher to discuss, in section 4.5.2, those behaviours which characterise CIT's 2014 leader (RQ1).

| Style | Leadership Behaviour | % of Overall Mentions (Questionnaire) | % of Overall Mentions (Interviews) | % of Overall Mentions (Observations) | AVG % of Overall Mentions[21] | AVG % Ranking[22] |
|---|---|---|---|---|---|---|
| Task Oriented | Short-Term Planning | 11.40% | 28.38% | 22.22% | 20.67% | 1 |
| | Monitoring Operations | 13.68% | 28.38% | 11.11% | 18.12% | 2 |
| | Clarifying Roles | 14.01% | 27.03% | 13.33% | 17.72% | 3 |
| Relations Oriented | Supporting | 11.40% | 6.76% | 17.78% | 11.98% | 4 |
| | Developing | 7.82% | 0.00% | 0% | 2.61% | 9 |
| | Consulting | 12.38% | 0.00% | 11.11% | 7.83% | 6 |
| | Recognizing | 2.28% | 1.35% | 0% | 1.21% | 11 |
| | Empowering | 9.45% | 5.41% | 11.11% | 8.66% | 5 |
| Change Oriented | External Monitoring | 5.86% | 0.00% | 8.89% | 4.92% | 7 |
| | Encouraging Innovative Thinking | 6.51% | 0.00% | 4.44% | 3.65% | 8 |
| | Envisioning Change | 3.26% | 1.35% | 0% | 1.54% | 10 |
| | Taking Risks for Change | 1.95% | 1.35% | 0% | 1.10% | 12 |
| | **Totals** | **100%** | **100%** | **100%** | **100%** | |

**Table 32 - RQ1: triangulated analysis (2014)**

### 4.5.2 What Behaviours Characterise CIT's 2014 Leader

When these data are illustrated based on their overall ranking, it provides some insight into which behaviours are more prevalent among the leaders in CIT during 2014. This ranking really represents CIT's 2014 leader, before the data driven programme had commenced. The 2014 leader is personalised in the behavioural word cloud represented in Figure 36. The

[21] This average was calculated by finding the average percentage of overall mentions across the questionnaire, interview and observation approaches.
[22] This is a ranking of leadership behaviours, highest to lowest, based on the averaged percentage of overall mentions

2014 leader was predominantly transactional, or tasks-oriented, in nature: a short-term planner who clarified roles, empowered staff and monitored operations.




**Figure 36 - CIT's 2014 leader**

A definitive ranking of behaviours demonstrated by CIT's 2014 leader is provided in Figure 37. Each of these ranked behaviours is then discussed with supporting evidence and quotes in the subsequent pages.

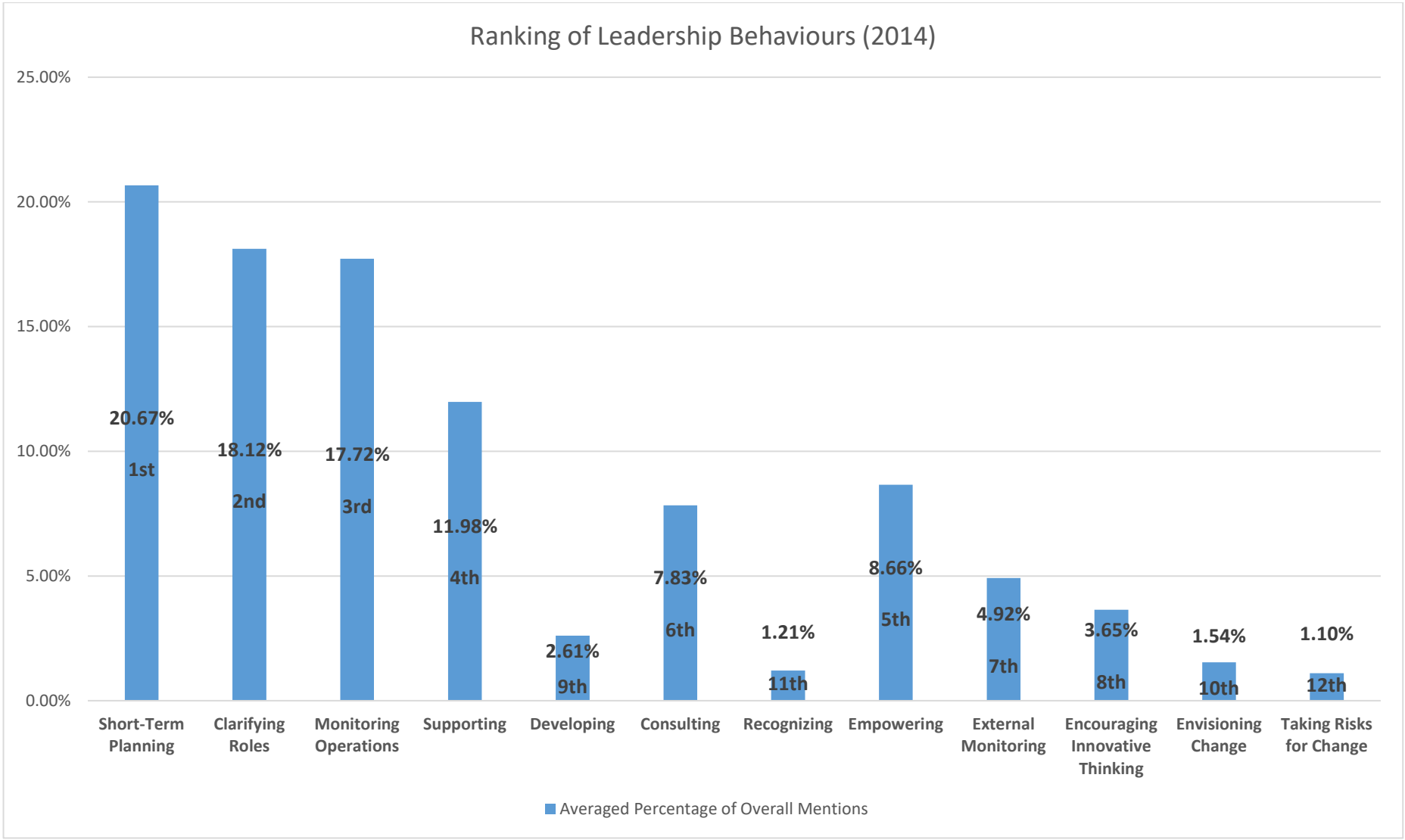



Figure 37 - Ranking of leadership behaviours (2014)

#### 4.5.2.1 1st: Short-Term Planning

Lots of evidence was found of CIT's 2014 leader demonstrating the short-term planning leadership behaviour. Ranked first for prevalence across all 12 behaviours, short-term planning made up 20.67% of those behaviours demonstrated by the 2014 leader. As part of data collection, any examples found where the leader eluded to the use of and/or reliance on a short-term plan, even if un-documented were seen as legitimate examples of the short-term planning behaviour. The following are a set of quotes taken from interviews with various subjects during 2014. The quotes are by subject code to protect their anonymity. In some cases, these quotes are responses to specific questions posed on student retention planning, in other cases these quotes came up in general conversation during the interview.

CIT's 2014 leader had a plan for the first six weeks of the semester aimed at 1st year students and retention:

> *"we have a plan for the first six weeks, we aim to have lots of engagement with the students, lots of welcomes and smiling faces and really work hard to make the student feel welcome and at ease in this crucial period" (Subject #17, 2014).*

> *"Our plan relies heavily on an induction session on each of the first two Saturdays" (Subject #25, 2014).*

This plan often relied heavily on the course coordinator role to ensure student retention success:

> *"The plan is to rely on course coordinators and soft information to see where we have risks" (Subject #16, 2014).*

Also, when the subject was pressed to elaborate on what was meant by the term 'soft information', they explained that this was where lecturers or course co-ordinators noticed risks directly and brought those to the head of department directly though informally. Evidence was found of the leader's plan including specific resources available to 'at risk' students after they were identified:

> *"Given our limited resources I decided that my plan needs to revolve around first years only to begin with, this really means that the second, third and fourth years don't get as much time. However, I look at exam results and failure rates and that*

*tells me which students are struggling and maybe be encouraged to use the ALC[23]" (Subject #45, 2014).*

Though this was not the only plan among CIT's 2014 leader, as some had plans which stretched back well before the first six weeks of the semester and revolved around student recruitment:

*"I am interested in how our students are being recruited as that is going to have an influence on any plans I make around retention" (Subject #1, 2014).*

*"The recruitment process is key for us as we try to plan to avoid recruiting students who are inappropriately qualified to progress in our graduate studies programme. If a student simply doesn't cut it then it is wrong to put them through a PhD, they may be more suitable for a Masters track. Student retention is important to us but not to the detriment of our moral responsibilities to the students and their families, i.e. if we don't feel they can complete a PhD we will try to switch them to a Masters instead." (Subject #41, 2014).*

CIT's 2014 leader also demonstrated plans specific to 'service departments', for example Maths. The Maths department will have students in programmes owned by that department, but this department will also provide lecturers (as a service) to other departments that require the delivery of a maths module in their programme e.g. a business student in a business programme taking a maths module in 1st year will have that maths module delivered by the maths (service) department and not the business department. Evidence was found of the leader's specific planning for one of those service departments:

*"As we are a service department we need to ensure that we stay very close to the programme department. If a student is struggling in a programme because of Maths then the finger gets pointed in my direction. We use attendance as a very important thing…. try and use CA[24] to give feedback as early as possible to our students…. maybe 15 minute assessments every few weeks…. we try and schedule our modules at good times e.g. not 3pm on Friday…. we try and ensure we have the best lecturers*

[23] The Academic Learning Centre (ALC) is a resource where students can book additional support around specific subjects with which they may be struggling, e.g. Statistics
[24] Continuous Assessment

*assigned to modules…. we also look at the 'hard markers'….create groups for carry/fail students to help each other out" (Subject #4, 2014).*

This evidence provides a very rich picture of the extent of one leader's plan just for one department. It does raise the question of whether plans such as these, if properly tested, should be rolled out across multiple departments in a coordinated way.

***Hypothesis #1: If a service department creates a short-term plan then it will have an impact on student retention in other departments.***

Effectively this means that retention of students in the Accounting department will be positively impacted if the Maths department has a short-term plan, as that Maths department is servicing in a maths module into the accounting department.

These fragments of evidence offer some insight to the level of short-term planning (20.67%) found in CIT's 2014 leader. Some consistency was seen where much planning revolved around the first six weeks of a first-year student, while others were focused on recruitment strategies and marketing strategies, all valid plans nonetheless. The researcher could see strong evidence that, whether explicitly documented or not, the leader's planning relied heavily on tacit knowledge and experience. This evidence allows the researcher to create another leadership behaviour hypothesis to be discussed further in section 4.7:

***Hypothesis #2: If a leader creates a short-term plan for the first six weeks of a semester then they will have an impact on student retention.***

#### 4.5.2.2 2nd: Clarifying Roles

The second ranked behaviour demonstrated by CIT's 2014 leader was clarifying roles. This behaviour made up 18.12% of those behaviours found in the leader in 2014. As part of the data collection, any examples found where the leader eluded to specific roles and/or clarification of roles in the context of student retention were seen as legitimate examples of the clarifying roles behaviour.

CIT's 2014 leader explicitly clarifies the role of the course coordinator and its importance to the student retention process in the Institute:

*"Course coordinators are really the first point of contact for identifying an issue (Subject #16, 2014)*

*"Just to say that as Heads of Department we rely so much on the lecturers and Course Coordinators to identify poor attenders and because everyone is caught for time sometimes, unfortunately we may not react to a student dropping out as quickly as we would like" (Subject #17, 2014)*

*"I think it has been a huge opportunity lost when the 2 Croke Park [25] hours came in that those 2 hours weren't given to class and course coordinators to coordinate....since that was not done then the lecturers do not really have as much time as I would like to follow up with at risk students or to identify at risk students" (Subject #17, 2014)*

Also, some leader's explicitly clarified a linear chain of command which existed:

*"We have a linear chain of command here to handle student retention, lecturer then course coordinator then head of department then head of school…all HoD's [26] are hands on and try to make the student feel valued…the Counselling Service has a strong role in retention…we always say to students, course coordinator is their first point of contact" (Subject #17, 2014)*

*"It is the responsibility of each Head of Department to go around to each class and introduce him/herself…Each student is given a handbook with contact details for admin, lecturers, course coordinators and head of department and we impress upon them the importance of the course coordinator…(Subject #17, 2014)*

*"My role is equivalent to Head of School so I rely on the heads of department for retention information…" 4m40s (Subject #16, 2014)*

As well as clarifying roles, CIT's 2014 leader is seen putting together teams and also making reference to the role of a course board in student retention:

[25] The Public Service or "Croke Park" Agreement is a commitment by public servants and their managers to work together to change the way in which the Public Service does its business so that both its cost and the number of people working in the Public Service can fall significantly, while continuing to meet the need for services and improve the experience of service users. In this case, it involved giving 2 timetabling hours back to lecturers in CIT. Subject #17 is suggesting disappointment those 2 hours were not specifically allocated to the course coordination role

[26] Heads of Department

*"I create the team, which monitors the students better…. cover for sick leave…. team sings off the same hymn sheet…Our course board has a very important role in ensuring high quality delivery which reduces attrition" (Subject #18, 2014)*

*While discussing student retention in general terms, leaders made reference to the role of data, the executive and the HEA [27] in student retention:*

*"The lack of a proper data solution for retention has been a significant blockage to any systematic approach…the executive has a role in driving performance targets down through the organisation, however without a system we cannot do this…also the HEA is now profiling institutes and impose targets on them…" (Subject #49, 2014)*

*"I believe it is the registrar's responsibility to define 'retention' for CIT" (Subject #1, 2014)*

*Consistent with the evidence of short-term planning focused on recruitment, evidence of roles associated with this recruitment was also found:*

*"Our engineering roadshow team are crucial because they go and meet prospective students and articulate the characteristics of a successful engineering student, thus they are proactive encouraging certain students and also discouraging certain students"*

This section offered some insight to the level of clarifying roles (18.12%) behaviour found in CIT's 2014 leader. Specific evidence was found of the leader eluding to the role of course boards, CIT's executive, the HEA and even government in student retention. The leader showed a consistent understanding of, appreciation for, and reliance on, the course coordinator role. This provides an opportunity to create a leadership behaviour based hypothesis:

***Hypothesis #3: If a leader clarifies the role of, and place a greater reliance on, the course coordinator then they will have an impact on student retention.***

[27] Higher Education Authority

#### 4.5.2.3 3rd: Monitoring Operations

Third ranked among the leadership behaviours was monitoring operations. This behaviour made up 17.72% of those behaviours found in CIT's 2014 leader. As part of the data collection, any examples found where the leader eluded to any monitoring of events, people, data or operations in general (in the context of student retention) were seen as legitimate examples of the monitoring operations behaviour.

Some leaders made explicit mention of their own role in monitoring and in some cases explicitly how they do so (in the context of student retention):

> *"I also have a role in measuring the institute's performance against student retention" (Subject #49, 2014)*

> *"People come to my door and that is useful feedback, I also try and get feedback in smaller groups as folks don't tend to speak out in larger groups" (Subject #4, 2014)*

> *"I lean heavily on Course Boards to tell me where I have issues" (Subject #17, 2014)*

> *"I monitor where we are losing most students and then plan against that, in particular I am trying to identify the active failing student from the passive failing student" (Subject #45, 2014)*

When asked to clarify how they differentiated an active failing student from a passive failing student, the leader in question clarified:

> *"An active failing student is one who is engaged, attending, submitting course work but struggling with the material for whatever reason. This student needs help from the ALC. A passive failing student is one who is not attending and/or not engaged. This student needs a different approach, we try to find out why they are not engaged and/or attending, and in particular can we do anything to change this" (Subject #45, 2014)*

Other leader's demonstrated evidence of scheduling explicit meetings or events aimed at monitoring student retention risk:

> *"I get a feel for where we are from course board meetings and lecturers would bring attendance records to these meetings also…. you have to be monitoring it" (Subject #25, 2014)*

> *"I have students in here to see why they are missing classes etc" (Subject #25, 2014)*

While other leaders demonstrated use of more implicit monitoring:

> *"In a place like this a lot of the information is soft, in that we get it over coffee, we sit down for tea with a course coordinator and have a chat about a course and its students' (Subject #25, 2014)*

> *"and when the proverbial is hitting the fan I also get information from peers....project team members will come to you and say Joe Bloggs we haven't seen him for 3 weeks, or he isn't contributing to the group" (Subject #25, 2014)*

One of the more frequent explicit monitoring examples however, was the leader's use of student attendance as a monitoring tool:

> *"We do a census, driven by admissions, where each CC goes into each class and manually takes a count of how many students are there…plus we look at reports from external examiners and attendance records" (Subject #25, 2014)*

> *"We see a strong correlation between progression and attendance…. the course coordinators would manually monitor attendance and would know who has poor attendance or not" (Subject #16, 2014)*

> *"Last semester I spent a number of hours interviewing students who had poor attendance records… The staff member goes in with a sheet of paper and calls a role " (Subject #18, 2014)*

> *"I ask my programme coordinators to take attendance to tell me who is attending or not" (Subject #4, 2014)*

> *"The staff member goes in with a sheet of paper and calls a role" (Subject #18, 2014)*

> *"I would sacrifice some of my budget to allocate towards an attendance solution if I thought I could have it for my department" (Subject #25, 2014)*

Monitoring operations is certainly demonstrated quite strongly by the 2014 leader. It does raise another two interesting hypothesis, one in the context of monitoring and another in the context of explicitly monitoring student attendance:

***Hypothesis #4: If a leader monitors operations and receives frequent feedback on student performance, then they will have an impact on student retention.***

***Hypothesis #5: If a leader promotes attendance monitoring then they will have an impact on student retention***

#### 4.5.2.4 4th: Supporting

Fourth ranked among the leadership behaviours was the supporting behaviour which made up 11.98% of those behaviours found in the leader in 2014. As part of the data collection, any examples where the leader was found to be supportive, of staff or students, in the context of student retention were seen as legitimate examples of the supportive behaviour.

Evidence was found where the leader showed empathy and a desire to be supportive of an 'at risk' or even a departed student:

> *"You feel a responsibility to a departed student and you wonder could you have helped them in any way, a student who leaves in October is likely to lose a whole year of their academic lives" (Subject #25, 2014)*

> *"There are huge pressures on kids….we send them out in placement in 1st year and that is really important as it gives the student an idea if it is for them or not" (Subject #18, 2014)*

CIT's 2014 leader also displayed evidence of explicit supports they introduced for an identified 'at risk' student:

> *"We use the Academic Learning Centre to help students with certain subjects, this is in the 'cure' space" (Subject #45, 2014)*

> *"I encourage soft supports from my lecturers…[gives name of lecturers] know the name of the students and say hello to them, something small like that can make a huge difference to a student who may be away from home for the first time" (Subject #25, 2014)*

The latter example shows the leader being supportive but in particular how those soft supports can be of crucial importance to an 'at risk' student. When this was probed further the leader elaborated to say:

> *"An 'at risk' student could have all sorts of things going in their lives. They come to CIT and might not know too many other people, maybe even they are the only person from their class to come to CIT, making that transition from second level even harder. Sometimes a staff member greeting that student warmly and by name can*

*give a student a feeling of belonging…maybe even that warm greeting could be something small that triggers a new path to better mental health for the student. We never know what we are dealing with really, and we have a huge responsibility". (Subject #25, 2014)*

While 4th in overall ranking, the importance of the supportive behaviour to the leader should not be understated. There is a palpable sense of responsibility, among many leaders, to support the student and a recognition that their responsibility extends to the student's family and not just the student themselves. This raises another hypothesis:

***Hypothesis #6: If a leader encourages teaching staff to be supportive of students, even if only to know a student's name, then they will have an impact on student retention.***

#### 4.5.2.5 5th: Empowering

The fifth ranked leadership behaviour was the empowering behaviour which made up 8.66% of those behaviours found in the leader in 2014. As part of the data collection, any examples where the leader was found to empower either staff or students in the context of student retention were seen as legitimate examples of the empowering behaviour.

Consistent with earlier examples, the role of the course coordinator provides evidence of the leader demonstrating the empowering behaviour:

*"We have fantastic staff, our course coordinators are now so experienced with recognising students who are suffering or at risk" (Subject #45, 2014)*

*"I really rely on the course coordinators, they are on the front line and tell me when a student is struggling" (Subject #18, 2014)*

One leader provided evidence of how lecturers in their department were very hands on with the students and engaged frequently and consistently to understand which students were at risk:

*"Our area is very hands on so it is easy for us to monitor students" (Subject #17, 2014)*

When probed for further information in regards to the "hands on" comment, the leader clarified that there were no formal tools, no formal meetings, no formal solutions to handle retention, but their department still had a fantastic retention record because their staff knew what to do and did it very well.

*"My lecturers are outstanding, I don't get in their way. When they have a student issue then they come to me and I try and help. Students 'trust' their course coordinators so we have a number of checks and balances in place" (Subject #17, 2014)*

When CIT's 2014 leader empowers their course coordinators and those course coordinators were able to instil trust in their students, it appeared to positively impact student retention. At only 8.66% of the overall behaviours found, empowering did not have as rich a set of examples as some of the earlier behaviours, however it was clearly evident in CIT's 2014 leader and also leads to another hypothesis:

***Hypothesis #7: If a leader encourages a hands-on approach from their course coordinators then they will have an impact on student retention***

#### 4.5.2.6 6th: Consulting

The sixth ranked leadership behaviour was the consulting behaviour which made up 7.83% of those behaviours found in CIT's 2014 leader. As part of the data collection, any examples where the leader was found to consult with colleagues, internal or external, in the context of student retention were seen as legitimate examples of the consulting behaviour.

Noticeably, no evidence of this behaviour was found during interviews, however it was found as part of the questionnaire and observations. Interview data was reviewed again to validate this and its absence may be explained by the semi-structured nature of the interviews. No explicit closed questions existed to test the presence of all behaviours. Also, the time with each interviewee was limited, thus not all behaviours were explicitly found or exhaustively tested for. However, the consulting behaviour is implicitly evident in interview data as the leader implicitly eludes to interactions with the course coordinator which would certainly constitute consultative behaviour on the leader's part. However, this behaviour is explicitly evident in both the questionnaire and observation approaches. Leaders were explicitly asked if they consulted with any persons/roles when it comes to student retention. 38 of the 56 leaders answered that they did in fact consult with other persons/roles in the context of student retention. Many occurrences are evident of the leaders consulting with other leaders and with academic staff such as course coordinators in particular.

***Hypothesis #8: If a leader consults appropriately with key roles (e.g. Course Coordinator) then they will have an impact on student retention***

#### 4.5.2.7 7th: External Monitoring

The seventh ranked leadership behaviour was the external monitoring behaviour which made up 4.92% of those behaviours found in CIT's 2014 leader. As part of the data collection, any examples where the leader was found to show an awareness of, and/or interest in, what other HEI's were doing in terms of student retention results, processes or practices was taken as an example of the external monitoring behaviour. The external monitoring behaviour was explicitly evident during interviews. Some awareness of what was happening in other HEI's was evident in the questionnaire results and also observed in meetings. At one meeting where student retention was not an agenda item but was raised for discussion, the following was observed:

> *Meeting Agenda: Discuss data driven programme and leadership requirements*
>
> *Meeting Attendees: IT Leadership, Senior Management Members*
>
> *Observation: The agenda of this meeting was to discuss the data driven programme that was being planned and what types of data the leadership would need. The researcher observed that two of the leaders in the room seemed very well informed on the retention statistics for programmes in other HEI's in Ireland which they felt were competing with their own. Retention statistics for programmes in UCC, WIT and LIT were being quoted with sufficient confidence and assuredness to convince the researcher that these leaders were very aware of what was happening across their sector.*

This really raises another hypothesis related specifically to the behaviour of external monitoring.

***Hypothesis #9: If a leader monitors their internal retention performance in comparison to their external market competition then they will have an impact on student retention internally***

#### 4.5.2.8 8th: Encouraging Innovative Thinking

The eighth ranked leadership behaviour was the encouraging innovative thinking behaviour which made up 3.65% of those behaviours found in the leader in 2014. As part of the data collection, any examples where the leader was found to seek/encourage new ideas from their staff on managing student retention was taken as an example of the encouraging innovative thinking behaviour. As with the consulting behaviour, the encouraging innovative behaviour

was not explicitly or implicitly evident during interviews. However, this behaviour was observed in a request the researcher received from one group of academic staff asked to engage with me directly (as Head of IT) by their Head of Department. The academic staff asked if the researcher could use CIT's WiFi infrastructure to gauge student engagement and even attendance with a view to feeding that information into student retention risk management. The researcher asked the academic staff where they got the idea and they mentioned they had brought it to their Head of Department who had then encouraged them to meet with me to see if it was possible.

***Hypothesis #10: If a leader encourages innovative thinking from staff members then they will have an impact on student retention***

#### 4.5.2.9 9th: Developing

The ninth ranked leadership behaviour was the developing behaviour which made up 2.61% of those behaviours found in the leader in 2014. As part of the data collection, any examples where the leader was found to be seeking to develop the staff in their department was taken as an example of the developing behaviour. No evidence of this behaviour was found in the interviews or observations, though some evidence was found in the questionnaire. While the evidence found for this behaviour was limited, it does raise another hypothesis:

***Hypothesis #11: If a leader develops their staff then they will have an impact on retention***

#### 4.5.2.10 10th: Envisioning Change

The tenth ranked leadership behaviour was the envisioning change behaviour which made up 1.54% of those behaviours found in the leader in 2014. As part of the data collection, any examples where the leader was found to bring forward a new idea, articulate the vision of this new idea to their team was taken as an example of the envisioning change behaviour. No evidence of this behaviour was found in observations, though limited evidence was found in the questionnaire and interviews. One example of this behaviour was found in the interview with subject #1. The leader articulated the need to change how their department was recruiting students. Historically, some students who were not retained in their department had not, in the leader's opinion, been fully informed about the programme upon which they were commencing. The leader articulated a vision for change which was based on the running of 'Engineering Roadshows' across the county where the merits, details, structure and expectations of the programme would be shared with prospective students at second level. This was aimed at creating interest, and ultimately awareness, among students

so that those who chose CIT, and were ultimately accepted, would be more informed and less likely to become a retention statistic due to lack of programme awareness. This analysis raises another hypothesis:

***Hypothesis #12: If a leader envisages change within his/her department then they will have an impact on student retention***

#### 4.5.2.11 11th: Recognizing

The eleventh ranked leadership behaviour was the recognizing behaviour which made up 1.21% of those behaviours found in the leader in 2014. As part of the data collection, any examples where the leader was found to recognise the efforts of a team member in the context of student retention was taken as an example of the recognizing behaviour. No evidence of this behaviour was found in observations, though some evidence was found in the questionnaire and interviews. Only 7 leaders indicated in the survey that they had some form of recognition for their staff, though no details were found to elaborate on this recognition.

***Hypothesis #13: If a leader recognizes the efforts of team members then they will have an impact on student retention***

#### 4.5.2.12 12th: Taking Risks for Change

The last ranked leadership behaviour was the taking risks for change behaviour which made up 1.10% of those behaviours found in the leader in 2014. As part of the data collection, any examples where the leader was found to take on and lead a significant student retention-based process or staff change, which could be deemed risky for that leader for any reason, was taken as an example of the taking risks for change behaviour. No evidence of this behaviour was found in observations, though very limited evidence was found in the questionnaire and interviews. In an interview with subject #4, the leader clarified the following:

> *"We have moved a Maths module in one programme from Semester 1 to Semester 2 and back again and that has not gone down well with my staff. The staff were happy that it moved to Semester 2 but I didn't think it was working. I decided to move it back to Semester 1 and I am not the most popular as a result." (Subject #4, 2014)*

This eludes to the notion that change is not always welcome and reaffirms the point that leaders wishing to effect change are in fact 'taking a risk'. While this behaviour was the least evident in CIT's 2014 leader, it does raise an interesting hypothesis:

***Hypothesis #14: If a leader is brave enough to take risks for change then they will have an impact on student retention***

This concludes the analysis for Research Question 1. Findings which have arisen from the analysis against Research Question 1 are now discussed in the next section.

## 4.6 Case Analysis: Research Question 2

The purpose of Research Question 2[28] is to determine if a journey towards a data driven approach has an impact on leadership behaviour. There are a number of components of interest to this research question and these are illustrated in Figure 38. The behaviours demonstrated by CIT's 2014 leader (largely in the absence of data) represent the behaviours of a tacit (non-data) knowledge driven leader. Having completed analysis against Research Question 1, these behaviours are now known and are shown on the left side of Figure 38. However, the behaviours of CIT's 2016 leader are not yet known, as illustrated by the right-hand side of Figure 38. To unlock this and to understand the impact a data driven approach may have on leadership behaviour, the analysis against Research Question 2 will use two units of analysis:

1) Percentage of Overall Mentions – this will be consistent with the analysis done against CIT's 2014 leader (and Research Question 1)
2) Percentage Change (2014 – 2016) – having analysed and understood CIT's 2014 and 2016 leaders, and their behaviours, a comparison of both will provide an answer to Research Question 2, i.e. the change a data driven approach may have.

[28] What is the impact of a data-driven approach on leadership behaviour in a typical student retention model?

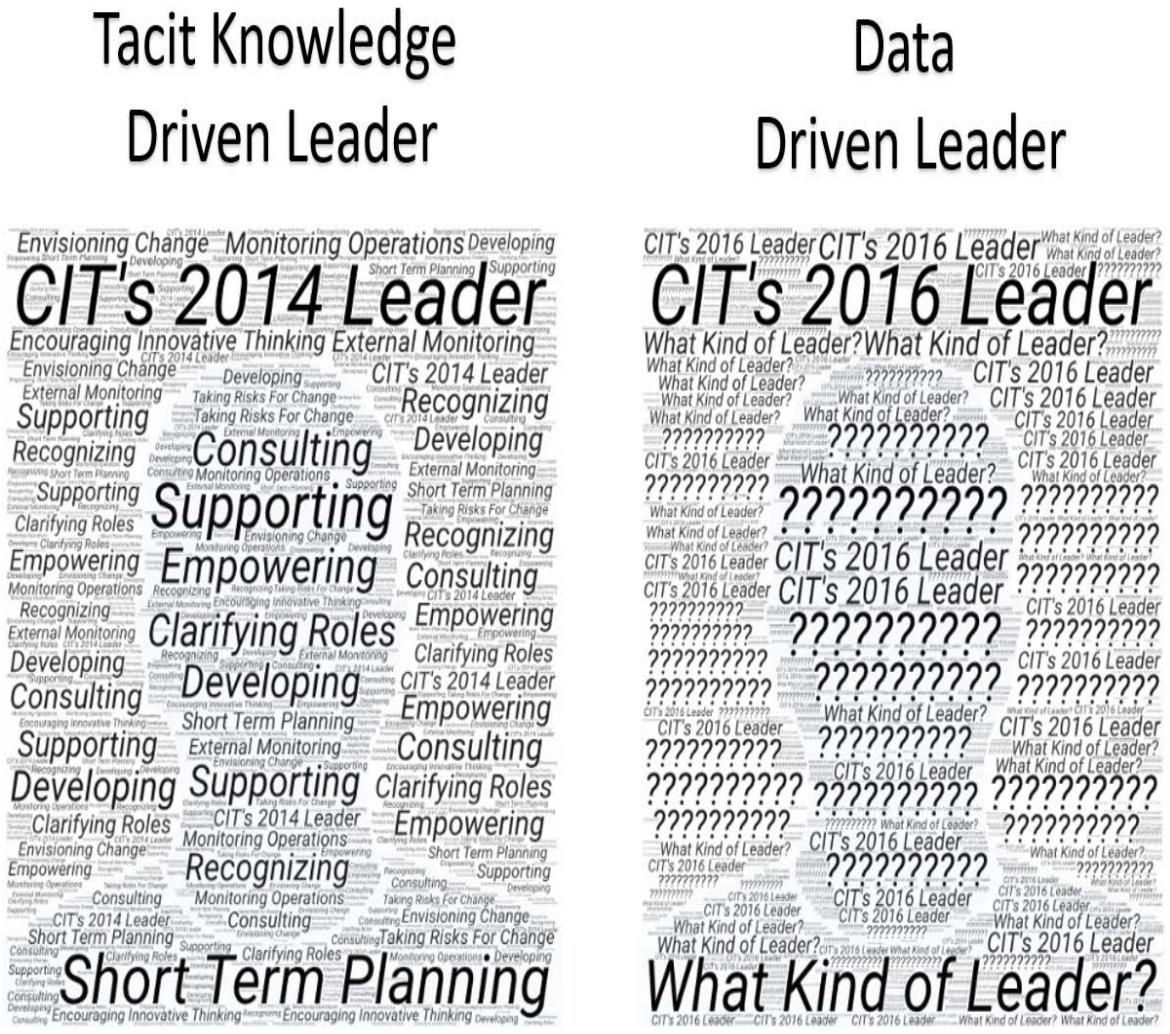



**Figure 38 - Focus of Research Question 2**

### 4.6.1 RQ2: Unit of Analysis = Percentage of Overall Mentions

Consistent with the analysis for Research Question 1 (2014 data), the unit of analysis for 2016 is also focused on the *percentage of overall mentions* [29] of leadership behaviour. What this means is that the average mention of each behaviour is compared to the average mentions of all other behaviours and the percentage of each behaviour is seen in the context of all leadership behaviours.

With data analysed from all three approaches, Table 33 shows a triangulation of evidence across all three. The percentage of overall mentions was taken from each of the approaches and an average was calculated across all three. Once this average was calculated, a ranking

[29] For further details on how this percentage is calculated see section 4.4.5.1

of leadership behaviours was created, from most prevalent to least prevalent, i.e. based on the average calculation, Monitoring Operations was the most prevalent leadership behaviour evident in CIT's 2016 leader.

| Style | Leadership Behaviour | % of Overall Mentions (Questionnaire) | % of Overall Mentions (Interviews) | % of Overall Mentions (Observations) | AVG % of Overall Mentions [30] | AVG % Ranking [31] |
|---|---|---|---|---|---|---|
| Task Oriented | Short-Term Planning | 7.17% | 15.31% | 14.52% | 12.33% | 3 |
| | Monitoring Operations | 14.33% | 20.41% | 4.84% | 18.12% | 1 |
| | Clarifying Roles | 11.26% | 28.57% | 14.52% | 13.19% | 2 |
| Relations Oriented | Supporting | 10.92% | 3.06% | 16.13% | 10.04% | 5 |
| | Developing | 7.51% | 0.00% | 1.61% | 3.04% | 11 |
| | Consulting | 11.60% | 0.00% | 9.68% | 7.09% | 7 |
| | Recognizing | 2.05% | 0.00% | 0.00% | 0.68% | 12 |
| | Empowering | 7.17% | 12.24% | 9.68% | 9.70% | 6 |
| Change Oriented | External Monitoring | 9.56% | 8.16% | 12.90% | 10.21% | 4 |
| | Encouraging Innovative Thinking | 6.83% | 4.08% | 4.84% | 5.25% | 9 |
| | Envisioning Change | 4.44% | 2.04% | 6.45% | 4.31% | 10 |
| | Taking Risks for Change | 7.17% | 6.12% | 4.84% | 6.04% | 8 |
| | **Totals** | **100%** | **100%** | **100%** | **100%** | |

**Table 33 - RQ2: triangulated analysis (2016)**

When these data are illustrated based on their overall ranking, it provides some insight into which behaviours are more prevalent in CIT's 2016 leader. What is evident is that certain behaviours are more prevalent than others in the 2016 leader. For example, of the behaviours found evident in the leader in 2016, on average *Monitoring Operations*, is evident 18.12% of the time, ranking it the most evident behaviour in the leader in 2016. The behaviours of the 2016 leader are ranked in Figure 39 on the next page and are then discussed in section 4.7.2. Rather than order them by the raking in which they were found in the 2016 leader, for easy comparison with the 2014 leader, the order of behaviours is presented in the same order as those behaviours found in the 2014 leader [32].

[30] This average was calculated by finding the average percentage of overall mentions across the questionnaire, interview and observation approaches.
[31] This is a ranking of leadership behaviours, highest to lowest, based on the averaged percentage of overall mentions
[32] See Figure 37 for 2014 order of behaviours

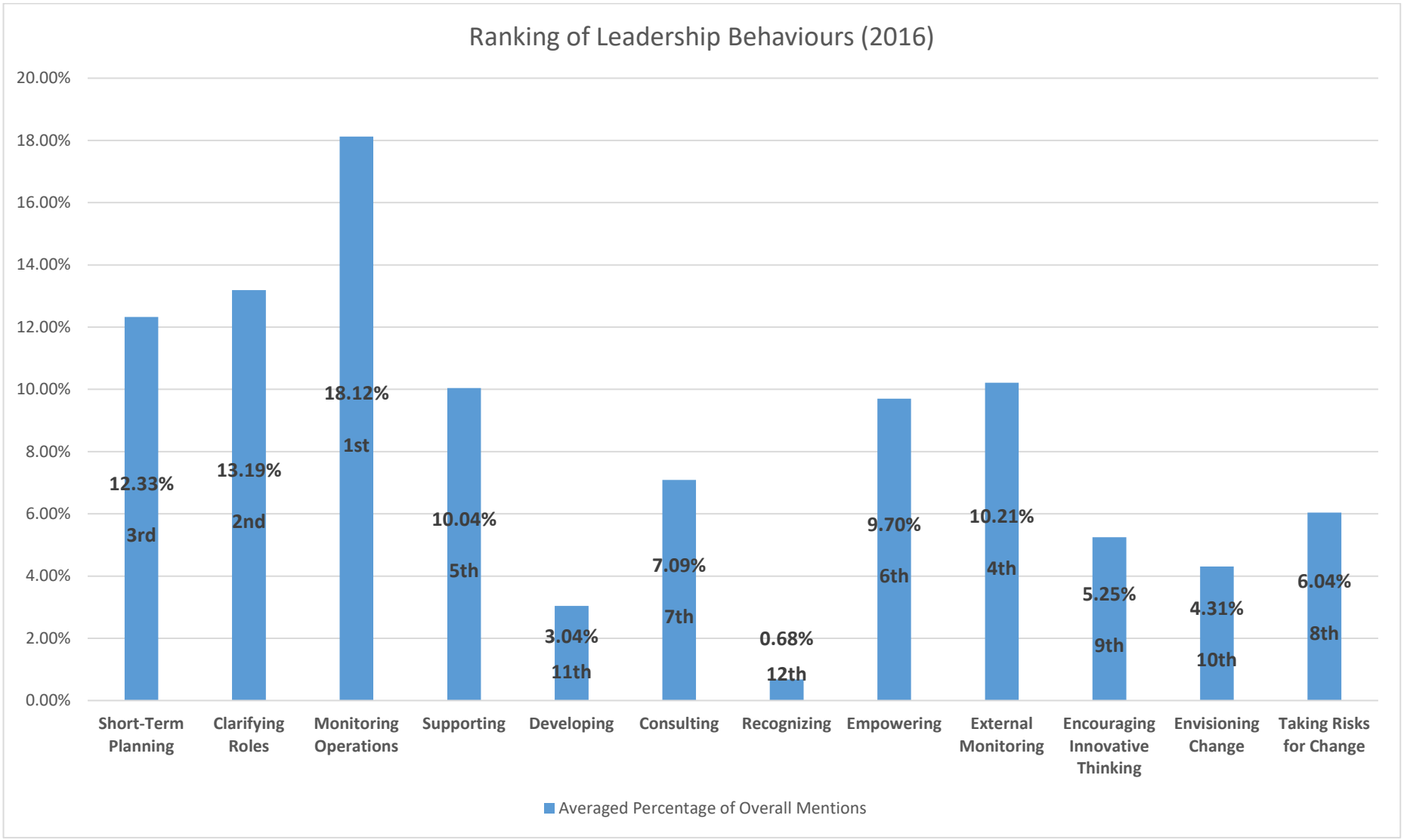



Figure 39 - Ranking of leadership behaviours (2016)

### 4.6.2 What Behaviours Characterise CIT's 2016 Leader

This section will discuss in detail each of the behaviours which were found when data for CIT's (data driven) 2016 leader was analysed. Each of the behaviours is discussed in order of most frequently evident.

#### 4.6.2.1 1st: Monitoring Operations

Monitoring Operations, with an average of 18.12% of overall mentions, was the first ranked behaviour in the analysis of the 2016 data. There was strong evidence of the leader using this behaviour specifically in the context of data they had been provided. When asked question 6 of the interview protocol form ***(****How do you inform yourself to make those decisions?*), subject 33 responded with the following:

> *"I am looking at the Cube reports now to see what that is telling me….I am interested in what the HEA reports and Course Monitoring reports are telling me….after exam sittings I can now look at our cube data to tell me how students have done" (Subject #33, 2016)*

This data driven approach is also corroborated in responses from other leaders to the same question:

> *"We used to rely on [named leader here] giving us data but now I can get that myself" (Subject #16, 2016)*

There is also evidence of the 2016 leader now combining soft information [33] with the hard information (data) being received from the new system.

> *"We ask the course coordinators to review all assignments and attendance, then based on both of these we intervene with at risk students. However, I am also now looking at the portal for what that is telling me" (Subject #22, 2016)*

> *"I rely first on what the course coordinators are telling me, however with the new system I also identify students who are failing to persist and look for trends among them" (Subject #2, 2016)*

[33] Soft information refers to opinions, ideas, commentary etc which heretofore were received from course coordinators among others

*"We provide a report to IEB, we get a lot of this data from the reporting solution (Subject #49, 2016)*

In the questionnaire, questions 10 (Do you monitor student retention across your department/school/faculty/function) and 11 (Please describe how you monitor student retention) were aimed to understanding if the leader was in fact monitoring and if so, how. Question 11 was only put to those who answered question 10 in the positive, and some of the responses to question 11 provide very strong evidence of the monitoring operations behaviour:

*Annual Student Number Returns, Ad hoc retention reports (IEB Member, 2016)*

*Student retention is reviewed across the institute. I also am a member of faculty boards of study where retention metrics are discussed down to programme level. (Head of School, 2016)*

*Student numbers are analysed, attendance records are taken in classes. We also work closely with Good Start, SPARQs and the Academic Success Coaching initiatives to ensure best possible retention levels. (Head of School, 2016)*

*Data is extracted from student database at Faculty level and distributed to Heads of Dept and programme boards for analysis and action. (Head of Department, 2016)*

*There are a number of different points at which student retention is measured: most obviously at exam boards and PABs but course co-ordinators would usually keep a log/spreadsheet. Course boards would typically discuss retention for relevant programmes. For our online students we generally have a number of metrics we informally review LMS access, online community engagement, synchronous attendance and participation and, naturally, coursework submissions (inc timeliness, academic honesty, validity etc) (Head of School, 2016)*

While there is strong evidence of monitoring operations which can be directly tied to a data driven approach (hard information), there is also evidence of monitoring operations which are still dependent on soft information:

*"I discuss directly with students, sometimes I get a referral from other staff" (Subject #15, 2016)*

*"Year coordinators notify my if there is an issue….we discuss any issues at departmental meetings" (Subject #1, 2016)*

*"We have a few strategies for this really: we keep a register of all students and their performance, we also track course board data, and finally discussions with each programme's extern". (Subject #4, 2016)*

*"We review retention in our faculty board meetings" (Subject #10, 2016)*

Soon after the leaders were provided with their relevant data sets and dashboards, external monitoring behaviours could be observed in interviews and meetings. As soon as leaders were comfortable with the quality of data and felt they understood what it was telling them, some consistent next questions included "*how does my programme compare nationally*", "a*re my numbers consistent with those of my peers*", "*but that is what the numbers are showing nationally so it is not just me*". The leaders interviewed wanted to know what the statistics for the relevant programme were nationally. If those figures were not available nationally then the next question tended to be "*how does my programme compare to our local peers*". Whether to identify threats or opportunities, there was an observable strong leaning to monitoring the external environment. The researcher was having an informal coffee with a colleague [34] one morning when the topic of conversation came around to the new data driven approach and its impact in that leader's department. The following is what subject #60 said [35].

*"You have to realise what this means for someone like me and my staff who are dealing with very large student numbers in some classes. I have some staff who have class sizes over 200. While we still believe in it, and strive for it, gone are the days where we can know every single one of those 200 students by name. The chances of us informally picking up retention risk in a class of that size is greatly reduced. This solution now allows us to monitor the entire class and the traffic light system points us in the right direction and quickly. And the icing on the cake is that now I know for certain that my numbers are going to compare favourably to <leader explicitly mentions another Irish HEI>" (Subject #60, 2016)*

[34] Subject #60
[35] Subject 60's quote was confirmed by email subsequent to the informal chat

That CIT's 2016 leader, having been provided with significantly more data, has shown a strong leaning towards monitoring operations that includes both soft and hard information raises an interesting hypothesis:

***Hypothesis #15: If a leader monitors operations using both soft[36] and hard (data) information then they will have an impact on student retention.***

#### 4.6.2.2 2nd: Clarifying Roles

Clarifying Roles, with an average of 13.19% of overall mentions, was the second ranked behaviour in the analysis of the 2016 data. This behaviour was evident across all three data gathering approaches. There were strong examples of the leader using this behaviour specifically both in the context of eluding to specific roles in the student retention process, but also clarifying the responsibilities of those roles. In particular the course coordinator role was frequently mentioned by the leader:

> *"I am really reliant on the course coordinators, the lecturers must speak to the course coordinators if they spot an issue" (Subject #33, 2016)*
>
> *"The Head of Department has a role to manage, the course coordinators have a role to coordinate the course, and Good Start have a role to try and help the student's engagement" (Subject #16, 2016)*
>
> *"It is the Year 1 co-ordinator who monitors year 1 retention" (Subject #1, 2016)*
>
> *"Coordinators try to ensure students remain focused" (Subject #2, 2016)*

Evidence of the importance of the course coordinator role, providing further support for Hypothesis #3 above in section 4.5.2, was also demonstrated by CIT's 2016 leader:

> *"The only role I rely on is the 1st year coordinators. That is our most crucial role for student retention, I try to ensure I always make time for the CC's as they perform such a crucial role" (Subject #15, 2016)*

The course coordinator role however, was not the only role clarified by CIT's 2016 leader:

> *"The Chair progression boards and the chair school retention committee have roles to play in student retention" (Subject #22, 2016)*

[36] Soft information refers to opinions, ideas, commentary etc

*"The institute retention initiative is located in SERI and that is the main driver for us" (Subject #4, 2016)*

*"The Head of Department and Class Coordinators really work closely together to ensure student retention is managed" (Subject #18, 2016)*

These additional roles also help to support Hypothesis #9[37]. While there is a definite shift to using data and relying more on data, the importance of the soft information (often received from course coordinators) cannot be lost from any student retention model.

#### 4.6.2.3 3rd: Short-Term Planning

Short-Term Planning, with an average of 12.33% of overall mentions, was the third ranked behaviour in the analysis of the 2016 data. This behaviour was evident across all three data gathering approaches. While this behaviour dropped from first in the 2014 ranking to third in the overall 2016 ranking, there were still strong examples of the leader using this behaviour. During 2016 interviews, the leader was asked the following question "*Do you have a plan for student retention?*"

Their responses indicated a number of things. Some leaders had a very clear understanding of their student retention plan and showed a reliance on the new data visualisations:

*"I am trying to identify the high issue modules (>30% retention)so the dashboards help that…I meet with Head of School to review issues and planned actions….all of my lecturers take attendance….we also engage strongly with SERI" (Subject #33, 2016)*

*"The institute has set a target figure for retention as part of its HEA Compact. We use a number of initiatives such as Academic Coaching, Academic Mentoring, PALS[38] and Just Ask[39] (Subject #15, 2016)*

*"We ensure the first year students see quickly what type of career they are destined for….we ensure there are tutorials for difficult modules….we try and get students and staff together in different fora" (Subject #18, 2016)*

*"In a broad sense, my department relies on social media a lot because we have a lot of online delivery….we also lean heavily on peer learning and virtual learning*

[37] If leaders monitor operations and receive frequent feedback on student performance, they can take actions which can impact on student retention
[38] Peer Assisted Learning & Support
[39] New orientation programme introduced for 1st year students

*communities, but the dashboards now help identify students of concern" (Subject #4, 2016)*

Similar to 2014, a plan to rely on the course coordinators appeared consistently across many leaders, though without any explicit reference to data and/or visualisations:

*"We work with Jane Doe's [40] team…we rely heavily on course coordinators and lecturers (Subject #16, 2016)*

*"we monitor all 1st year attendance through our coordinators…we then look at the assignments through the course coordinators….any at risk students are identified and spoken to" (Subject #22, 2016)*

*"I try to stay in touch by delivering a 1st year module in Sem1...all course coordinators also teach a module…through the 2 of these we try to engage students more and teach them the importance of strong engagement (Subject #1, 2016)*

*"Really I am interested in seeing attendance rates and also assignment performance…that is what tells me whether a student is engaged or not (Subject #2, 2016)*

The evidence demonstrated by CIT's 2016 leader is consistent with that of the 2014 leader and further strengthens Hypothesis #2 [41]

#### 4.6.2.4 4th: External Monitoring

External Monitoring, with an average of 10.21% of overall mentions, was the fourth ranked behaviour in the analysis of the 2016 data. This behaviour was evident across all three data gathering approaches. This behaviour showed a marked increase in use from a 2014 ranking of 7th to 4th in 2016. The types of external monitoring also varied which was very interesting.

Some leaders displayed evidence of showing a real interest in what was happening in second level education:

"*What is really interesting is that I got some very useful data showing what secondary schools were the biggest feeder schools to our programmes. I was surprised by the results*"*(Subject #33, 2016)*

[40] Real name of leader quoted is anonymised
[41] If a leader creates a short-term plan for the first six weeks of a semester they will have an impact on student retention

> **"***We are growing our numbers from FE feeder schools and I am engaging with the heads there in a more structured way now***"** *(Subject #16, 2016)*

Consistent with external monitoring of the 2nd level sector, the leader also displayed evidence of interest in monitoring the 3rd level market:

> **"***We are now using the data to benchmark ourselves against other HEI's*" (Subject #18, 2016)

> **"***So it is great that I now have data showing me the numbers for me, however I really need to compare that to my peers and see how I am doing sectorally for it to really mean something, and it is hard to get this data for peers at my level*" (Subject #2, 2016)

> **"***I meet some counterparts from other IOT's and Universities at various for a and I find myself comparing my data / stories with my peers*" (Subject #42, 2016)

> **"***I now find myself far more interested in sectoral and HEA figures and how my department is faring against that*" (Subject #47, 2016)

This evidence raises some interesting points. It supports hypotheses #8[42]. However, this evidence also raises a new, data specific, hypotheses:

***Hypothesis #16: If leaders are provided with performance data for their organisation then they will have an impact on student retention.***

#### 4.6.2.5 5th: Supporting

Supporting, with an average of 10.04% of overall mentions, was the fifth ranked behaviour in the analysis of the 2016 data. This behaviour was evident across all three data gathering approaches. This behaviour experienced a slight drop (from 4th to 5th) when comparing CIT's 2014 and 2016 leaders. Accepting that this was ranked 5th, the supporting nature of the leader in CIT cannot be understated. Taken from one 2016 interview, the following is an excerpt from the leader. What is important to note, was that this was not a response to a targeted question, it was the leader elaborating on why student retention is important to all leaders and in doing so displaying very strong evidence of the supportive nature/culture in CIT:

[42] *If a leader monitors their internal retention performance in comparison to their external market competition then they will have an impact on student retention internally*

*"I met a past student recently at an industry event. It was on in Dublin and this past student was speaking (I didn't know going to the event that she was a past student by the way). So this girl spoke so well but she said something on stage that blew me away. She said that she was struggling badly in 1st year (which was 10 years ago) and that she came to her Head of Department for help and her head of department couldn't have been more supportive and helped her through a difficult time. What she then said was that her 'Head of Department' was sitting in the audience and she named me. I nearly died with shock. I had a lovely chat with her afterwards but what struck me was that we have such a responsibility to support our students and you never know what is going on in their lives. After hearing that....I will always make myself available to support a student who asks for help." (Subject #19, 2016)*

While this evidence shows some consistency with hypothesis #6[43], it also raises another interesting hypothesis relating to the responsibilities academic leaders have when it comes to supporting their students:

***Hypothesis #17: If a leader is supportive to students then they will have an impact not only upon a student's academic performance, but also their entire career path***

#### 4.6.2.6 6th: Empowering

Empowering, with an average of 9.70% of overall mentions, was the sixth ranked behaviour in the analysis of the 2016 data. This behaviour was evident across all three data gathering approaches. This behaviour experienced a slight drop (from 5th to 6th) when comparing the 2014 to 2016 CIT leader. The empowering behaviour, while 6th ranked overall, is still strongly evidenced, in particular during interviews.

The leader was seen to make explicit reference to data and how it allowed them to empower their staff:

*"What I am able to do now is with the data from the portal is I can work much better with my staff. They see something happening in the class and I can also see it happening in our data - it is allowing for some really interesting conversations that we couldn't have in the past" (Subject #28, 2016)*

[43] If a leader encourages teaching staff to use soft supports (such as knowing a student's name) then student retention will be impacted

*"Now that I have reports I manage risks and leave the operational element to <names a colleague>" (Subject #20, 2016)*

This evidence from the 2016 leader further supports hypothesis #7 [44] (section 4.5.2 above).

Also, however, there is further evidence from CIT's 2016 leader which further strengthens hypotheses #4 [45] when explicit reference is made to empowering the course coordinator role:

*"I have given out access to the reporting portal so the course coordinators is now the crucial role. I try and use the data to help me manage the risks and have consistent conversations with the Course Coordinators" (Subject #18, 2016)*

*"The portal data is giving me more comfort with what the course coordinators are doing as it confirms some risks for me that the CC's come back with also" (Subject #19, 2016)*

*"Really it is the course monitoring report that has changed things for us, it allows me to keep an eye on things but interact with the CC's when required." (Subject #47, 2016)*

#### 4.6.2.7 7th: Consulting

Consulting, with an average of 7.09% of overall mentions, was the seventh ranked behaviour in the analysis of the 2016 data. This behaviour was evident only in the questionnaire and observation approaches, though this could be explained by no explicit question on consulting being put on the interview protocol. This behaviour experienced a slight drop (from 6th to 7th) when comparing the 2014 to 2016. The consulting behaviour, while 7th ranked overall, is still strongly evidenced, in particular during observations.

The leader was seen consistently consult with the course coordinator role when it came to student retention. Subject #9 was observed on one occasion: the setting was an informal chat over coffee between subject #9 and the researcher and during this chat a member of the leader's staff was walking past our table to another table when the leader asked the following question:

*Subject #9: "I just need to check something quickly with you. (Department Secretary Name) mentioned to me earlier this morning that she had a student in (Programme*

[44] *If a leader encourages a hands on approach from their course coordinators then student retention will be impacted*
[45] *If a leader clarifies the role of, and place a greater reliance on, the course coordinator they will have an impact on student retention*

*Name) into her yesterday who was upset. Has (Student Name) come to your attention?*

*Course Coordinator: "Oh yeah, I have spoken with her on a few occasions. She is after moving to Cork for this course and doesn't know too many people. I have spoken to each of her lecturers and asked them to try and put her in a welcoming group for each group project. We are making progress, but I think it will take another few weeks for her to settle. It is mostly males in her programme so that makes it a little more difficult for her"*

*Subject #9: "Ok, will you keep me posted on how she is doing? Let's have a think about any other supports we can introduce for her, like maybe there are some clubs and societies that she might benefit from joining"*

*Course Coordinator: "Ok, will do".*

NB: above conversation is paraphrased by the researcher and is not likely to be 100% accurate word for word. However, the paraphrased conversation was shared with the leader after the observation to check for accuracy.

After this exchange the researcher asked the leader if this was a typical conversation with a course coordinator. His response was very revealing from the perspective of the consultation behaviour:

*"Really Jonathan we cannot understate the importance of the course coordinator. The really good ones (and we have many of them) are plugged in extremely well with our students and they have the best chance of making any intervention when required. It would be very rare that I would make a student decision without consulting with the course coordinator in question" (Subject #9, 2016)*

While this shows the 2016 leader demonstrating the consulting behaviour, it provides further support for hypotheses #4 [46] and hypothesis #7 [47].

#### 4.6.2.8 8th: Taking Risks for Change

Taking Risks for Change, with an average of 6.04% of overall mentions, was the eighth ranked behaviour in the analysis of the 2016 data. This behaviour was evident across all

[46] *If a leader clarifies the role of, and place a greater reliance on, the course coordinator they will have an impact on student retention*
[47] *If a leader encourages a hands on approach from their course coordinators then student retention will be impacted*

three data gathering approaches and experienced an increase from 12th in 2014 to 8th in 2016. While ranked 8th overall, some really revealing evidence of this behaviour was found, in particular during interviews. One leader found a risk highlighted by the data and had to make a risky intervention as a result:

> *"I guess one thing the data has highlighted for me is that certain courses have much worse retention rates, I since found out that these courses students are being offered jobs in the catering industry and the money is of course better. To try and curb this we are trying to manage the delivery hours to allow part time jobs, we are also working to see if we can get our students jobs onsite in CIT while they study to make up the money difference. We are balancing these changes as the change of hours doesn't suit all students and we may make it worse if we aren't careful." (Subject #9, 2016)*

Having been empowered by his head of faculty to analyse what the data was telling him and make data driven decisions, another leader made a bold decision based on an issue his data was highlighting to him. A particular programme, delivered by his department, had far poorer retention statistics than all other programmes in the institution. The leader in question felt that this was

> *"..because our programme delivery created student cohorts strongly linked to programmes, this programme was a self-fulfilling prophecy as everyone, students and staff included, now expected that this cohort was going to experience the largest retention issue". (Subject #47, 2016)*

The leadership response was to drastically change how that programme was delivered and create blended cohorts rather than programme cohorts. This change had a drastic impact on staff who were quite unhappy and threatened industrial action. However, the leader, in the face of strong discontent from his staff, felt strongly enough to take personal risks and make sacrifices to encourage and promote change in the organization.

Unlike CIT's 2014 leader, who was not seen to demonstrate the 'taking risks for change' leadership behaviour, CIT's 2016 leader (who has been provided with data) is now seen to have started taking risks for change. This leads to an interesting new finding which is discussed in more detail in section 4.7.2.4:

***Finding: If a leader is data driven then they are more likely to take risks for change than a tacit knowledge driven leader***

#### 4.6.2.9 9th: Encouraging Innovative Thinking

Encouraging Innovative Thinking, with an average of 5.25% of overall mentions, was the ninth ranked behaviour in the analysis of the 2016 data. This behaviour was evident across all three data gathering approaches and experienced a slight decrease from 8th in 2014 to 9th in 2016. CIT's 2016 leader was seen to encourage innovative thinking on the basis of using the new data sets provided:

In early 2016 a senior leader arranged a meeting with his senior staff. At this meeting heads of department and school were given the following messages:

> "*Now that you have the student retention related data for your department I will be asking each of you individually to come up with a response to what the data is telling you*".

The senior leader challenged each member of his senior leadership team to question their assumptions about their department's approach to student retention in light of the data provided. In doing this the head of faculty also challenged each of his leadership team to consider better ways to deal with any issues highlighted. A natural inclination may have been to review the data and give a view on what should be done. However, this was evidence of the leader empowering his staff and also encouraging innovative thinking.

This behaviour was not seen in the 2014 leader and thus leads to another data related finding arises which is discussed in more detail in section 4.7.2.5:

***Finding: A data driven leader is are more likely to encourage innovative thinking than a tacit knowledge driven leader***

#### 4.6.2.10 10th: Envisioning Change

Envisioning Change, with an average of 4.31% of overall mentions, was the tenth ranked behaviour in the analysis of the 2016 data. This behaviour was evident across all three data gathering approaches and its 10th place ranking in 2016 was consistent with that of 2014.

In early 2016 one of the Vice Presidents asked for assistance from the IT Department to facilitate a data quality exercise. Having reviewed the data, the VP felt that, as data owner, she had a data quality issue. After an initial meeting it was agreed that the researcher, as

Head of the IT Department, would host and run a data quality exercise which would leverage Tom Redman's 'Friday Afternoon Measure'. At the workshop, which included all staff members involved in processing and consuming the relevant data, the Vice President in question articulated to their staff an unhappiness with the quality of data that was owned, processed and consumed by their function. As a result of this data quality issue, the Vice President felt that the quality of their decision making was compromised. The Vice President enthusiastically presented an appealing description of a desirable outcome that required commitment from all team members.

As this behaviour was not explicitly evident in CIT's 2014 leader it leads to another data related finding from the analysis of CIT's 2016 leader:

***Finding: A data driven leader is more likely to envision change than a tacit knowledge driven leader***

This finding is discussed in more detail in section 4.7.2.5.

#### 4.6.2.11 11th: Developing

Developing, with an average of 3.04% of overall mentions, was the eleventh ranked behaviour in the analysis of the 2016 data. This behaviour was not evidenced in the interview instrument and while observed was really not observed very much in 2016. It was however evident in the questionnaire data. Leaders were asked (question 7) in the survey:

> *"Do you assist staff in these roles by offering coaching / training / mentoring?"*

While 42% of leaders responding stated that they did in fact offer coaching / training / mentoring to their staff, little evidence could be found other than the quote attributed to the senior leader above under the 'encouraging innovative thinking' section:

> "*Now that you have the student retention related data for your department I will be asking each of you individually to come up with a response to what the data is telling you",*

This leader was also observed offering coaching / mentoring to his leadership team who sought assistance with the data. The leader, as well as offering coaching / mentoring directly, also arranged to have additional data related training provided by IT Services for any leader

who felt they required it. This shows some consistency with, and support for, hypothesis #11[48], which emerged during analysis against Research Question 1.

#### 4.6.2.12 12th: Recognizing

Recognizing, with an average of 0.68% of overall mentions, was the lowest ranked behaviour in the analysis of the 2016 data. This behaviour was not evidenced in the interview or observation approaches. Limited evidence, however, was found in the questionnaire data where question 8 of the survey asked leaders:

> *"Do you have a mechanism (formal / informal) for rewarding good performance of staff in relation to student retention?"*

While 11% of leaders responded 'Yes' to question 8, unsurprisingly, given the sector, no formal recognition mechanisms were found. However, it does again raise a similar question to that raised above in hypothesis #11[49].

Section 4.7.1 has explored the analysis of CIT's 2016 leader from the perspective of the 'Percentage of Overall Mentions' unit. This then led to section 4.7.2 (the behaviours which characterise CIT's 2016 leader). This now allows the researcher to personify CIT's 2016 leader, which could not be done in Figure 38.

[48] ***A leader who develops their staff will have an impact on retention***
[49] ***A leader who recognizes the efforts of team members can have an impact on student retention***

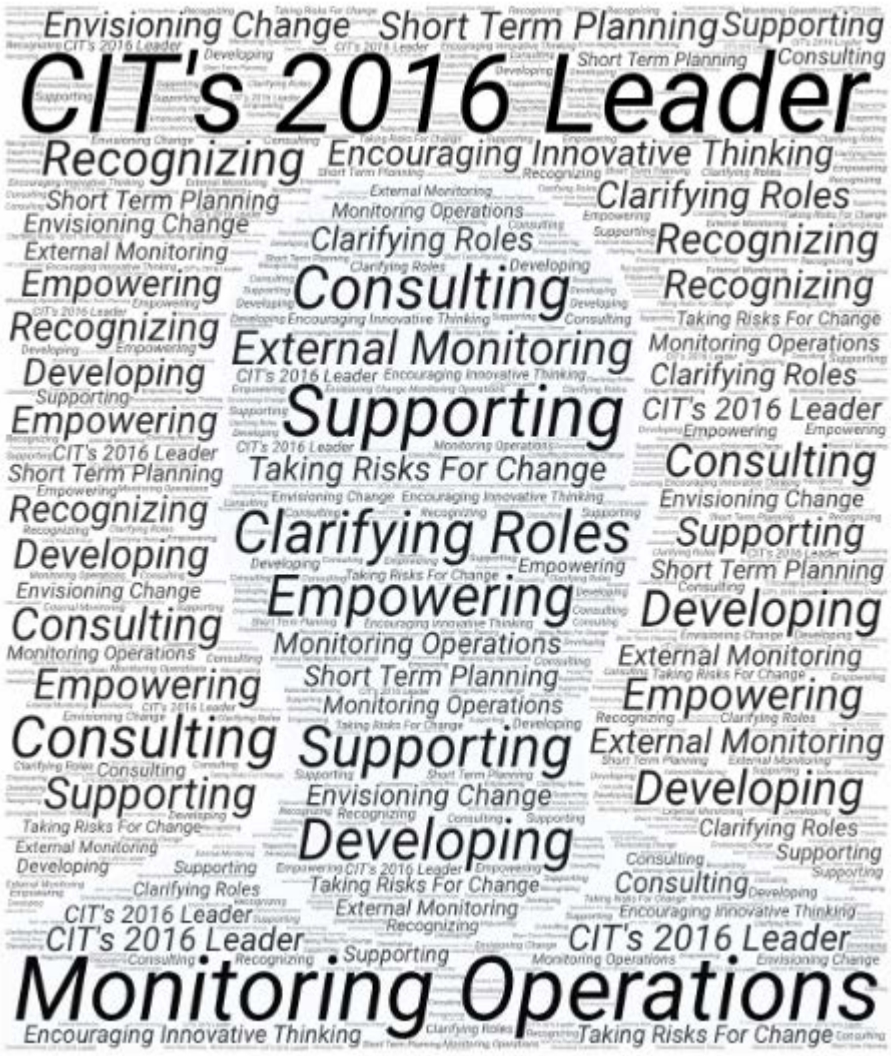



**Figure 40 - CIT's 2016 leader**

CIT's 2016 leader is still task oriented: monitors operations; clarifies roles and uses short-term plans. However, CIT's 2016 leader is now also far more change oriented: encouraging innovative thinking; envisioning change; and taking risks for change, behaviours not as evident in CIT's 2014 leader.

Now that an understanding of CIT's 2016 leader has been reached, a comparison, as illustrated in Figure 41, can be made to CIT's 2014 leader. This comparison will be analysed in section 4.7.3 to understand the impact a data driven approach has had on leadership behaviour.




**Figure 41 - CIT's 2014 and 2016 leaders**

### 4.6.3 The Impact of a Data Driven Approach on Leadership Behaviour

The previous section has analysed the 2016 data in a manner consistent with the analysis done on the 2014 data; from the perspective of percentage of overall mentions. However, to understand the impact a data driven approach has had on CIT's leader, any change from the 2014 to the 2016 results will now be analysed in this section. Table 34 shows a comparison of the triangulated data from Table 32 (CIT's 2014 Leader) and Table 33 (CIT's 2016 Leader). As this allows the researcher to compare CIT's tacit knowledge driven leader (2014) with CIT's data driven leader (2016), it offers real insight into Research Question 2 [50]. The important columns in Table 34 are the two right most columns:

1. AVG % Change (2014–2016) = (2016 AVG % of Overall Mentions) - (2014 AVG % of Overall Mentions)
2. Ranking Change (2014–2016) = (2014 Ranking) – (2016 Ranking)

[50] What is the impact of a data-driven approach on leadership behaviour in a student retention model

| Style | Leadership Behaviour | 2014 AVG % of Overall Mentions [51] | 2014 Ranking [52] | 2016 AVG % of Overall Mentions [53] | 2016 Ranking [54] | AVG % Change (2014 – 2016) | Ranking Change (2014 – 2016) |
|---|---|---|---|---|---|---|---|
| Task Oriented | Short-Term Planning | 20.67% | 1 | 12.33% | 3 | -8.34% | -2 |
| | Monitoring Operations | 18.12% | 2 | 18.12% | 1 | 0% | +1 |
| | Clarifying Roles | 17.72% | 3 | 13.19% | 2 | -4.53% | +1 |
| Relations Oriented | Supporting | 11.98% | 4 | 10.04% | 5 | -1.94% | -1 |
| | Developing | 2.61% | 9 | 3.04% | 11 | 0.43% | -2 |
| | Consulting | 7.83% | 6 | 7.09% | 7 | -0.74% | -1 |
| | Recognizing | 1.21% | 11 | 0.68% | 12 | -0.53% | -1 |
| | Empowering | 8.66% | 5 | 9.70% | 6 | 1.04% | -1 |
| Change Oriented | External Monitoring | 4.92% | 7 | 10.21% | 4 | 5.29% | +3 |
| | Encouraging Innovative Thinking | 3.65% | 8 | 5.25% | 9 | 1.60% | -1 |
| | Envisioning Change | 1.54% | 10 | 4.31% | 10 | 2.77% | 0 |
| | Taking Risks for Change | 1.10% | 12 | 6.04% | 8 | 4.94% | +4 |
| | **Totals** | **100%** | | **100%** | | | |

**Table 34 - RQ2: Triangulated Analysis (2014 to 2016 Change)**

These two right most columns show the decreases and increases across all 12 behaviours from 2014 to 2016. Interestingly, the data shows no change in the *Monitoring Operations* behaviour, some decrease in the *Supporting*, *Consulting* and *Recognizing* behaviours, and a significant decrease in the *Short-Term Planning* and *Clarifying Roles* behaviours.

Similarly, some increase has been seen in the *Developing*, *Empowering*, *Encouraging Innovative Thinking* and *Envisioning Change* behaviours while a noticeable increase is seen in the *Taking Risks for Change* and *External Monitoring* behaviours. Figure 42 provides an illustration of these changes and helps provide some insight into the impact a data driven approach can have on leadership behaviour. Leadership styles (Task Oriented, Relations Oriented, Change Oriented) are also added to the illustration as these provide some context for some of the subsequent findings discussed in section 4.8.

[51] This average was calculated by finding the average percentage of overall mentions across the questionnaire, interview and observation approaches.
[52] This is a ranking of leadership behaviours, highest to lowest, based on the averaged percentage of overall mentions
[53] This average was calculated by finding the average percentage of overall mentions across the questionnaire, interview and observation approaches.
[54] This is a ranking of leadership behaviours, highest to lowest, based on the averaged percentage of overall mentions

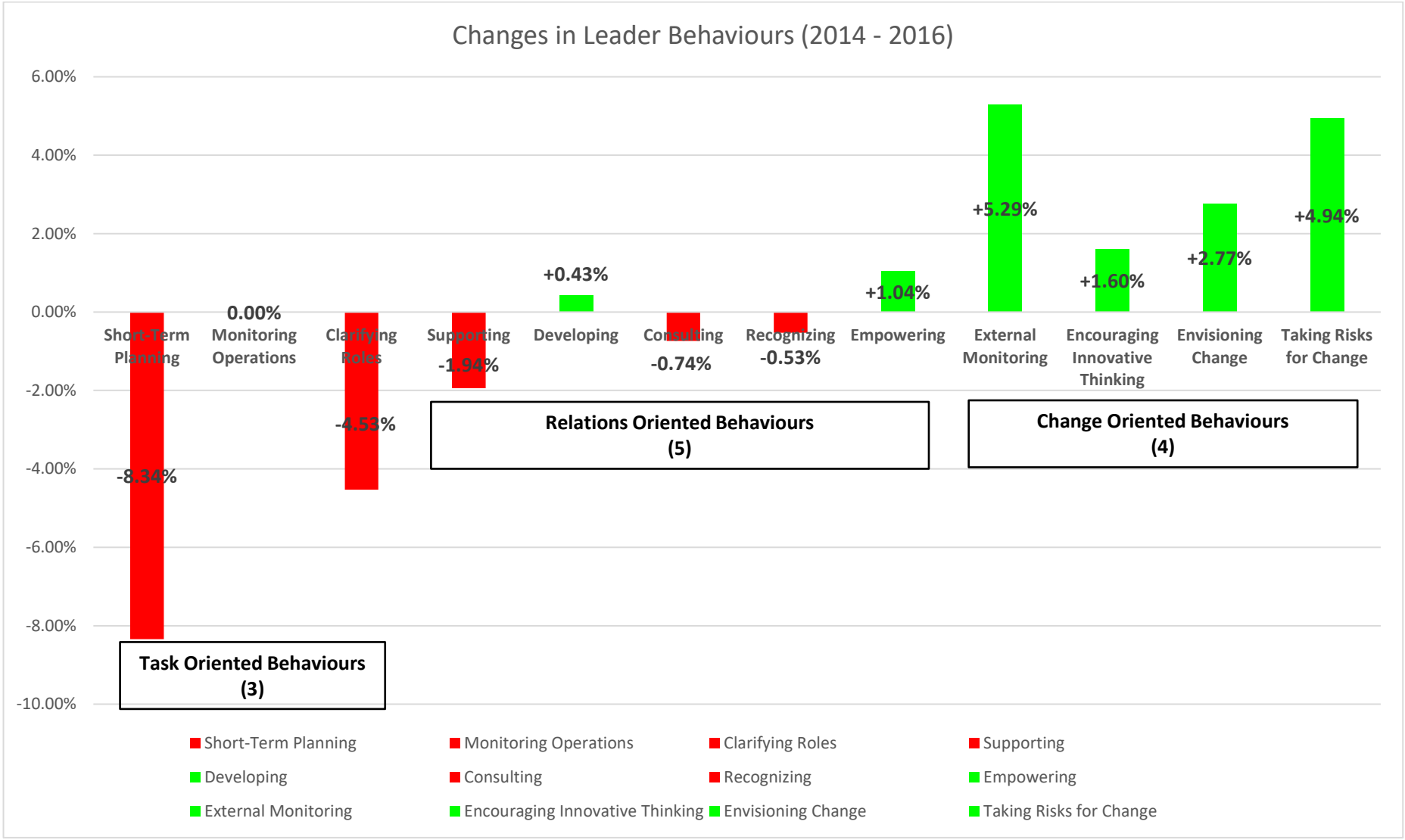



Figure 42 - Change in leader behaviours (2014 - 2016)

## 4.7 Case Findings

Having analysed data for Research Question 1 in section 4.5 and then Research Question 2 in section 4.6, this section will now present the findings which arose from the analysis against each of these two questions. Section 4.7.1 will present findings arising from analysis against Research Question 1 and then 4.7.2 will present those findings arising from analysis against Research Question 2.

### 4.7.1 Case Findings: Research Question 1

Having discussed the behaviours which characterise CIT's 2014 leader (section 4.5.2), which also lead to the creation of a number of hypothesis, this section will now discuss the associated findings which emerged from Research Question 1.

#### *4.7.1.1 Finding #1: In the absence of data, CIT's 2014 leader was found to be predominantly Task Oriented.*

In 2014, very little data was being provided to the CIT leader so, understandably they were leaning towards what they knew: tacit knowledge about the area and sector. CIT's 2014 leader was inclined to stick to their own, known, short-term plans, clarify all roles required for those plans and then monitor against those plans. This is not to suggest for one second that those plans were incorrect in any way, it merely confirms that the leaders were seen to be strongly task oriented (56.51%[55]), as shown in Figure 43 which uses Yukl et al.'s (2002) grouping (3) of behaviours into styles. The 12 behaviours found are grouped using Yukl et al.'s 3 categories (styles): task oriented; relations oriented and change oriented. CIT's 2014 leader was found to be *Task Oriented* 56.51% of the time, *Relations Oriented* 34.72% of the time and *Change Oriented* only 8.76% of the time.

[55] Percentages taken from the *AVG % of Overall Mentions* field from Table 33

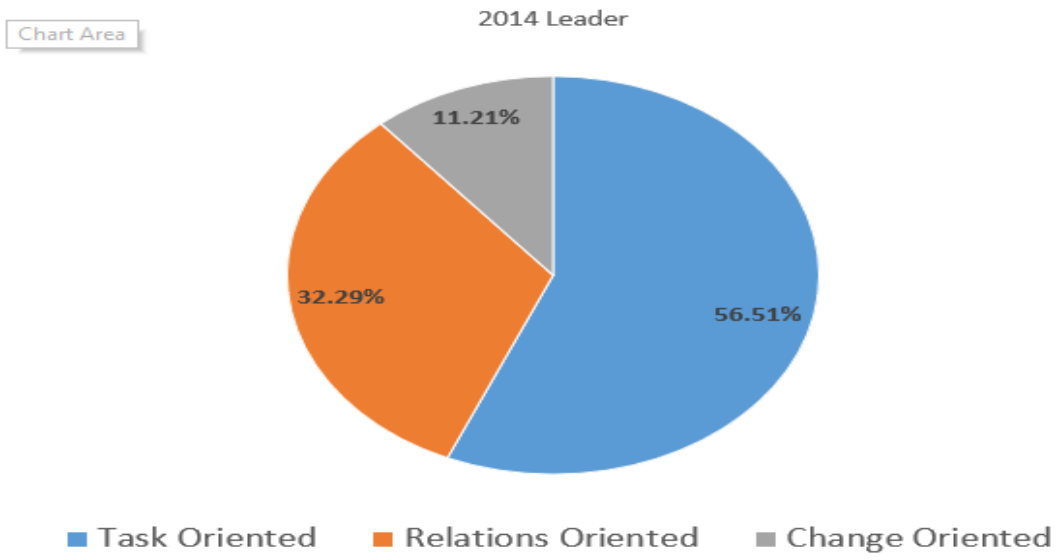



**Figure 43 - 2014 leader visualisation**

For example, Yukl et al.'s task-oriented behaviours: short-term planning (20.67%); clarifying roles (18.12%) and monitoring operations (17.72%) make up 56.51% of the behaviours found in the leaders in 2014.

#### *4.7.1.2 Finding #2: In the absence of data, CIT's 2014 leader was found to be somewhat change averse*

Figure 43 also illustrates that the 2014 leader was rarely seen to embrace change. Though some evidence was found of external monitoring, very little evidence was found of encouragement of innovative thinking, envisioning change or taking risks for change. This is not really of significant surprise, when one considers that the availability of data, for the 2014 leader, was limited in the extreme. Leaders relied heavily on tacit knowledge and any information they could get their hands on, which was limited in itself and arguably questionable in terms of data quality [56]. With this as a backdrop, it is not surprising that the 2014 leader exhibited these change-oriented behaviours so infrequently: taking risks for change (1.10%); envisioning change (1.54%); encouraging innovative thinking (3.65%) and external monitoring (4.92%).

That the 2014 leader was seen to be 'external monitoring' more than any other change-oriented behaviour is unsurprising. When one considers the nature of Ireland as a country

[56] See data quality section of 5.3.1 for further information

being so small and many of the leaders being familiar with other educational institutions offering similar programmes, it really is to be expected that the leaders will exhibit some interest in understanding how other, possibly competing, programmes are doing, or even what they are doing.

### 4.7.2 Case Findings: Research Question 2

Having discussed the behaviours which characterise CIT's 2016 leader (section 4.6.2), which also lead to the creation of a number of hypothesis, this section will now discuss the associated findings which emerged from Research Question 2.

#### 4.7.2.1 Finding #3: CIT's (2016) data driven leader is less Task Oriented and more Change Oriented than CIT's (2014) tacit knowledge driven leader

Yukl et al's task-oriented behaviours include: 'Short Term Planning', 'Monitoring Operations' and 'Clarifying Roles'. Significant drops can be seen in the 'Short Term Planning' and 'Clarifying Roles' behaviours with changes of -8.34% and -4.53% respectively when comparing CIT's 2014 and 2016 leaders. CIT's 2014 leader demonstrated task-oriented behaviours 56.51% of the time, while this dropped to 43.64% of the time for CIT's 2016 leader, equating to a total drop of 12.87%. Figure 44 helps illustrate this finding. In 2014, very little data was being provided to the CIT leader so, understandably they were leaning towards what they knew: tacit knowledge about the area and sector. While predominantly task oriented (56.51%), CIT's (2014) tacit knowledge driven leader was also relatively change averse as the change-oriented behaviours were only demonstrated 11.21% of the time.

After being provided with data, all four change-oriented behaviours showed an increase when comparing CIT's 2014 and 2016 leaders. When taking all four change-oriented behaviours together, CIT's 2014 leader (operating largely in a data vacuum) was seen to be change-oriented only 11.21% of the time. However, having been provided with data to fill this data vacuum, CIT's 2016 leader was seen to become change-oriented 25.81% of the time, equating to the significant overall increase of 14.60%. This shift can be largely attributed to CIT's 2016 leader demonstrating far more of the 'External Monitoring' and 'Taking Risks for Change' behaviours, which showed increases of 5.29% and 4.94% respectively.

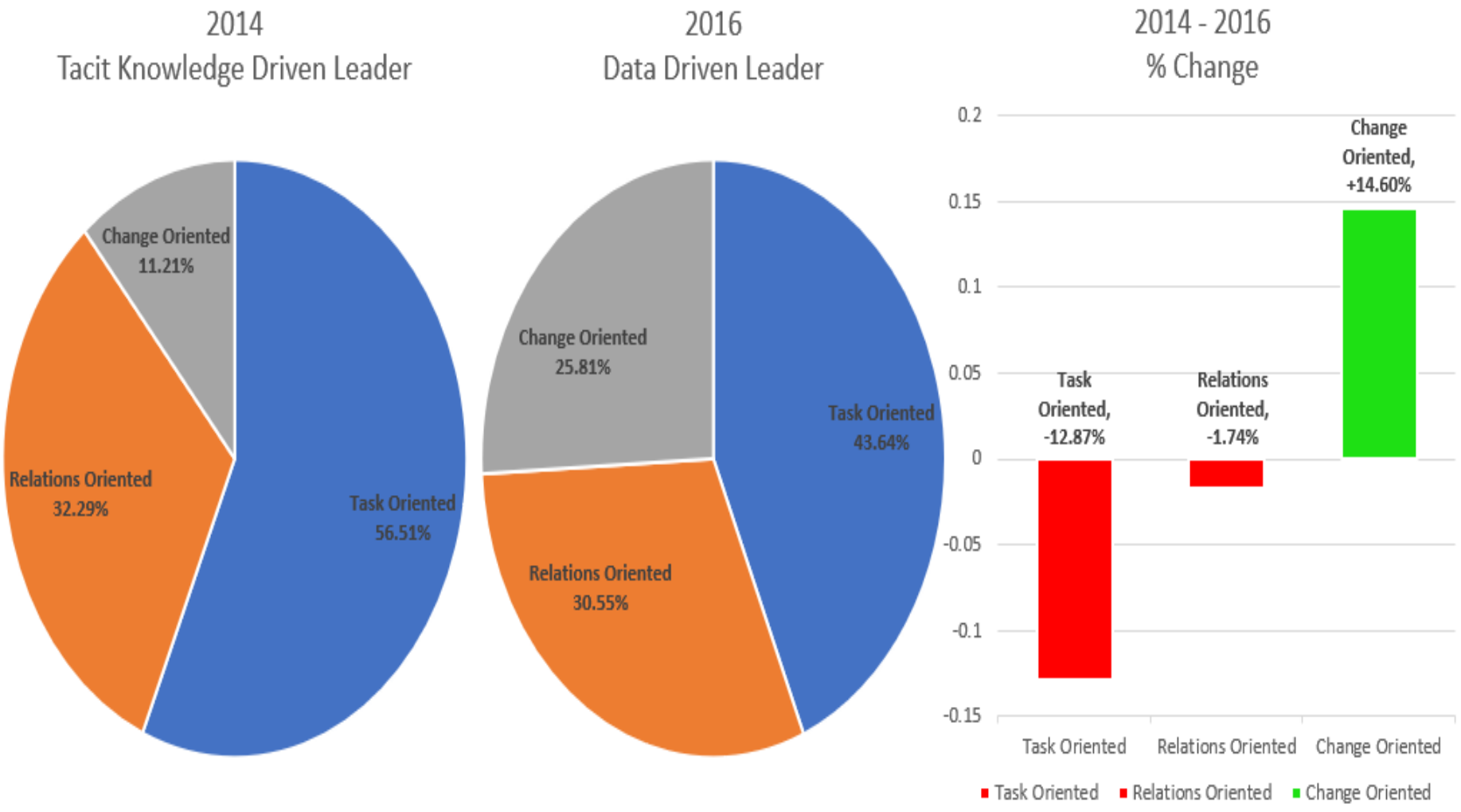



Figure 44 - Finding #3: changes observed in CIT's 2016 leader

This increase is further supported when the ranking of behaviours is considered: both of these behaviours account for the most significant change, each with a +3 and +4 place change respectively in the ranking order. Notably, this behavioural change, demonstrated by CIT's 2016 (data driven) leader, lends further support to hypothesis #10 [57] above which eluded to monitoring of the external market.

#### 4.7.2.2 Finding #4: CIT's (2016) data driven leader is more likely to take engage in external monitoring than CIT's (2014) tacit knowledge driven leader

Building from the above point, CIT's 2016 leader leaning more towards the 'External Monitoring' behaviour raises another interesting observation: when taking the 1st ('Monitoring Operations') and 4th ('External Monitoring') ranked behaviours together CIT's 2016 leader is shown to have become far more data driven and demonstrates a strong leaning towards monitoring. CIT's 2016 leader is monitoring 28.33% of the time while CIT's 2014 leader (who operated in a data vacuum) is monitoring only 23.04% of the time. CIT's 2016 leader was seen to show an increased interest in what the data was saying and, more importantly, in how the data could be used to monitor their own operations:

> *"We are now monitoring differently owing to the extra data I have access to." (Subject #39)*
>
> *"Our programme board meetings are now fed with retention reports from the portal, we also have a culture of looking at this data across our department" (Subject #18)*
>
> *"I am now mainly relying on the BI reports - the annual returns and also the ad-hoc retention reports I can run or sometimes Subject #1 [58] gives them to me directly" (Subject #33)*
>
> "*I rely on the portal to give me the data, what has changed is that I don't have to feed the heads data anymore as the portal gives it to them directly. They consume it when they need it, on their terms which is a game changer*." (Subject #1)

[57] *If leaders are provided with performance data for their organisation, they will become more aware of the market performance of their competitors.*
[58] Name of leader was anonymised by the author after quote was analysed

#### 4.7.2.3 Finding #5: CIT's (2016) data driven leader shows a lower interest in short-term plans than CIT's (2014) tacit knowledge driven leader

Using Figure 44, CIT's (2016) data driven leader has been shown to demonstrate the short term planning behaviour 12.33% of the time, equating to a drop of 8.34% when compared to CIT's (2014) tacit knowledge driven leader. This drop can be explained when the correlation to the increase in change-oriented behaviours (and the introduction of data) is taken into account. CIT's (2016) leader has been armed with relevant data which has challenged the status quo of some of the tacit knowledge driven short-term plans. See section 4.7.2.8 for an example where data challenged the status quo of some tacit knowledge driven thinking and catalysed some changes to the provision of education to some cohorts. This links neatly to the next finding which is that CIT's data driven leader is now demonstrating particular change-oriented behaviours far more than CIT's tacit knowledge driven leader.

#### 4.7.2.4 Finding #6: CIT's (2016) data driven leader is more likely to take risks for change than CIT's (2014) tacit knowledge driven leader

Building on the narrative above, and again using Figure 44 as a reference, having been provided with data CIT's 2016 leader has demonstrated a much higher appetite for change and in particular taking risks for change. The example referenced above in section 4.6.2.8 speaks to a leader who took some significant risks to change the provision of education to a particular cohort of students. The cohort in question had far poorer retention statistics than all other programmes in the institution, and it was only when armed with supporting data that the leader fully realised and appreciated this. The leader in question felt that this poor retention statistic was

> *"..because our programme delivery created student cohorts strongly linked to programmes, this programme was a self-fulfilling prophecy as everyone, students and staff included, now expected that this cohort was going to experience the largest retention issue". (Subject #47, 2016)*

The leadership response was to drastically change how that programme was delivered and create blended cohorts rather than programme cohorts. This change had a drastic impact on staff who were quite unhappy and threatened industrial action. However, the leader, in the

face of strong discontent from his staff, felt strongly enough to take personal risks and make sacrifices to encourage and promote change in the organization.

Another really good example of a CIT leader taking risks for change is related to a leader who change the timetabling of a particular programme to try and increase student retention for the programme. Having again been armed with relevant and supporting data, the leader said:

> *"I guess one thing the data has highlighted for me is that certain courses have much worse retention rates, I since found out that these courses students are being offered jobs in the catering industry and the money is of course better. To try and curb this we are trying to manage the delivery hours to allow part time jobs, we are also working to see if we can get our students jobs onsite in CIT while they study to make up the money difference. We are balancing these changes as the change of hours doesn't suit all students and we may make it worse if we aren't careful." (Subject #9, 2016)*

This explains why CIT's data driven leader demonstrated this particular behaviour 4.94% more than the tacit knowledge driven leader. Change is not always easy and sometimes it can be difficult to build an appetite for it. However, in the absence of data which tells us otherwise, our tacit knowledge driven plans may never be challenged possibly reducing the need for change when it may be required.

#### 4.7.2.5 *Finding #7: CIT's (2016) data driven leader is more likely* envision change than CIT's (2014) tacit knowledge driven leader

Envisioning Change, with an average of 4.31% of overall mentions in 2016 saw an increase of 2.71% from the 1.54% of overall mentions in 2014.

In early 2016 one of the Vice Presidents asked for assistance from the IT Department to facilitate a data quality exercise. Having reviewed the data, the VP felt that, as data owner, she had a data quality issue. After an initial meeting it was agreed that the researcher, as Head of the IT Department, would host and run a data quality exercise which would leverage Tom Redman's 'Friday Afternoon Measure'. At the workshop, which included all staff

members involved in processing and consuming the relevant data, the Vice President in question articulated to their staff an unhappiness with the quality of data that was owned, processed and consumed by their function. As a result of this data quality issue, the Vice President felt that the quality of their decision making was compromised. The Vice President enthusiastically presented an appealing description of a desirable outcome that required commitment from all team members. What was interesting was that this behaviour was observed from the Vice President after the data driven programme had been in place. Only after data was made available did data quality become a discussion point which then led to the change in question being envisioned.

### 4.7.3 Discussion on Findings

The above findings (#1-#7 inclusive) highlight some interesting differences between the 2014 (tacit knowledge driven) leader and the 2016 (data driven) leader. The tacit knowledge driven leader is not seen to embrace data for decision making, instead depending on anecdotes, biases and their own personal experiences. As illustrated in Figure 8, this contributes to greater uncertainty in the decision-making process. Conversely, the 2016 leader exhibits a greater reliance upon, and embracing of, data to assist with decision making leading to greater certainty in decision making.

This data driven programme, driven by the practitioner/researcher, set out to push data back into the organisation to aid decision making. That the 2014 leader was found to be task-oriented, change averse with little or no reliance on data was not unexpected when one considers that the data which existed in CIT was stored in an inaccessible data warehouse to which access required some technological skills. Data availability and in particular the technology and data system capacity of the organisation can be major barriers to data use (Lachat and Smith, 2005) as was the case for the 2014 leader. Also, it is not unusual for public sector organisations to place a heavy reliance on hierarchy and rules (Currie et al., 2008; Hales, 2002). However, the use of data to aid decision making in education is not a new concept. The United States passed the No Child Left Behind Act (NCLBAct, 2002) which states that all programmes requiring funding must stem from evidence and scientific research and be otherwise data-driven. The Act also requires that "*district central offices must also generate and use student and school performance data to drive their decisions*"

(Honig and Coburn, 2008, p. 581). One of the primary reasons for this shift towards evidence-based (or data driven) decision making is that it can help to remove politics, ideology and other influences from the decision making process (Honig and Coburn, 2008). Another significant reason is that evidence based decision making can fundamentally improve student and school performance (Honig and Coburn, 2008).

As discussed above, much of the existing research on evidence-based decision making in education (higher or otherwise) shows consistency with the data elements of this research. However, while many studies offer evidence of new plans or initiatives that came about in schools as a result of data being used to inform decisions (Bernhardt, 1999; Johnson, 1996; Lachat and Smith, 2005), the leader's perspective is left unexplored. This makes findings #1 to #7 particularly interesting and useful. The behavioural shift evident between the 2014 and 2016 leader shows that a data driven programme is likely to have a consequence of creating significant organisational change as the leaders themselves become more change oriented. Burnes (2003, p. 627) posits that "*organisations need to align organisational change and management development strategically and operationally in order to maintain and increase competitiveness*". That the 2016 leader leans strongly towards change oriented behaviours suggest that change management, and the ability of leaders to manage change, must be an expected outcome of any data driven programme. This is further strengthened when the evidence provided in section 4.6.2.8 highlights a leader embracing, but struggling to manage, change. It is also evident that the transformational leader introduced first by Burns (1978) and further developed by Bass (1990) offers useful direction in this regard to CIT's 2016 leader. When considering the change that a data programme inevitably brings, there is some merit in considering the 'government agent' change agent (one of three) proposed by (Gatenby et al., 2015) as a suitable agent of change in the HE sector. Gatenby et al.'s (2015, p. 1132) 'government agent' is responsible for taking government policy and adapting it for local use as well as being "*accountable for achieving and monitoring performance against centrally driven targets*" (much like a HE head of department would do with presidential policy decisions). However, for HE to see some of the gains seen by Gatenby et al. in the UK's NHS such as patient waiting time, caseload processing time and efficiency savings, any HE organisation would need to ensure it that it embeds a culture of data interrogation as

outlined in contribution #5 (section 5.3.1) which aligns top down and bottom up approaches to data.

## 4.8 Chapter Conclusion

Section 4.2 provided a background to the case study. This provided detail of CIT as an institute, the student and leader profile and also some information on student retention and data analytics within the institute. Section 4.3 then provided a background of CIT's leadership and how a data gap was recognised in 2014: i.e. that CIT's 2014 leader was operating in a data vacuum. This section was complemented by an assessment of data maturity in CIT as of 2014. Section 4.4 then described CIT's response to that data gap which was a data driven programme to address the data vacuum, followed by another data maturity assessment to show the impact of that programme by 2016. Section 4.5 then provided detail on how data were analysed against each research question which was interweaved with 11 x Hypothesis and 8 x Findings which arose from this analysis.

# 5. Chapter 5: Contributions and Conclusions

## 5.1 Introduction

This chapter will introduce the contributions of and conclusions to this research. Section 5.2 will introduce the contributions to research and section 5.3 will then introduce the contributions to practice. Finally, section 5.4 will provide the conclusions to this research.

## 5.2 Contributions to Research

### 5.2.1 Contribution #1: A new student retention model: the perspective of a higher education leader

Many student retention conceptual models already exist: Tinto (1975), Bean and Metzner (1985), Tinto (1993) and Bean and Eaton (2001) to name a few. Each of these student retention models has significant merit in their position. Each posits the specific areas upon which institutions must focus in order to increase student retention. All models are consistent with, while not listing, six summary steps to student retention (*Identify Factors, Harvest Data, Identify 'at risk' Students, Introduce Supports, Monitor Students and Change Student Behaviour*). However, each of these models, have one other significant (and understandable) consistency. They are all focused on the perspective of the student, and in particular changing the behaviour of the student to achieve better student outcomes. This new model, developed from this research, can now propose a leader's perspective in a student retention model, and in particular the perspective of a higher education leader.

The new model contains three distinct parts which are introduced below and then discussed in more detail later in this section:

1. **Part 1: A Summary Approach to Student Retention**: the model is underpinned by the six summary steps to student retention (*Identify Factors …. Change Student Behaviour).* This provides some context for the main stakeholder in the model (the higher education leader). This is discussed in more detail in this section.
2. **Part 2: Leadership Behaviours for Student Retention**: the model surrounds the higher education leader with Yukl et al.'s (2002) leadership styles which can be employed when dealing with student retention. Leaders will naturally lean toward particular leadership styles but this model prescribes those behaviours which are required under all styles. Therefore, the model can act as a guide for those leaders not naturally inclined to particular styles or behaviours. These behaviours are also discussed further below. The model also links each of those leadership styles to the hypotheses of leadership behaviours taken from the findings of this research. There are seven task-oriented, six relation-oriented and four change-oriented hypotheses. These are the behaviours which can be employed by higher education leaders wanting to have an impact on student retention. Leaders employing particular behaviours will be able to understand the leadership style they are employing in their student retention approach and more importantly, the implications of those behaviours.
3. **Part 3: A Categorisation of Student Retention Supports**: the model links each of those hypotheses to the various supports (academic, institutional and environmental) identified during the literature review of this research. These are supports which leaders can utilise to reduce the retention risk associated 'at risk' students. Depending on the leadership behaviour and style employed by the higher education leader, the model will provide guidance to the leader on those types of supports that may be offered to 'at risk' students.

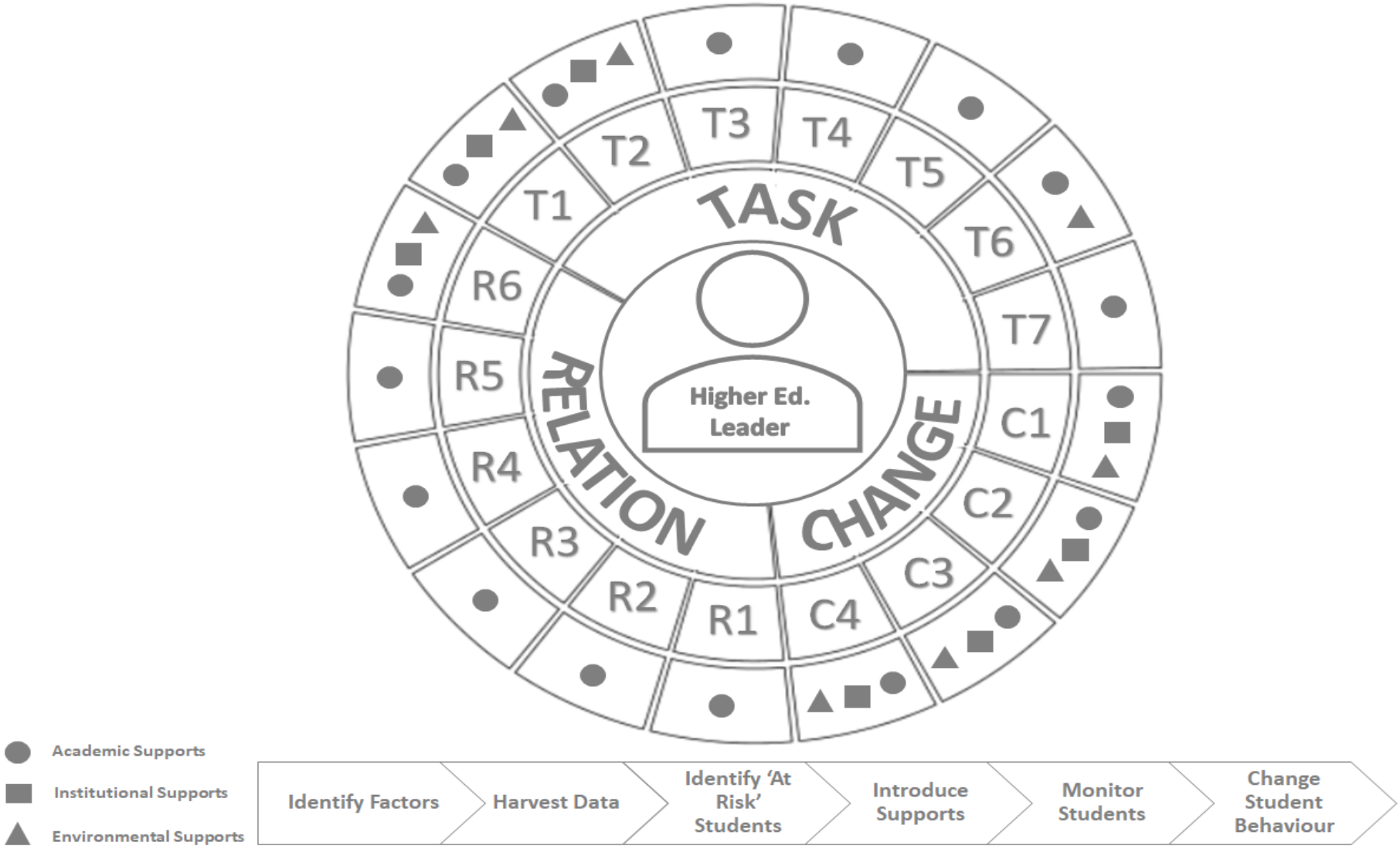



**Figure 45 - A new student retention model: the perspective of a higher ed. leader**

## Part 1: A Summary Approach to Student Retention

Section 2.2.3 explored various student retention theories. Some of these theories focused on identifying factors that would predict student retention risk (Tinto (1975), Bean and Metzner (1985) [59]), while others focus on approaches to reduce retention risk (Tinto (1987), Bean and Eaton (2001) [60]). When marrying the researcher's learnings from the literature review conducted for this study, with the practitioner's experience of how student retention was handled in CIT, the researcher has come up with a summary approach to student retention that covers both the identification and management of student retention risk. This summary approach underpins the new student retention model and the six stages are discussed further below

### *Identify Factors*

All HEI's focus their initial efforts on identifying the risk. What students are actually a retention risk? How can we identify those students? What are the factors that that will help our HEI identify at risk students? This is always step 1 in the student retention approach. As was shown in Table 7 (previously discussed in section 2.2.3), the factors used to predict student retention risk include:

a) socio-economic background
b) individual attributes
c) pre-college schooling
d) student commitment
e) academic integration
f) social integration
g) residence

This initial step shows some similarity with '*Business Understanding'* phase of Wirth and Hipp's (2000) CRISP-DM reference model for data mining. In CIT, like all other HEI's, we spent time initially on identifying those factors which would predict student retention risk for our institute. Factors such as socio-economic background, individual attributes and social integration were deemed to be too sensitive to harvest and analyse, and in a sense, given the climate of GDPR, ruled out at least for the initial plans. With one of the primary measures

[59] see Table 6 for a more comprehensive list
[60] see Table 7 for a more comprehensive list

of academic integration being student attendance, this was also ruled out as CIT did not have an Institute wide electronic student attendance system at the time.

During this study, the researcher observed a mix of factors being considered relevant for CIT students. Initially [61], *pre-college schooling* was one of the main factors used to identify student retention risk in CIT. Considering the findings of Healy et al. (1999) it was felt that a correlation may exist between a CIT student's performance in Leaving Certificate [62] Mathematics and English and their ability to progress through first year in CIT. Data were provided visually [63] to the leaders in CIT that identified the performance, in leaving certificate Mathematics and English, of every student due to join first year of a programme in that leader's department. Interestingly, unlike some other factors such as LMS activity, assessment performance or social engagement, the factors used in CIT could be provided to the leaders prior to week 1 as the data was available before the student arrived in CIT. This was seen as a significant advantage to CIT as it provided an opportunity to start early on planning any interventions required. Subsequent to this study, CIT has since begun to look at *student commitment* and is developing more visualised data sets based on these factors.

***Harvest Data***

The next step in every HEI's student retention approach is to harvest data for each of the identified factors. This is implicit in much of the research to date but an important step nonetheless. Once a HEI has identified those factors it believes important in capturing student risk, it then sets out to harvest as much data as it can on those factors. As with step one of this summary student retention approach, *harvesting data* shows similarity with the *'Data Understanding'* and '*Data Preparation'* stages of Wirth and Hipp's CRISP-DM reference model. The CRISP-DM model describes collecting, describing, exploring, verifying, cleaning and integrating data as part of these two reference model steps. These are all summarised in the '*harvesting data'* step of the summarised student retention approach adopted by HEI's.

This study allowed me to observe that CIT's initial focus in this regard was on harvesting leaving certificate Mathematics and English results for every incoming first year student.

[61] It is important to note, that these factors were considered important to CIT during 2015 and 2016. As CIT was early in its data driven maturity, the factors considered important are likely to change over time as our knowledge and understanding of our students grows.
[62] The Leaving Certificate is the university matriculation examination in the Republic of Ireland and the final exam of the Irish secondary school system
[63] See Chapter 4 for examples of visualisations provided to CIT's leader

These data were harvested and loaded into CIT's data warehouse as per the data flow in Figure 46.

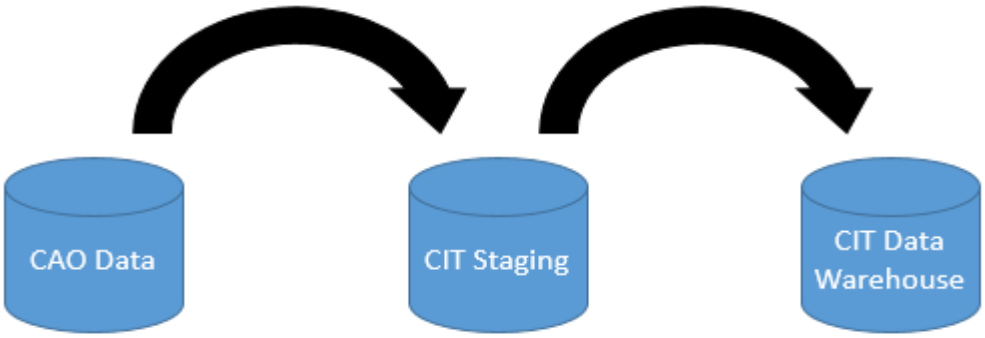



**Figure 46 - Data flows for harvesting of relevant data**

Data were harvested initially from CAO [64] which happened during the summer break and in advance of semester 1. This load was completed by members of the IT Services department. Consistent with the CRISP-DM, these data were very well understood from the outset (of this programme of work) as they had formed the basis for all incoming students for many years. The preparation of those data was then focused on extracting it from the CAO database into CIT's staging database and then integrating that data with other CIT specific data elements as it was loaded into CIT's data warehouse. At this point we were able to match each student to a programme and each programme to a department, allowing us to slice this harvested data at department level for each leader (Head of Department).

***Identify 'At Risk' Students***

After completing the harvesting of relevant data, each HEI then focuses on using those data to identify the 'at risk' students. This again shows similarity with the 'Modelling' and 'Evaluating' steps in CRISM-DM. A HEI, having identified the relevant factors and then harvesting data for those factors, will focus on modelling and evaluating that harvested data, often visually, so that at risk students are identified quickly. Rio Salado College's PACE system harvested *LMS data* on its students and then visualised that data in a traffic light system that highlighted students most at risk in red (Smith et al., 2012). Purdue's Signals system was also a visual traffic light solution which also identified 'at risk' students but

[64] The Central Applications Office is the organisation responsible for overseeing undergraduate applications to colleges and universities in Ireland.

based on a different set of factors: *Grades, demographic characteristics, past academic history, LMS activity* (Arnold and Pistilli, 2012).

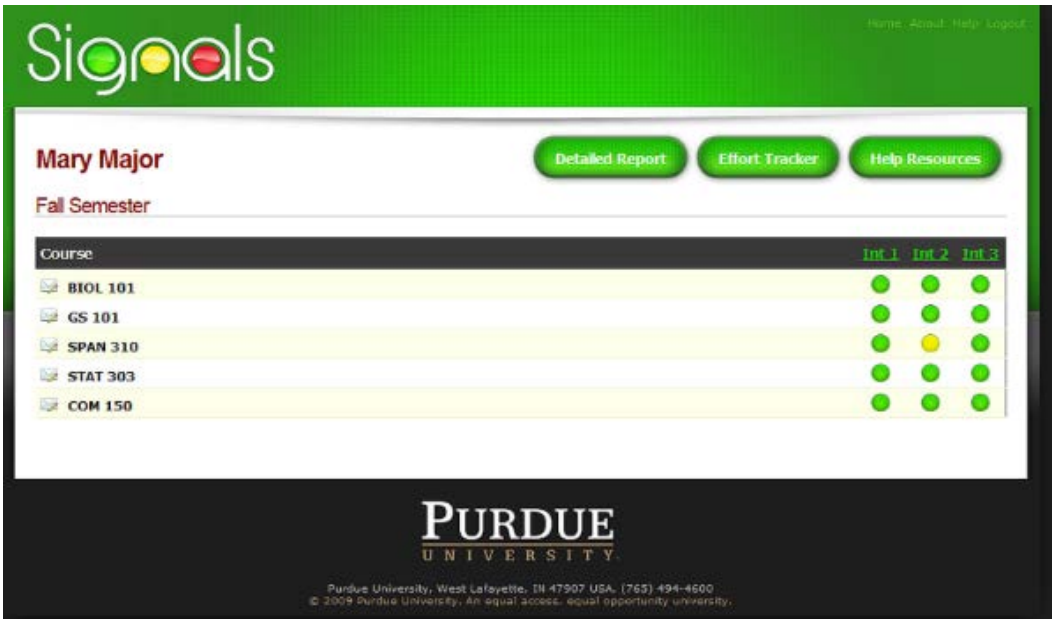



**Figure 47 - Purdue's Signals traffic light system (Atkisson, 2012)**

Figure 47 provides an illustration of Purdue's traffic light system. For each student a simple algorithm, based on the factors listed above, signals whether a student is green, yellow or red from a retention risk perspective. In line with this study, in CIT we developed a similar traffic light system based on our factors (leaving certificate English and Mathematics).

Figure 48 shows a sample of one report, provided to all leader's in CIT. This report has two main sections: Leaving Cert Results and Sem (semester) 1 Results. At the beginning of the semester, only the Leaving Cert Results section was populated (as semester results would not yet have been available). This section flagged as red those students meeting the risk criteria as determined by their Mathematics and English results and was used by the leaders to identify those at risk students. These data were available to the leaders in CIT up to 4 weeks before the semester commenced, giving a significant advantage in preparing any interventions required. As this was a new model being tested in CIT semester 1 results (when available) were then positioned against each student's leaving certificate results to understand the accuracy of the initial indicators.

| | Leaving Cert Results | | | | Sem 1 Results | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Student | CAO Type | CAO Pts | LC Maths | LC English | module 01 | | module 02 | | module 03 | | module 04 | | module 05 | |
| Student Details Redacted | standard | 293 | O4 | H6 | ENVI6004 | 40 | ARCH6051 | 43 | ARCH6052 | 30 | ARCH6053 | 55 | CMOD6001 | 30 |
| Student Details Redacted | standard | 293 | O4 | O6 | ENVI6004 | NP | ARCH6051 | 6 | ARCH6052 | NP | ARCH6053 | NP | CMOD6001 | NP |
| Student Details Redacted | standard | 412 | O5 | O2 | ENVI6004 | 58 | ARCH6051 | 55 | ARCH6052 | 47 | ARCH6053 | 58 | CMOD6001 | 59 |
| Student Details Redacted | standard | 357 | O3 | H4 | ENVI6004 | 76 | ARCH6051 | 57 | ARCH6052 | 47 | ARCH6053 | 58 | CMOD6001 | 63 |
| Student Details Redacted | standard | 357 | O3 | H4 | ENVI6004 | 37 | ARCH6051 | 35 | ARCH6052 | 44 | ARCH6053 | 55 | CMOD6001 | 59 |
| Student Details Redacted | standard | 373 | H5 | O3 | ENVI6004 | 60 | ARCH6051 | 44 | ARCH6052 | 40 | ARCH6053 | 49 | CMOD6001 | 55 |
| Student Details Redacted | standard | 360 | H7 | O2 | ENVI6004 | 60 | ARCH6051 | 67 | ARCH6052 | 59 | ARCH6053 | 48 | CMOD6001 | 61 |
| Student Details Redacted | standard | 279 | O5 | H6 | ENVI6004 | 28 | ARCH6051 | 35 | ARCH6052 | 41 | ARCH6053 | 60 | CMOD6001 | 54 |
| Student Details Redacted | standard | 371 | H5 | H6 | ENVI6004 | 36 | ARCH6051 | 20 | ARCH6052 | 33 | ARCH6053 | 69 | CMOD6001 | 30 |
| Student Details Redacted | standard | 390 | O3 | H2 | ENVI6004 | 40 | ARCH6051 | 25 | ARCH6052 | 41 | ARCH6053 | 49 | CMOD6001 | 58 |
| Student Details Redacted | standard | 291 | O3 | O3 | ENVI6004 | 15 | ARCH6051 | 24 | ARCH6052 | 21 | ARCH6053 | 55 | | |
| Student Details Redacted | standard | 337 | O2 | H6 | ENVI6004 | 37 | ARCH6051 | 55 | ARCH6052 | 62 | ARCH6053 | 67 | CMOD6001 | 59 |
| Student Details Redacted | standard | 298 | O2 | O3 | ENVI6004 | 32 | ARCH6051 | 21 | ARCH6052 | 30 | ARCH6053 | 63 | CMOD6001 | 54 |
| Student Details Redacted | standard | 348 | O3 | H5 | ENVI6004 | 40 | ARCH6051 | 36 | ARCH6052 | 27 | ARCH6053 | 60 | CMOD6001 | 57 |
| Student Details Redacted | standard | 348 | O5 | H4 | ENVI6004 | 54 | ARCH6051 | 59 | ARCH6052 | 60 | ARCH6053 | 48 | CMOD6001 | 65 |
| Student Details Redacted | standard | 317 | O3 | H6 | ENVI6004 | 41 | ARCH6051 | 33 | ARCH6052 | 43 | ARCH6053 | 60 | CMOD6001 | 56 |
| Student Details Redacted | standard | 412 | H6 | H4 | ENVI6004 | 47 | ARCH6051 | 46 | ARCH6052 | 49 | ARCH6053 | 69 | CMOD6001 | 57 |
| Student Details Redacted | standard | 391 | H5 | H4 | ENVI6004 | 61 | ARCH6051 | 53 | ARCH6052 | 58 | ARCH6053 | 69 | CMOD6001 | 61 |
| Student Details Redacted | standard | 289 | O2 | O3 | ENVI6004 | 58 | ARCH6051 | 48 | ARCH6052 | 54 | ARCH6053 | 61 | CMOD6001 | 56 |

**Figure 48 - CIT's year 1 non-progression indicator**

***Introduce Supports***

Having identified an 'at risk' student, HEI's generally resort to a support, sometimes referred to as interventions (Purdue's Signals system)**,** that falls into one of the three categories: *Academic Supports, Institutional Supports* or *Environmental Supports.* Having identified the relevant risk factors, harvested necessary data and identified at risk students, the HEI will now focus on introducing supports to those at-risk students in an attempt to reduce their retention risk.

The *Academic Support* category can include supports such as *mentoring* (Tinto, 2005), *assessment and feedback* (Tinto, 2010), the use of *positive role models* (Tinto, 2005) and finally *interaction with faculty* (Bean and Eaton, 2001; Chickering and Gamson, 1987; Kuh, 2003; Lau, 2003; Pascarella and Terenzini, 2005; Tinto, 2005).

The second category of supports is *Institutional Support*. This category includes supports such as the fostering of learning communities to support student learning, the provision of funding for students who might benefit from it and the development of orientation programmes to assist an easy transition to third level. This section will discuss each of those approaches in more detail.

The final category of support is *Environmental Support*. This category includes supports such as the provision of physical facilities, access to technology and a sense of community. This section will discuss each of those approaches in more detail.

As part of this study I observed that while preferred supports vary by leader, CIT employs a number of the supports listed above once an 'at risk' student is identified. *Interaction with faculty* is generally the first and most widely used step. A student identified as at risk is contacted by a faculty member, often a course coordinator, whose primary aim is to engage the student. Once engaged, the student may then be pointed in the direction of other supports such as *career guidance and counselling*, or even just *orientation programmes*. As the aim of CIT faculty is to generally intervene as early as possible these interactions were seen to happen as early as week 1. However, interactions such as these were also observed in weeks 11 and 12.

***Monitor Students***

The next stage in the summary approach is to then *monitor students*. A student, having been identified as 'at risk' and provided with appropriate supports (academic, institutional or environmental), is then monitored for the purposes of reducing the retention risk. A faculty member who has engaged with an 'at risk' student must attempt to continue to monitor that student to see if the supports or interventions are having the desired effect. Other supports such as *assessment and feedback* can also be utilised as part of monitoring. A student's assessment results can start to highlight if the risk is increasing, decreasing or not changing and the faculty member can then provide feedback to the student, again with a focus on reducing retention risk.

In CIT the researcher observed a strong leaning towards early assessment and feedback as a mechanism to monitor student interventions. Many faculty members would structure their delivery to have an assessment as early (week 2 or 3) in the semester as possible so that there was enough time to intervene and provide additional supports to 'at risk' students where required.

"If I don't get them assessed and give them good feedback in the first 3 weeks I have no chance of turning them around in the crucial 6 week period"

Faculty members felt that the first 6 weeks of semester 1 was crucial for year 1 retention risk students. The above quote is from a faculty member who had intervened with an 'at risk' student. The student was first identified as at risk because of particular results in leaving certificate Mathematics and English. The student was engaged early through an informal chat to discuss the workload for the module and also the methods through which the student to increase the change of success. The student was encouraged to attend, commence work early and engage with the module material early. The faculty member then scheduled an assessment in week 2 and subsequently provided feedback that same week. The student performed poorly in the week 2 assessment and the faculty member provided feedback on those areas where the student could have improved in the assessment. The faculty member facilitated the creation of an informal learning community among groups of the first year cohort and ensured the student in question was grouped with students who would assist with their learning. A follow up assessment was scheduled for week 4 and the student performed significantly better. In this example, the early assessment and feedback support mechanism was used as a monitoring tool.

### *Change Student Behaviour*

All previous five stages of this approach are aimed at one thing: changing the student behaviour. The last stage of this approach is really a desired outcome rather than a step in itself. Regardless of the factors a HEI identifies, or the mechanisms it uses to monitor those factors, or the supports it engages to reduce retention risk, all HEI's are working towards the same outcome at stage 6: changing the student's behaviour so their associated retention risk is reduced. Syracuse University identified 'at risk' students through their socio-economic background and academic integration and then used learning communities in attempt to change the student behaviour so their retention risk would decrease (Tinto, 2006). Purdue used multiple factors to identify 'at risk' students and then signal those 'at risk' students to faculty members in real time, hoping the faculty member could intervene in time to change the behaviour of the 'at risk' students (Arnold and Pistilli, 2012). Similarly, University of Alabama's SAS system was interested in academic achievement and student commitment as factors so that faculty members could be informed allowing them to intervene and change the student's behaviour. Regardless of the factors used, regardless of the supports employed, all student retention models are aimed at achieving the same ultimate outcome: change the 'at risk' student's behaviour in some way so that their retention risk is decreased.CIT was no different. Our data driven approach had an early, yet unintended, consequence. The push towards data, and understanding our data in a more comprehensive way, highlighted the fee losses CIT was experiencing as a result of student retention issues. Data sets were quickly provided clarifying how many students CIT was losing on an annual basis. It didn't take long before these figures were bumped up against the fees value of each student to understand the significant revenues CIT was losing each year. This quickly focused the minds and the question was asked: "*How do we fix this*"? We quickly realised that the mechanism to "fix this" was to ultimately change the student's behaviour in some way so that the retention rates currently being experienced were improved. Figure 49 provides some context on how CIT approached student retention, at least initially [65]. English and Mathematics results from the leaving certificate were the factors identified at step 1. Data for these were then harvested from the CAO.

[65] Some fantastic work has subsequently been done on student retention initiatives, led by fantastic leaders from the Registrar's office and this initiative led to many additional supports being introduced. However, CIT's initial approach is summarised in Figure 49.

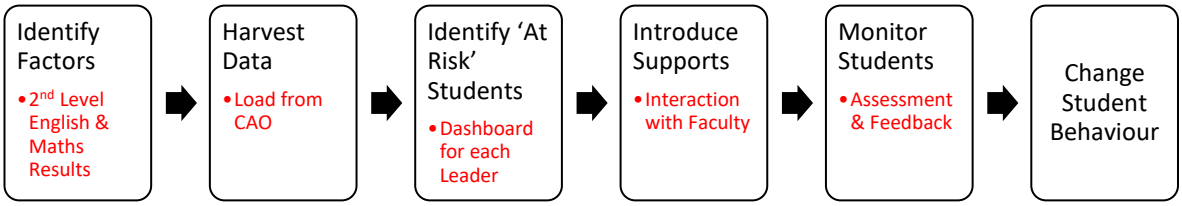



**Figure 49 - CIT's initial summary approach to student retention**

Visualisations were provided to each leader, based on a traffic light system for each student in that leader's department. This then led to faculty interactions for the at-risk students with faculty then using assessment and feedback as a support for those students. All of which was aimed directly at changing the behaviour of the 'at risk' student.

This new summary approach was uncovered after marrying my learnings from the literature review, with practical experience of how student retention was handled in CIT. This is a contribution of the researcher, having come up with a summary approach to student retention that covers both the identification and management of student retention risk.

## Part 2: A Categorisation of Student Retention Supports

This study has not found any new approaches to student retention, nor did it set out to do so. However, during the literature review, the researcher found that all supports (interventions) employed across various HEI's could be categorised neatly into one of three categories, illustrated by support in Table 35. These categories of support are an integral part to the student retention model as they create a link between the how leadership behaviours can map to actions that can assist at-risk students.

| Category | Support |
|---|---|
| Academic Supports | Interaction with faculty |
| | Assessment and feedback |
| | Mentoring |
| | Positive role models |
| Institutional Supports | Learning communities |
| | Career guidance and counselling |
| | Funding |
| | Orientation programmes |
| Environmental Supports | Physical facilities |
| | Access to technology |
| | Sense of community |
| | Expectation climate |

**Table 35 - Categorisation of student retention supports**

Within each category, each individual support is listed. However, it is important to note that this is not an exhaustive list of all supports employed by all HEI's. It is a list of those found as part of this research and how they fit into the new categories.

## Part 3: Leadership Behaviours for Student Retention (a summary of hypotheses)

The third part of the student retention model is the mapping of hypotheses to leadership styles. The analysis conducted against Research Questions 1 and 2 uncovered a total of 17 hypotheses. These hypotheses are listed in Table 36 and categorised across each of Yukl et al.'s (2002) three leadership styles. Each hypothesis is also mapped to the categories of supports, taken from Table 35, that can be offered to any students identified as posing a retention risk. For example, for task-oriented hypotheses #1 (TO1) a service department's short-term plan could involve academic, institutional and/or environmental supports.

| Style | Listing of Hypotheses | Support |
|---|---|---|
| T*ask Oriented* | TO1: If a service department creates a short-term plan then it will have an impact on student retention in other departments (Hypothesis #1) | A/I/E |
| | TO2: If a leader creates a short-term plan for the first six weeks of a semester then they will have an impact on student retention (Hypothesis #2) | A/I/E |
| | TO3: If a leader clarifies the role of, and place a greater reliance on, the course coordinator then they will have an impact on student retention (Hypothesis #3) | A |
| | TO4: If a leader monitors operations and receives frequent feedback on student performance, then they will have an impact on student retention (Hypothesis #4) | A |
| | TO5: If a leader promotes attendance monitoring then they will have an impact on student retention (Hypothesis #5) | A |
| | TO6: If a leader encourages teaching staff to use soft supports (such as knowing a student's name) then they will have an impact on student retention (Hypothesis #6) | A/E |
| | TO7: If a leader monitors operations using both soft[66] and hard (data) information then they will have an impact on student retention (Hypothesis #15) | A |
| *Relations Oriented* | RO1: If a leader encourages a hands-on approach from their course coordinators then they will have an impact on student retention (Hypothesis #7) | A |
| | RO2: If a leader consults appropriately with key roles (e.g. Course Coordinator) then they will have an impact on student retention (Hypothesis #8) | A |
| | RO3: If a leader encourages innovative thinking from staff members then they will have an impact on student retention (Hypothesis #10) | A |
| | RO4: If a leader develops their staff then they will have an impact on retention (Hypothesis #11) | A |
| | RO5: If a leader recognizes the efforts of team members then they will have an impact on student retention (Hypothesis #13) | A |
| | RO6: If a leader is supportive to students then they will have an impact not only upon a student's academic performance, but also their entire career path (Hypothesis #17) | A/I/E |
| *Change Oriented* | CO1: If a leader monitors internal retention performance in comparison to their external market competition then they will have an impact on student retention internally (Hypothesis #9) | A/I/E |
| | CO2: If a leader envisages change within his/her department then they will have an impact on student retention (Hypothesis #12) | A/I/E |
| | CO3: If a leader is brave enough to take risks for change then they will have an impact on student retention (Hypothesis #14) | A/I/E |
| | CO4: If a leader is provided with performance data for their organisation, then they will become more aware of the market performance of their competitors (Hypothesis #16) | A/I/E |

**Table 36 - Leadership behaviours for student retention (summary of hypotheses)**

[66] Soft information refers to opinions, ideas, commentary etc

Having discussed the contribution to research, the next section will introduce the contributions to practice. The main contribution (#4) is aimed at the Chief Data and Analytics Officer (CDAO) in higher education and aims to guide the CDAO who is working to facilitate, using data, the transformation of leadership behaviour. This transformation will lead to tacit knowledge driven leaders becoming more data driven. This transformation will make a significant contribution to improving student retention. Finally, this transformation will make a significant contribution to better student outcomes.

## 5.3 Contributions to Practice

As a practitioner/researcher this section is particularly important. This is really a significant 'so what?' moment. What impact does this research really have for this practice area? During the period of this research, and the implementation of the data driven programme, some measurable changes have occurred in CIT in the context of student retention. These include:

- From 2013/2014 to 2017/2018 progression[67] rates for the year 1 intake has increased by 7.6%, from 70% to 77.6%.
- From 2013/2014 to 2017/2018 the repeat[68] rates for the year 1 intake has decreased from 8% to 7.3%
- From 2013/2014 to 2017/2018 the progression rates for one particularly poorly performing programme increased by 32% (from a class progression rate of 35% in 2013/14 to 67% in 2017/18). This is the same programme referred to in section 4.6.2.8 where the head of department (subject #47) took significant risk for change based on what the data was telling them.

While the data driven programme cannot take 100% of the credit for these improvements, it has certainly made a very significant contribution to them. Having articulated some of the impacts of this research, this section will now discuss the contribution to practice made by this research. A total of three contributions to practice are made. A data driven programme for HEI's is defined in section 5.3.1, the role of the Chief Data and Analytics Officer (CDAO) is defined in section 5.3.2 and both are then used to create a model to enable leadership behaviour transformation in HEI's in section 5.3.3.

[67] A year 1 student is deemed to have progressed if they progress to 2nd year
[68] A year 1 student who repeats 1st year is classed as a repeat. While repeat students are not included in progression statistics, neither are they in the key retention statistic of failing to persist.

### 5.3.1 Contribution #2: Defining a Data Driven Programme within a Higher Education Institution (HEI)

This section will define a data driven programme that any HEI can adopt to improve the data and analytics maturity of the organisation. The programme can have an overall mission, "Get the Right **Data to** the Right **People** at the Right **Time"**, which is then enabled by eight steps. This mission and associated steps are illustrated in Figure 51.




**Figure 50 - A data driven programme for higher education**

This programme helps move leaders from being tacit knowledge driven to data driven. A data driven programme needs to have one overarching objective (or mission) to:

**"Get the Right Data to the Right People at the Right Time"**

This mission encourages questions such as: what decisions does the leader need to make? when does the leader need to make those decisions? and what data might assist the leader with making those decisions? These questions then lead to some demand being created from

the perspective of these leaders. Once this demand is created there are eight associated steps, not in any particular order, which are required for a successful data driven programme. These eight steps are discussed below.

1. **Formalise Data Requests**

Formalising requests for data is required so that some consistency can be achieved across the organisation. Consistency from both the demand and delivery perspectives. This is effectively contributing to the engagement strategy for the organisation. How will the organisation 'engage' with data? From the demand side, different leaders may be asking for the same thing, some leaders may not be aware of what they should be asking for, other leaders may want to ensure their idea benefits colleagues. From a delivery perspective, it allows consistency in terms of how data is provisioned to leaders. Consistency in data is paramount. Leaders across different areas using similar but inconsistent data sets is harmful. Worse yet is if they are using different data sets which they think are identical. Formalising data requests is a key step as it ensures delivery is consistent to all leaders and the creation of silos of information are thus avoided. This also leads to the next step:

2. **Form Organisational Data Governance**

To govern data is to properly manage its integrity, accessibility, security, usability and usefulness. To govern data successfully will lead to increasing its overall value. A governance group should be responsible for governing the data for the entire organisation. It should make priority decisions on data architecture, those data sets which need to be harvested next, those data sets which need to be presented for consumption next, effectively governing the technical resource investment[69]. Also, this group must govern the definitions of data which would make up the organisational data dictionary (see next step). This is imperative as data definitions must be consistent and that consistency is only achieved by good data governance. This governance group would also govern decisions such as *which are the most appropriate technical solutions for the organisation*? *what technology is best suited for the presentation layer?* and *which technology is best used for harvesting and storing data?* While IT, and the CDAO, will play a significant part in these decisions, this data governance group need to also be part of these decisions from a governance perspective. Nagle and Sammon (2017, p. 1442) define data governance (in their *data value map*) as "*the*

[69] Data Science / IT Resources who would focus on harvesting, integrating and presenting datasets for comsumption

*promotion of behaviours for good data practice*". Ultimately, the responsibility for the organisational data governance group is to provide categories for good data behaviours. Some of these good data behaviours include communication with all users, and in particular communicating what is expected of them and what they are accountable for – policies, standards, procedures etc (Carruthers and Jackson, 2018). It is therefore important that the organisational data governance group concern itself with engagement and communication. How will the group communicate its decisions to the wider organisation, and more importantly how will the group engage the wider organisation?

### 3. Creating Organisational Data Dictionary

Metadata, or data about data, in the context of an enterprise data strategy is often referred to as a *data dictionary*. This defines each data element so that the understanding across all users is consistent. For example, in an educational institution, the definition of student retention is important. In particular, its consistent definition is paramount. Some definitions of a *retained* student include:

1. A student who progresses from 1st year to 2nd year
2. A student who graduates from a 4-year programme within 4 years
3. A student who graduates from a 4-year programme within 6 years

For a single data element to have this many potential definitions leads to a potential mine field for data users. Without a data dictionary providing a single definition of each data element, users will have inconsistent interpretations of the same data leading to significant organisational issues. The data dictionary should not be seen as a technical document only however. It should also be seen as a catalogue, a mechanism that would allow the CDAO to communicate the data available in the organisation, but also equate that data to value and communicate that value in the context of business outcomes.

Also, once the data dictionary is created, the opportunity to group these at a high level is presented. Carruthers and Jackson (2018) recommend finding the 5-10 major data elements in your data dictionary and concentrating on the information architecture for these. This involves putting the names of domain owners against these major data elements who should be accountable for decisions involving these data elements.

### 4. Create an Accessible Presentation Layer

Regardless of how rich or well-integrated the data layer is, if that data is not easily accessible it will have little organisational value. If leaders, and data users in general, cannot access the data then the value of that data is unlikely to be realised. Creating an easily accessible, visually rich presentation layer is imperative in any data driven programme. Nagle and Sammon (2017) refer to this as the *delivery* component of their data value map. Data which is acquired, well-integrated, of high quality and well governed finally begins to provide real value when it is easily consumed through the presentation layer. The technology used should allow for rich data visualisations as this is likely to increase consumption and usage and make for easier interpretation by the user (Nagle and Sammon, 2017). Also, the absence of this accessible presentation layer will have a significantly detrimental effect on momentum of the data driven programme.

### 5. Provide Leaders with Training

Having reached step 6 in the data driven programme, relevant data has been acquired, integrated, analysed, delivered and governed but it is also important that the data users are trained on both the presentation layer and also the organisational data dictionary. Users must understand the data and must feel comfortable in consuming that data which makes the provision of training a crucial step. The technology acceptance model posits that user acceptance is determined by two key beliefs: perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness is influenced by the overall data strategy (see point 8) and the delivery of that strategy. However, perceived ease of use is heavily influenced by the technology chosen and the quality of training provided to its users. Slick and effective training, in this case for leaders, is an imperative.

### 6. Embrace Ongoing Data Quality Monitoring

Having overcome the steps of creating a visually appealing, accessible presentation layer and then training the leaders on same, the leaders will then start to really consume data. However, if there are data quality issues in the organisations data it can prove a significant stumbling block. It can undermine the entire data driven programme and cause leaders to pull away from the system: some due to genuine concern with making decisions upon bad data; others using the opportunity as an excuse for really not wanting to use data at all. The impact of poor data quality while often far reaching and multi layered, is often heavily underestimated and/or misunderstood. Some impacts can include reduced customer

satisfaction, higher costs, reduced decision making effectiveness and reduced strategic capabilities (Redman, 1998).

There are many mechanisms to review and improve data quality. The mechanism used in CIT, and one the researcher highly recommends is the *Friday Afternoon Measurement* (Redman, 2015). This measure is based on a few simple yet powerful steps for the data set for which you are seeking to measure quality. This measure can be quite powerful for any organisation. Any areas which identify as having data quality issues can be facilitated with a '*Friday Afternoon Measurement'* which can lead to many simple yet effective changes to improve data quality across the organisation.

7. **Embed a Culture of Data Interrogation**

Data driven programmes are more likely to be successful when the use of data, and a culture of measurement, is driven from the top down as well as the bottom up. While some success can be seen in particular areas (departments), widespread use of data and the embedding of a culture of measurement requires top-down support and must be driven by the most senior leadership. If a head of faculty is not asking his/her heads of school and or heads of department questions which require data interrogation, then it becomes easier for those heads of school and heads of department to be data apathetic. On the contrary, a leader who is asking questions of his / her teams that can only be answered through data interrogation by those team members will increase the likelihood of embedding a culture of measurement and data use into their organisation. In this scenario, being data apathetic is far more difficult for subordinates.

8. **Involve Appropriate Change Management Expertise**

This research has concluded that one significant impact of the data driven programme was that leaders tended towards more change-oriented behaviours. What organisations must consider however, is how to manage that change safely and effectively. Not all leaders provided with data may be ready to manage the change they are eager to pursue. Some leaders may be naturally inclined to manage change and others may be appropriately trained to do so. However, some do not fall into either of these categories. For this reason, involving the appropriate change management expertise as mandatory stakeholders in data programmes would allow the company to catch these situations and ensure that data driven change management does not result in failed or painful initiatives due to poor change management skills. The addition of this change management stakeholder does not have to

single out any leaders who may or may not need change management assistance. However, what it can do is:

1) Expect change as a result of the data programme
2) Expect leaders to initiate that change
3) Target the leadership stakeholders with an offering of change management training in advance of, or in unison with, the data programme

For the same reason, change management expertise could be included on the governance boards of data programmes. This could be to identify and manage any change that may arise as the programme progresses.

### 5.3.2 Contribution #3: Defining the role of a Chief Data and Analytics Officer (CDAO) within a HEI

Having defined the stages involved in a data driven programme there is a key role, that of the CDAO, which is crucial to that data driven programme and therefore also has to be defined as an additional contribution. HEI's intending to follow a data driven programme and/or transformation really must plan to have a CDAO, at executive level, to drive that programme. This contribution defines the role of the CDAO in the context of two key questions:

1. Why does any organisation need a CDAO?
2. What is the role of a CDAO in Higher Education?

**1. Why does any organisation need a CDAO?**

Organisations are run on decisions. Some decisions are significant, strategic decisions which effect the success of a company. Other decisions are more mundane but may happen every day or many times per day. What is consistent across all these decisions however, is 'data' is a key factor in all. Whether decisions are informed with all relevant data or made in its absence, data is always a key factor. As discussed in section 2.3.3, Davenport (2009) proposes decision-making disorder is a result of decisions being the prerogative of senior executives, where data goes into the 'black box' and decisions come out without anyone

really understanding the decision making process. Decisions based upon data are better decisions (McAfee et al., 2012b) and are inherently about managing uncertainty:

> *"By definition decisions involve uncertainty. If a decision algorithm could completely eliminate uncertainty, then the right thing to do would be clear and there would be no need to make a decision at all." (Redman, 2008, p. 91)*

Figure 51 shows a model illustrating how data can impact upon uncertainty in decision making. Decisions based on data and information are more likely to have an increased level of certainty. Conversely, decisions based on anecdotes and biases, HIPPO[70] decisions, are more likely to have an increased level of uncertainty.

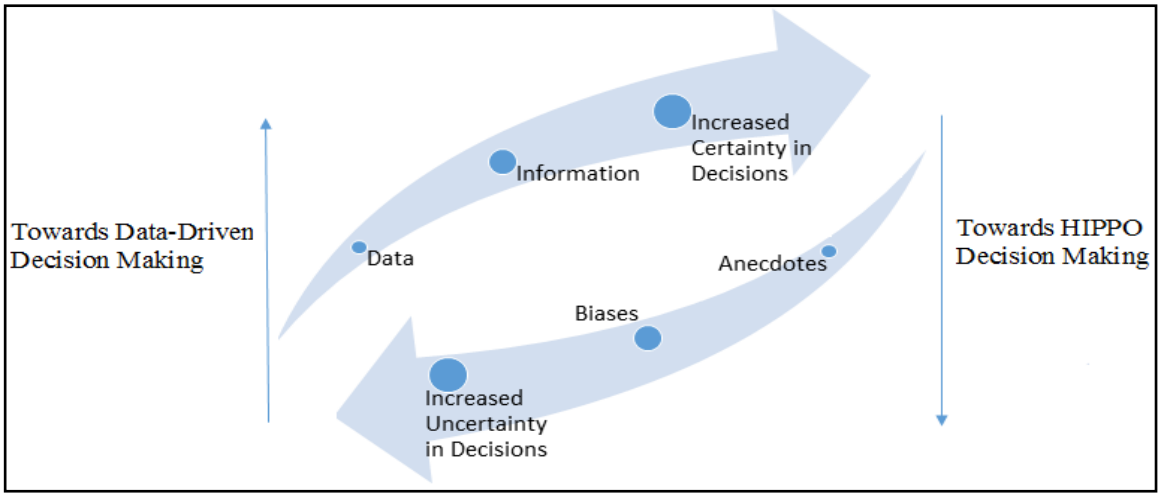



**Figure 51 - Uncertainty in decision making**

In fact, data really is the 'currency' of decision making, and as organisations are run on decisions, data becomes the 'currency' of the organisation. Some organisations collect, store, govern and deliver that currency better than others and often reap a reward for doing so. In their survey of almost 600 global executives, the Economist Intelligence Unit (2011) found that companies with a top executive responsible for data have better performance than their peers. That executive is the CDAO. The CDAO is charged with harvesting, harnessing and protecting that currency so that the organisation can make more informed decisions, more certain decisions. Organisations can show an interest in data but generally start at the wrong level. Organisations wishing to increase certainty in their decision making are likely to dig deep on tackling data related problems such as data quality, data governance and data stewardship only to find that their data problems are actually rooted in fundamental business

[70] HIghest Paid Person's Opinion

problems (Lee et al., 2014). Companies often begin by appointing persons to roles such as data stewards, data analysts or even data managers and this is understandable but flawed. As soon as one of these junior – mid lever persons finds a data issue that is really rooted in a business problem (such as poor business process, as is often the case) they lack the leadership and/or influence to correct the fundamental business issue. This is why an executive level CDAO is required. The CDAO is "*the voice of data within a company and represents data as a strategic business asset*" (Henric Jogin, IDG Sweden in (Carruthers and Jackson, 2018)).

## 2. What is the role of the CDAO in Higher Education?

The CDAO is a role which should sit at executive level and be responsible for data governance, management and exploitation across the entire organisation. The CDAO must be on the lookout for new ways to extract value from data that will lead to positive business outcomes. Those outcomes will vary by sector, but in Higher Education, those outcomes could include student retention, funding, recruitment and general operational efficiencies. There are four distinct aspects to the role of the CDAO. These aspects are built upon the works of Lee et al. (2014), Deloitte (2016), Xu et al. (2016), IBM Institute for Business Value (2016) and Carruthers and Jackson (2018).

i. Lead the data and analytics vision and strategy for the organization

The CDAO is responsible with creating and implementing the data and analytics vision and strategy for the organisation. The data and analytics strategy must be aligned with and enabling the organisation's strategy.

ii. Create and implement a data driven programme for the organisation

The CDAO must take responsibility for the creation and implementation of a data driven programme, as described in detail in contribution #5.

iii. Communicate, evangelise and extract the value of treating data as an asset

The CDAO must be an effective communicator and positively evangelise, in particular with other executives, the value of treating data as an organisational asset. As described in part 1 (why does an organisation need a CDAO), data is the currency of decision making. The CDAO needs to evangelise the business value of this currency to real business outcomes. On top of this, the CDAO must also extract value from this asset using services such as business intelligence, advanced analytics, data mining, and machine learning, and even artificial intelligence (ZDNET, 2019).

iv. Serve as trusted partner to, and build relationships with, key business executives

In order to become a true agent of change and transformation, the CDAO must build real trust with other executives. The CDAO must convince other executives of the value of data and deliver that value to his/her colleagues so they can realise business outcomes for themselves. Crucially, however, the CDAO must ensure that colleagues realise the contribution data has made to those business outcomes.

### 5.3.3 Contribution #4: A Model to Enable Leadership Behaviour Transformation in Higher Education (HE)

Figure 52 illustrates contribution #4: *a model to enable leadership behaviour transformation in higher education*. This model has three main personas: the tacit knowledge driven leader (e.g. CIT's 2014 Leader), the data driven leader (e.g. CIT's 2016 Leader) and also the Chief Data and Analytics Officer (CDAO). The CDAO is the person in the best position to transform leadership behaviour and create data driven leaders in a higher education institution. The CDAO is the enabler. The CDAO must recognise the characteristics of a tacit knowledge driven leader. A tacit knowledge driven leader is one who does not use data to inform decisions. This leader is highly task oriented, may rely heavily on short-term plans (or no plans) and is likely to be quite change averse. This leader is also likely to benefit widely from engaging with a data driven programme. The CDAO must recognise, and articulate to executive leadership, the consequences of tacit knowledge driven leaders in a higher education institution: high uncertainty, opinion (or HIPPO[71]) driven decision making; less appropriate choice of supports for 'at risk' students; all leading to poor student outcomes. The CDAO must fulfil the four aspects of the CDAO role and in particular lead and/or sponsor a data driven programme for the organisation. Once this data driven programme has been completed a number of changes can be observed. Leaders are likely to have become data driven, less task-oriented and more change-oriented which can deliver more positive outcomes such as *reduced uncertainty, informed decision making, more appropriate choice of supports all leading to better student outcomes*. This provides HEI's with another way to improve student retention: through leadership, data and the Chief Data and Analytics Officer.

[71] Highest Paid Person's Opinion

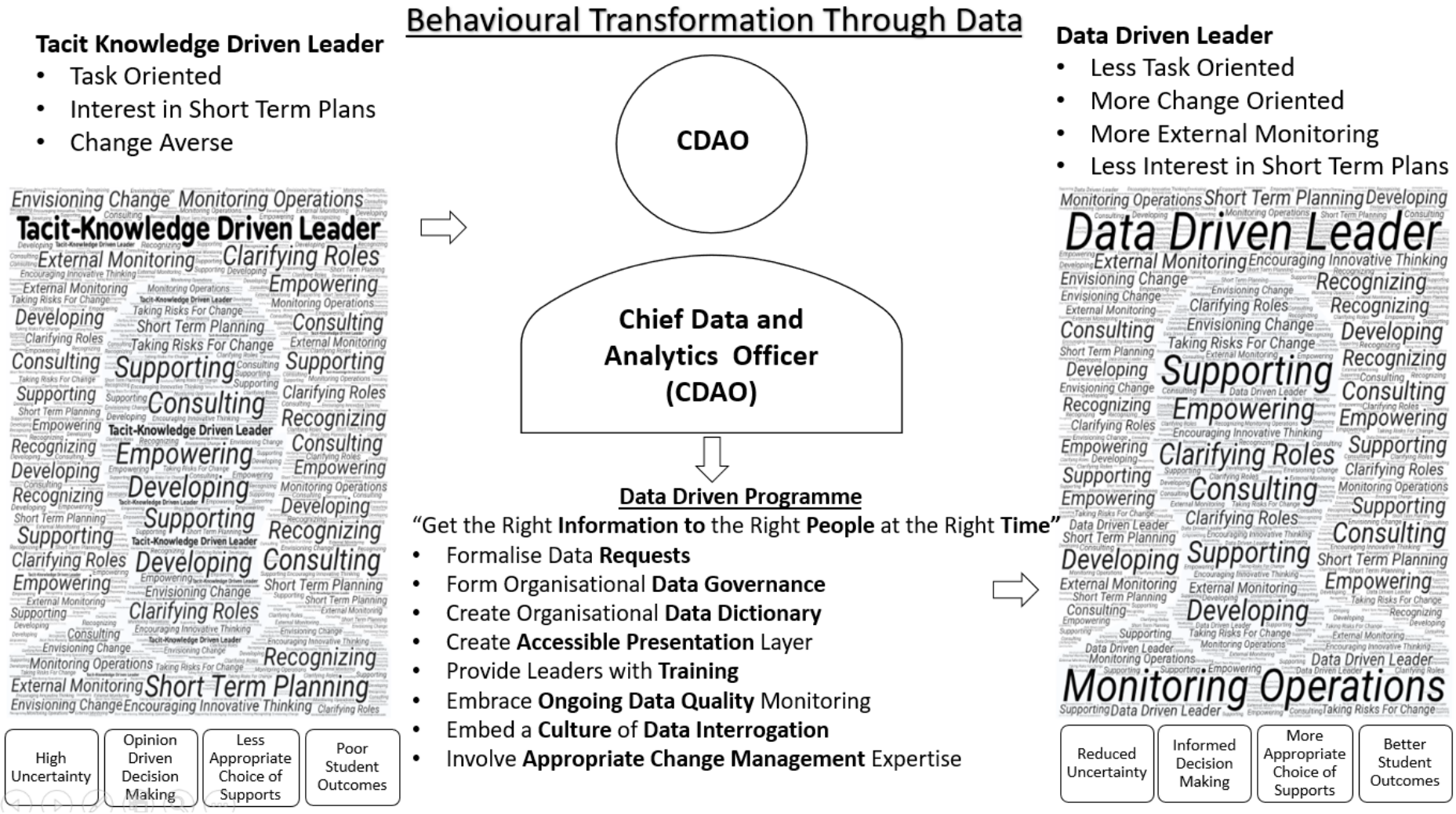



Figure 52 - A model to transform leadership behaviour in higher education

## 5.4 Practitioner/Researcher Reflections

This section is to capture the reflections of the practitioner/researcher at the conclusion of this research. Initially it is important to recognise the efforts of CIT's leadership team and the contribution they have made to this research. The leadership were open with their experiences and generous with their time, both contributions which are evident in the richness of the data and findings.

From the perspective of the literature review and subsequent data collection and analysis, the researcher has achieved one significant personal objective of the PhD journey: new personal learning. From the outset this was important both from an academic and practitioner perspective. The journey has facilitated substantial learnings in the three main areas of student retention, data and leadership. An additional learning for the researcher was the significant and varied role of the leader in HE student retention was not fully appreciated. The integral role the leader plays in all student retention models is important, significant and the potential impact leaders can have on a student's educational (and life) journey is now much better appreciated by the researcher. The potential for the leader to impact on a student's life journey was properly appreciated from this interview feedback below (reused from section 4.6.2.5

> *"I met a past student recently at an industry event. It was on in Dublin and this past student was speaking (I didn't know going to the event that she was a past student by the way). So this girl spoke so well but she said something on stage that blew me away. She said that she was struggling badly in 1st year (which was 10 years ago) and that she came to her Head of Department for help and her head of department couldn't have been more supportive and helped her through a difficult time. What she then said was that her 'Head of Department' was sitting in the audience and she named me. I nearly died with shock. I had a lovely chat with her afterwards but what struck me was that we have such a responsibility to support our students and you never know what is going on in their lives. After hearing that....I will always make myself available to support a student who asks for help." (Subject #19, 2016)*

The contributions made by this research, academic and practical, are a source of great pride to the researcher. The academic significance of these two new models (contributions #1 and #4) must be considered in the context of other relevant research. These models, in particular

when seen as mutually beneficial, will overcome some of the known barriers to data use such as data availability and technology/data system capacity (Lachat and Smith, 2005). It reduces the reliance on hierarchy and rules, something which proves unhelpful to public sector organisations (Currie et al., 2008; Hales, 2002). The model will assist HE move towards a more data-driven approach espoused by the No Child Left Behind Act (NCLBAct, 2002) and will assist with HE generating and using student and school performance data to drive decisions as recommended by Honig and Coburn (2008). Another benefit of this model is that the move towards a data driven approach will help to remove the reliance on politics, ideology and other influences from the decision making process (Honig and Coburn, 2008) which the authors argue will fundamentally improve student and school performance.

The practical uses for contribution #4 are significant for any Chief Data and Analytics Officer in HE. The model provides a method to implement a data driven programme in a way that aligns organisational strategy with data in a way that facilitates a cultural change where leaders become more data driven. This contribution, in particular, is a source of great pride to the researcher and will be used personally for many years to come.

## 5.5 Conclusions of Research

This research set out to answer two research questions:

**Research Question 1**: What characterises leadership behaviour in a student retention model?

This research question produced the illustration of CIT's 2014 Leader who, as a result of being analysed at a time when little or no data was provided to CIT's leaders, is referred to as a 'tacit knowledge driven leader'.




Figure 53 - CIT's 2014 leader

This illustration provides an insight to those behaviours which characterise a leader in the context of student retention. These behavioural characteristics are detailed in Table 37 in order of priority as per the findings of this study.

| Leadership Behaviour | Averaged Percentage of Overall Mentions |
|---|---|
| Short-Term Planning | 20.67% |
| Clarifying Roles | 18.12% |
| Monitoring Operations | 17.72% |
| Supporting | 11.98% |
| Empowering | 8.66% |
| Consulting | 7.83% |
| External Monitoring | 4.92% |
| Encouraging Innovative Thinking | 3.65% |
| Developing | 2.61% |
| Envisioning Change | 1.54% |
| Recognizing | 1.21% |
| Taking Risks for Change | 1.10% |

Table 37 - 2014 characteristics of leadership behaviour

Having completed the analysis against, and answering of, Research Question 1, the researcher then moved onto Research Question 2.

**Research Question 2:** What is the impact of a data-driven approach on leadership behaviour in a student retention model?

This research question led to the illustration of CIT's 2016 (or data driven) Leader.




**Figure 54 - CIT's 2016 leader**

This research question was answered in two steps:

1. Step 1: clarify what characterises a data driven leader
2. Step 2: compare the results of step 1 against the results of Research Question 1 (the characteristics of a tacit knowledge driven leader).

Figure 54, like Figure 53 also provides an insight to those behaviours which characterise a leader in the context of student retention, but this time a data driven leader. These behavioural characteristics are detailed in Table 38 in order of priority as per the findings of this study.

| Leadership Behaviour | Averaged Percentage of Overall Mentions |
|---|---|
| Monitoring Operations | 18.12% |
| Clarifying Roles | 13.19% |
| Short-Term Planning | 12.33% |
| External Monitoring | 10.21% |
| Supporting | 10.04% |
| Empowering | 9.70% |
| Consulting | 7.09% |
| Taking Risks for Change | 6.04% |
| Encouraging Innovative Thinking | 5.25% |
| Envisioning Change | 4.31% |
| Developing | 3.04% |
| Recognizing | 0.68% |

**Table 38 - 2016 characteristics of leadership behaviour**

In answering these questions, a number of findings have been made along with contributions to research and practice. This in turn has led to the research objective also being met.

**Research Objective**: "To explore the impact of a data driven approach on leadership behaviour in the context of student retention"

## 5.6 Limitations of this Research

One limitation of this research is that it is only a single case. While the single case afforded the researcher significant access to CIT's leadership, it also restricts (by its nature) generalizability and thus it would be interesting to see the results from another case.

Another limitation often attached to single case study design is the notion of replicability. Notwithstanding the limitations of restrictions in general terms, there is a slight difference with the HE sector, particularly in the context of Ireland, in that it shows remarkable similarities both in organisational structure as well as information systems and approaches. For this reason, the limitation of replicability could be lessened owing to the sectoral context.

The research itself spanned almost 6 years and the data gathering taking up to 3 years of that. For this reason, the time-consuming nature of the study could be seen as a limitation. Notwithstanding the impact this had on the researcher, on a practical level some of the research population changed during the study (retirements, new hires, job changes etc). While these changes represented less than 5% of the population and the study focused on the leadership as a group to be studied rather than any one individual, it is still worth mentioning as a limitation.

Finally, researcher bias, again a limitation to case study research in general, has to be listed as a limitation here. While every effort was taken reduce this bias through practical means such as not setting out with a pre-defined theory, triangulating all evidence and also playing back evidence to the subjects to confirm accuracy and fair representation.

## 5.7 Opportunities for Further Research

The 17 hypotheses presented in Table 36 (section 5.2.3), and in Figure 45 (the new student retention model: the perspective of a higher education leader), present an opportunity for further research. This presents an opportunity to test some or all of these 17 hypotheses in detail with some interesting questions from the outset:

1. Are all 17 hypotheses true?
2. Do some individual hypotheses have more (or less) impact on 'at risk' students than others?
3. Do some collective (categories) hypotheses have more (or less) impact on 'at risk' students than others?
4. Do some hypotheses (leadership behaviours) tend towards particular support categories?
5. Are categories of supports favoured by some institutions more than others?
    - And if so, why?
6. Do any particular categories of supports have more (or less) impact on 'at risk' students than others?

## 5.8 Chapter Conclusion

This chapter introduced the contributions of and conclusions to this research. Section 5.2 introduced the contributions to research and section 5.3 discussed the contributions to practice. Section 5.4 provided the conclusions to this research. Finally, sections 5.6 and 5.7 discuss the limitations of the research and the opportunities for further research respectively.

# 6. Appendices

## 6.1 Letter to Interview Participants

Dear [Recipient Name]:

I am conducting PhD research entitled "To explore the impact a journey towards a data driven culture in an Irish Higher Education Institution may have on leadership behaviour in the context of student retention". I am using Cork Institute of Technology as my research case. As part of this research study I want to engage with decision makers who have an active participation in student retention. I am seeking your participation in this research as decision makers of Cork Institute of Technology.

If you agree to participate in this study I will strive not to put excessive demands on your time. Your participation will be broken into two parts;

a) A first interview (30-45 minutes in the near future) to take a baseline before the implementation of a data analytics solution, among other things, as part of moving CIT towards a data driven culture;
b) A second interview (30-45 minutes in 18-36 months time) offering a comparison with the baseline.

The questions (below) will be the same for each interview and the research will explore the impact the BI implementation has had on decision making behaviour across the Institute.

Thank you again for taking the time to read this letter. Should you decide to participate please let me know by email and I will arrange the first interview slot at your convenience. Your participation is very important to me in the expansion of this body of knowledge and will hopefully be of benefit to CIT.

As part of your participation in this research study your responses will be treated in the strictest of confidence. All data gathered will be used for the sole purposes of this research study only. Your responses will not be linked to you personally and all participants' confidentiality will be protected.

During the interview I will focus our discussion on the following questions:

1. How important is student retention to you? (1 = not at all important; 5 = very important)
2. Why is student retention important to you?
3. What decisions do you have to make in relation to student retention
4. Who / What requires you to make those decisions?
5. When do you have to make those decisions?
6. How do you inform yourself to make those decisions?
7. Where/Who do you get information from to assist you making those decisions?
8. Do you have a plan to manage student retention?
    a. Has anything changed in this plan now that you have more data?
9. How do you monitor student retention?
    a. Has this changed in any way now that you have more data?
10. Do you work alone on student retention or with others
    a. Who are the people who help you with student retention?
    b. How do you interact with those people?
11. How do your retention rates compare nationally / internationally?

Sincerely,

Jonathan McCarthy
Head of IT Department, Cork Institute of Technology

## 6.2 Interview Protocol Form

Research: To explore the impact a journey towards a data driven culture in an Irish Higher Education Institution may have on leadership behaviour in the context of student retention

Date: _____

Time: _____

Location: _____

Interviewer: _____

Interviewee: _____

Notes to interviewee:

Thank you for your participation. I believe your input will be valuable to this research and in helping grow all of our professional practice. **Confidentiality of responses is guaranteed.**

Approximate length of interview: 45 minutes

During the interview I will focus our discussion on the following questions:

1. How important is student retention to you? (1 = not at all important; 5 = very important)
2. Why is student retention important to you?
3. What decisions do you have to make in relation to student retention
4. Who / What requires you to make those decisions?
5. When do you have to make those decisions?
6. How do you inform yourself to make those decisions?
7. Where/Who do you get information from to assist you making those decisions?
8. Do you have a plan to manage student retention?
    a. Has anything changed in this plan now that you have more data?
9. How do you monitor student retention?
    a. Has this changed in any way now that you have more data?
10. Do you work alone on student retention or with others
    a. Who are the people who help you with student retention?
    b. How do you interact with those people?
11. How do your retention rates compare nationally / internationally?

Interviewer Notes

As the participants spoke,the researcherused the template below to take interview notes. This helped the coding process.

| Leadership Behaviour | Interview Results |
|---|---|
| Short-Term Planning | |
| Monitoring Operations | |

| | |
|---|---|
| Clarifying Roles | |
| Supporting | |
| Developing | |
| Consulting | |
| Recognizing | |
| Empowering | |
| External Monitoring | |
| Encouraging Innovative Thinking | |
| Envisioning Change | |
| Taking Risks for Change | |

## 6.3 Interview Coding (Excel)

| Year | Subject Code | Date | LB1 | LB2 | LB3 | LB4 | LB5 | LB6 | LB7 | LB8 | LB9 | LB10 | LB11 | LB12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |

LB1 – Planning

LB2 – Monitoring

LB3 – Clarifying

LB4 – Supporting

LB5 – Developing

LB6 – Consulting

LB7 – Recognizing

LB8 – Empowering

LB9 – External Monitoring

LB10 – Encouraging Innovative Thinking

LB11 – Envisioning Change

LB12 - Taking Risks for Change

## 6.4 Participant Observation Template

Observer Notes
Date & Time: _____
Location: _____
Event/Meeting: _____
Event/Meeting Attendees: _____
Event/Meeting Focus: _____

| Leadership Behaviour | Observation Results |
|---|---|
| Short-Term Planning | |
| Monitoring Operations | |
| Clarifying Roles | |
| Supporting | |
| Developing | |
| Consulting | |
| Recognizing | |
| Empowering | |
| External Monitoring | |
| Encouraging Innovative Thinking | |
| Envisioning Change | |
| Taking Risks for Change | |

## 6.5 Questionnaire Structure and Questions

*Introduction*

### 1. Please confirm your role in CIT *

Please choose **only one** of the following:

- ○Academic: Head of Faculty
- ○Academic: Head of School
- ○Academic: Head of Department
- ○Academic: Lecturer / Course Co-Ordinator
- ○Administration: Vice President/Registrar
- ○Administration: Head of Function/Department

### 2. Some questions ask for feedback based on your 'Department / School / Faculty / Function". For the purposes of this survey, as a VP your "Function" can be both the entire Institute and your direct function.

**Only answer this question if the following conditions are met:** Answer was 'Academic: Lecturer / Course Co-Ordinator' at question '1 [Role]' (Please confirm your role in CIT )

### 3. In your role in CIT, how important is Student Retention to you *

Please choose **only one** of the following:

- ○1
- ○2
- ○3
- ○4
- ○5

1 = not at all important

5 = extremely important

### 4. Based on your answer above, please describe why Student Retention is important/not important to you in your role in CIT

Please write your answer here:

---

*Section 1 - Student Retention Roles*

---

### 5. Are there roles (formal/informal) which have some responsibility for student retention in your Department/School/Faculty/Function?

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 6. Please list the roles

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '5 [ClarifyingRoles]' (Are there roles (formal/informal) which have some responsibility for student retention in your Department/School/Faculty/Function?)

Please write your answer here:

### 7. Do you assist staff in these roles by offering coaching / training / mentoring?

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '5 [ClarifyingRoles]' (Are there roles (formal/informal) which have some responsibility for student retention in your Department/School/Faculty/Function?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 8. Do you have a mechanism (formal / informal) for rewarding good performance of staff in relation to student retention?

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 9. Please describe this mechanism briefly

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '8 [Recognizing]' (Do you have a mechanism (formal / informal) for rewarding good performance of staff in relation to student retention ?)

Please write your answer here:

---

*Section 2 - Monitoring of Student Retention*

---

### 10. Do you monitor Student Retention across your Department / School / Faculty / Function? *

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 11. Please describe how you monitor Student Retention

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '10 [Monitoring]' (Do you monitor Student Retention across your Department / School / Faculty / Function? )

Please write your answer here:

### 12. In your opinion, over the past 2 years has the Student Retention percentage across your Department / School / Faculty / Function? *

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '10 [Monitoring]' (Do you monitor Student Retention across your Department / School / Faculty / Function? )

Please choose **only one** of the following:

- ○ Improved
- ○ Disimproved
- ○ Remained largely the same
- ○ Don't know

### 13. Do you have a plan (formal / informal) that you work against, or have worked against, to improve Student Retention across your Department / School / Faculty / Function *

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 14. Please describe the plan

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '13 [Planning]' (Do you have a plan (formal / informal) that you work against, or have worked against, to improve Student Retention across your Department / School / Faculty / Function )

Please write your answer here:

---

*Section 3 - Student Retention Risks*

---

### 15. In your Department / School / Faculty / Function, how are Student Retention risks typically identified? *

Please choose **only one** of the following:

- ○ By staff following a clearly defined process
- ○ By staff who are empowered to use their own discretion
- ○ By some other mechanism

- ◯ Don't know

### 16. Please describe this other mechanism

**Only answer this question if the following conditions are met:** Answer was 'By some other mechanism' at question '15 [Empowering]' (In your Department / School / Faculty / Function, how are Student Retention risks typically identified?)

Please write your answer here:

### 17. In your Department / School / Faculty / Function, how are Student Retention risks typically addressed? *

Please choose **only one** of the following:

- ◯ By staff following a clearly defined process
- ◯ By staff who are empowered to use their own discretion
- ◯ By some other mechanism
- ◯ Don't know

### 18. Please describe this other mechanism

**Only answer this question if the following conditions are met:** Answer was 'By some other mechanism' at question '17 [Empowering2]' (In your Department / School / Faculty / Function, how are Student Retention risks typically addressed?)

Please write your answer here:

### 19. What are the factors which you use to flag a student posing a retention risk?

Please choose **all** that apply:

- ☐ Poor attendance
- ☐ Poor grades
- ☐ Failure to submit assignments
- ☐ Notification by student
- ☐ Other

### 20. Please list the other factors you use

**Only answer this question if the following conditions are met:** Answer was at question '19 [Envisioning1]' (What are the factors which you use to flag a student posing a retention risk? )

Please write your answer here:

### 21. Are you happy with how Student Retention risks are identified in your Department / School / Faculty / Function?*

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 22. Have you ever tried to change how Student Retention risks are identified across your Department / School / Faculty / Function?

**Only answer this question if the following conditions are met:** Answer was 'No' at question '21 [Envisioning3]' (Are you happy with how Student Retention risks are identified in your Department / School / Faculty / Function?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 23. Was this change successful?

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '22 [TakingRisks]' (Have you ever tried to change how Student Retention risks are identified across your Department / School / Faculty / Function?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 24. Please describe the change and how you went about implementing it

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '22 [TakingRisks]' (Have you ever tried to change how Student Retention risks are identified across your Department / School / Faculty / Function?)

Please write your answer here:

### 25. Are you happy with how Student Retention risks are addressed in your Department / School / Faculty / Function? *

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 26. Have you ever tried to change how Student Retention risks are addressed across your Department / School / Faculty / Function?

**Only answer this question if the following conditions are met:** Answer was 'No' at question '25 [Envisioning4]' (Are you happy with how Student Retention risks are addressed in your Department / School / Faculty / Function?)

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 27. Was this change successful?

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '26 [TakingRisks3]' (Have you ever tried to change how Student Retention risks are addressed across your Department / School / Faculty / Function? )

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 28. Please describe the change and how you went about implementing it

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '26 [TakingRisks3]' (Have you ever tried to change how

Student Retention risks are addressed across your Department / School / Faculty / Function? )

Please write your answer here:

### 29. Do you offer support mechanisms to students identified as a retention risk *

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 30. Please describe these support mechanisms

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '29 [Supporting1]' (Do you offer support mechanisms to students who are identified as a retention risk )

Please write your answer here:

### 31. Do you consult with other persons/roles when making decisions related to Student Retention? *

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 32. Please list those roles with which you consult

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '31 [Consulting]' (Do you consult with other persons/roles when making decisions related to Student Retention? )

Please write your answer here:

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*Section 4 - Approaches used in other Institutions*

---

### 33. Are you aware of the factors other Institutions use to identify students who pose a retention risk? *

Please choose **only one** of the following:

- ○ Yes
- ○ No

### 34. Please choose from the list below the factors which, to your knowledge, other Institutions use to flag a student posing a retention risk?

**Only answer this question if the following conditions are met:**
Answer was 'Yes' at question '33 [ExternalMonitoring]' (Are you aware of the factors other Institutions use to identify students who pose a retention risk?)

Please choose **all** that apply:

- ☐ Poor attendance
- ☐ Poor grades
- ☐ Failure to submit assignments
- ☐ Notification by student
- ☐ Other

### 35. Please list those other factors

**Only answer this question if the following conditions are met:**
Answer was at question '34 [ExternalMonitoring1]' (Please choose from the list below the factors which, to your knowledge, other Institutions use to flag a student posing a retention risk?)

Please write your answer here:

### 36. Have you ever tried to introduce any of those factors to how CIT identifies students posing a retention risk?

**Only answer this question if the following conditions are met:**
Answer was 'Yes' at question '33 [ExternalMonitoring]' (Are you aware of the factors other Institutions use to identify students who pose a retention risk?)

Please choose **only one** of the following:

- ◯Yes
- ◯No

### 37. Have you encouraged any of your staff / colleagues to come up with different approaches to Student Retention *

Please choose **only one** of the following:

- ◯Yes
- ◯No

### 38. Has this encouragement wielded any suggestions from your staff / colleagues?

**Only answer this question if the following conditions are met:** Answer was 'Yes' at question '37 [Encouraging]' (Have you encouraged any of your staff / colleagues to come up with different approaches to Student Retention )

Please choose **only one** of the following:

- ◯Yes
- ◯No

Thank you very much for taking the time to complete this survey.

Jonathan

### 6.5.1 Survey 1 (2014) Email to Participants

*PhD Survey: The impact of a Business Intelligence (BI) implementation on approaches to Student Retention*

Hi {FIRSTNAME},

I wonder if I could ask you a huge favour. I am conducting PhD research with a title of "To explore the impact a journey towards a data driven culture in an Irish Higher Education Institution may have on leadership behaviour in the context of student retention".

My high level plan is to survey people involved in Student Retention pre BI implementation and again post implementation to see if there has been a behavioural change or not that can be tied to the BI implementation itself. Responses are anonymous and comparisons will be made at an Institute level rather than on an individual level.

As someone who has visibility of and involvement with student retention, I would really value your opinion. Can I be terribly cheeky and ask if you would be able to take my survey? It should take no more than 5-10 minutes in total.

The link to the survey is here:

{SURVEYURL}

I understand you are really busy, but if you could spare the time I would really appreciate it. The survey is completely anonymous other than asking for your general role in CIT.

Sincerely,

Jonathan

({ADMINEMAIL})

### 6.5.2 Survey 2 (2015) Email to Participants

*PhD Survey (2 of 3): The impact of a Business Intelligence (BI) implementation on approaches to Student Retention*

Hi {FIRSTNAME},

I wonder if I could ask you a huge favour. I am conducting PhD research with a title of "To explore the impact a journey towards a data driven culture in an Irish Higher Education Institution may have on leadership behaviour in the context of student retention". Last year you completed the initial survey for me and I was hoping, it being at a relevant time again, that you might complete another survey for me this September.

My high level plan is to survey people involved in Student Retention pre BI implementation (last year) and again post implementation to see if there has been a behavioural change (or not) that can be tied to the BI implementation itself. This request is an intermediate survey to allow me to have some extra data for comparison purposes. Responses are anonymous and comparisons will be made at an Institute level rather than on an individual level.

As someone who has visibility of and involvement with student retention, I would really value your opinion. Can I be terribly cheeky and ask if you would be able to take my survey? It should take no more than 5-10 minutes in total.

The link to the survey is here:

{SURVEYURL}

I understand you are really busy, but if you could spare the time I would really appreciate it. The survey is completely anonymous other than asking for your general role in CIT.

Sincerely,

Jonathan

({ADMINEMAIL})

### 6.5.3 Survey 3 (2016) Email to Participants

*PhD Survey (3 of 3): The impact of a Business Intelligence (BI) implementation on approaches to Student Retention*

Hi {FIRSTNAME},

I wonder if I could ask you a huge favour. I am conducting PhD research with a title of "To explore the impact a journey towards a data driven culture in an Irish Higher Education Institution may have on leadership behaviour in the context of student retention". Last year you completed an interim survey for me and I was hoping, it being at a relevant time again, that you might complete a final survey for me.

My high level plan has been to survey people involved in Student Retention pre BI implementation (2014) and again post implementation (2015 & 2016) to see if there has been a behavioural change (or not) that can be tied to the BI implementation (e.g. Faculty Dashboard, Course Monitoring Report, Program Status Review Report etc). This request is a final survey to allow me to have some extra data for comparison purposes. Responses are anonymous and comparisons will be made at an Institute level rather than on an individual level.

As someone who has visibility of and involvement with student retention, I would really value your opinion. Can I be terribly cheeky and ask if you would be able to take my survey? It should take no more than 5-10 minutes in total.

The link to the survey is here:

{SURVEYURL}

I understand you are really busy, but if you could spare the time I would really appreciate it. The survey is completely anonymous other than asking for your general role in CIT.

Sincerely,

Jonathan

({ADMINEMAIL})

## 6.6 Data Driven Programme Visualisations

The following are samples of some of the visualisations provided to the leader as part of the data driven programme in CIT. Not all of these are explicitly relevant to student retention. However, all speak to the type of visualisations with which the leader was supplied.

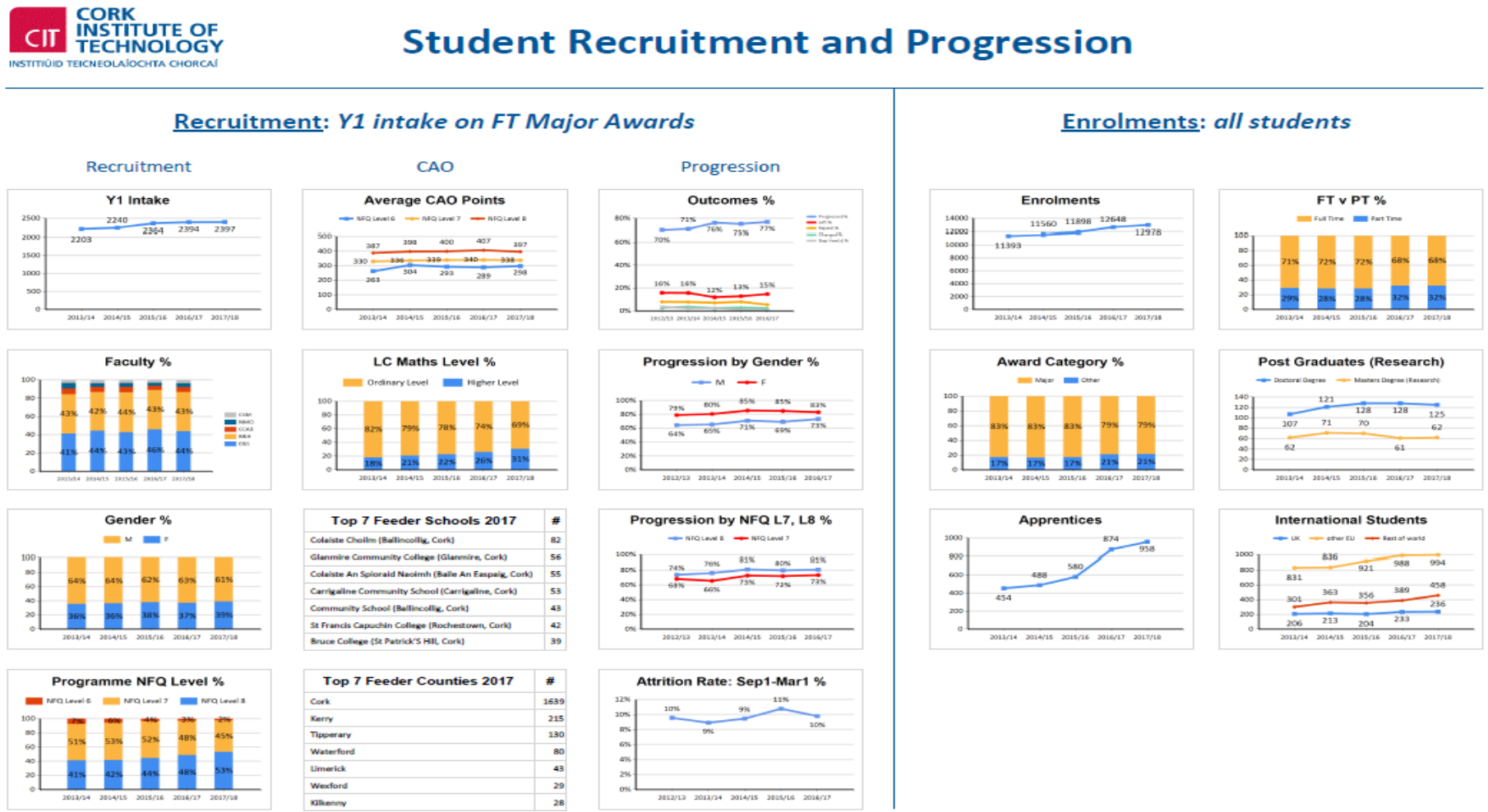



Figure 55 - Leader visualisation: student recruitment and progression

## Department of Accounting & Inf. Systems

### Programme: CR_BACCE_7 Bachelor of Business in Accounting

### Stage 3:

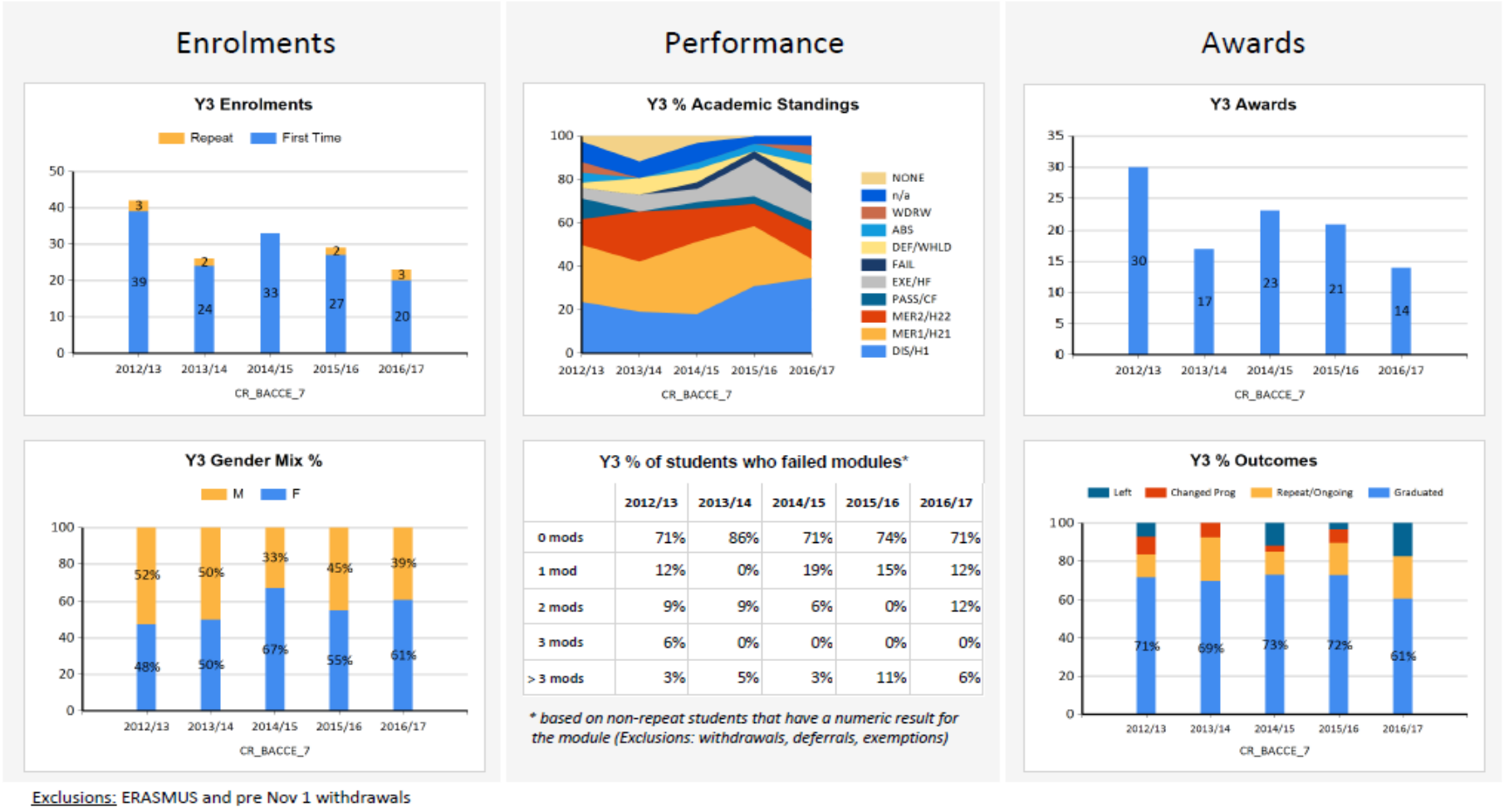



Figure 56 - Leader visualisation: programme dashboard (AFIS)

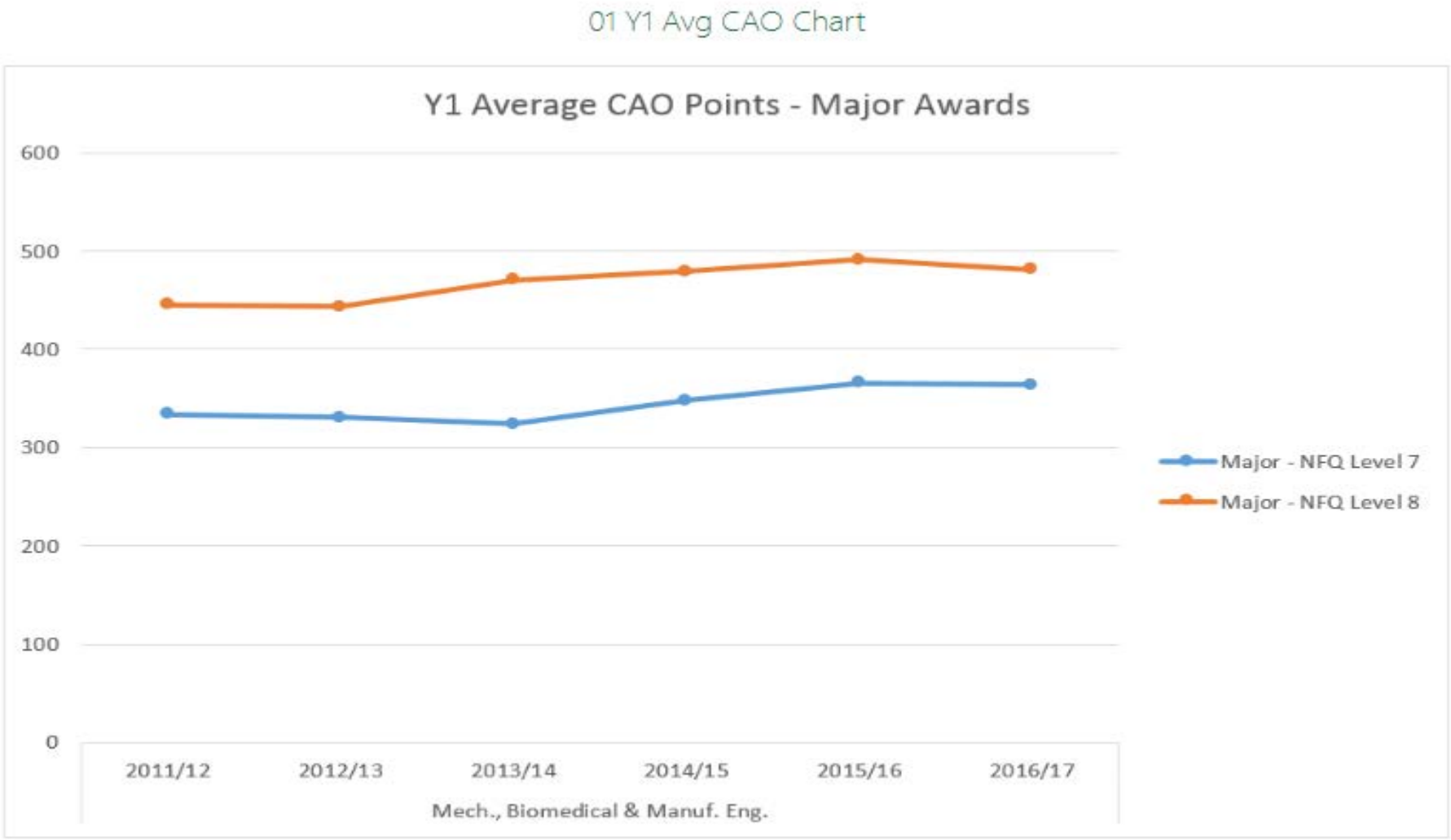



**Figure 57 - Leader visualisation: year 1 average CAO points (single department)**

# 7. Bibliography


Abdullah, M.C., Elias, H., Uli, J., Mahyuddin, R., 2010. Relationship between coping and university adjustment and academic achievement amongst first year undergraduates in a Malaysian Public University. Int. J. Arts Sci. 3, 379–392.

Ackerman, R., Schibrowsky, J., 2007. A business marketing strategy applied to student retention: A higher education initiative. J. Coll. Stud. Retent. Res. Theory Pract. 9, 307–336.

ACT, 2012. National Collegiate Retention and Presistence to Degree Rates.

Agudo-Peregrina, Á.F., Iglesias-Pradas, S., Conde-González, M.Á., Hernández-García, Á., 2014. Can we predict success from log data in VLEs? Classification of interactions for learning analytics and their relation with performance in VLE-supported F2F and online learning. Comput. Hum. Behav. 31, 542–550. https://doi.org/10.1016/j.chb.2013.05.031

Arnold, K.E., Pistilli, M.D., 2012. Course signals at Purdue: using learning analytics to increase student success, in: Proceedings of the 2nd International Conference on Learning Analytics and Knowledge. ACM, pp. 267–270.

Astin, A.W., 1993. What matters in college?: Four critical years revisited. Jossey-Bass San Francisco.

Astin, A.W., 1975. Preventing students from dropping out. San Francisco: Jossey-Bass.

Atkisson, M., 2012. Has Purdue's Course Signals Shattered The College Entrance Paradigm? Ways Knowing Examining Percept. Pract. Learn. Des. URL https://woknowing.wordpress.com/2012/05/17/has-perdues-course-signals-shattered-the-college-entrance-paradigm/ (accessed 8.28.18).

Bakharia, A., Heathcote, E., Dawson, S., 2009. Social networks adapting pedagogical practice: SNAPP. Citeseer.

Bass, B.M., 1990. From transactional to transformational leadership: Learning to share the vision. Organ. Dyn. 18, 19–31.

Bass, B.M., 1985. Leadership and performance beyond expectations.

Bass, B.M., Stogdill, R.M., 1990. Handbook of leadership. Theory Res. Manag. Appl. 3.

Bean, J.P., 1980. Dropouts and turnover: The synthesis and test of a causal model of student attrition. Res. High. Educ. 12, 155–187.

Bean, J.P., Eaton, S.B., 2001. The psychology underlying successful retention practices. J. Coll. Stud. Retent. Res. Theory Pract. 3, 73–89.

Bean, J.P., Metzner, B.S., 1985. A conceptual model of nontraditional undergraduate student attrition. Rev. Educ. Res. 55, 485–540.

Benbasat, I., Goldstein, D.K., Mead, M., 1987. The Case Research Strategy in Studies of Information Systems. MIS Q. 11, 369–386.

Bennis, W., 1989. Why leaders can't lead. Jossey-Bass San Francisco.

Bernhardt, V.L., 1999. Databases can help teachers with standards implementation. California Association for Supervision and Curriculum Development.

bin Mat, U., Buniyamin, N., Arsad, P.M., Kassim, R., 2013. An overview of using academic analytics to predict and improve students' achievement: A proposed proactive intelligent intervention, in: Engineering Education (ICEED), 2013 IEEE 5th Conference On. IEEE, pp. 126–130.

Blake, R., Mouton, J., 1964. The managerial grid: The key to leadership excellence. Houst. Gulf Publ. Co., Yes 140–142.
Boston, W.E., Ice, P., Gibson, A.M., 2011. Comprehensive assessment of student retention in online learning environments. Online J. Distance Learn. Adm. 14.
Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3, 77–101.
Braxton, J.M. (Ed), 2002. Reworking the student departure puzzle. Vanderbilt University Press, Nashville, TN.
Braxton, J.M. (Ed), Hirschy, A.S., McClendon, S.A., 2004. Understanding and reducing college student departure. Jossey-Bass, San Francisco, CA.
Braxton, J.M. (Ed), Milem, J.F., Sullivan, A.S., 2000. The influence of active learning on the college student departure process: Toward a revision of Tinto's theory. J. High. Educ. 71, 569–590.
Brooks, I., 2009. Organisational Behaviour, 4th ed, Yes. Prentice Hall.
Bryman, A., 2012. Social research methods. Oxford university press.
Burnes, B., 2003. Managing change and changing managers from ABC to XYZ. J. Manag. Dev. 22, 627–642. https://doi.org/10.1108/02621710310484768
Burns, J.M., 1978. leadership. NY. Harper & Row.
Cabrera, A.F., Castañeda, M.B., Nora, A., 1993. College persistence: Structural equations modeling test of an integrated model of student retention. J. High. Educ. 64, 143–164.
Cabrera, A.F., Castañeda, M.B., Nora, A., Hengstler, D., 1992. The convergence between two theories of college persistence. J. High. Educ. 63, 143–164.
Carruthers, C., Jackson, P., 2018. The Chief Data Officer's Playbook. Facet Publishing.
Cattell, R.B., 1956. Second-order personality factors in the questionnaire realm. J. Consult. Psychol. 20, 411.
Cattell, R.B., 1946. Description and measurement of personality.
Chen, M., Mao, S., Liu, Y., 2014. Big data: A survey. Mob. Netw. Appl. 19, 171–209.
Chickering, A.W., Gamson, Z.F., 1987. Seven principles for good practice in undergraduate education. AAHE Bull. 3, 7.
Chuah, M., Wong, K., 2011. A review of business intelligence and its maturity models. Afr. J. Bus. Manag. 5, 3424–2428.
CIT, 2018. CIT Strategic Plan 2018-2023.
CIT, 2012a. CIT Strategic Plan 2012-2016.
CIT, 2012b. 2011/2012 Programmatic Review of the School of Science & Informatics.
Clayton, M., 2017. The Management Pocketbook Blog. URL https://www.pocketbook.co.uk/blog/2017/05/16/robert-blake-jane-mouton-managerial-grid/
Cohen, L., Manion, L., Morrison, K., 2011. Research methods in education. Routledge.
Currie, G., Humphreys, M., Ucbasaran, D., McManus, S., 2008. Entrepreneurial leadership in the English public sector: paradox or possibility? Public Adm. 86, 987–1008.
Davenport, T., Harris, J., 2017. Competing on Analytics: Updated, with a New Introduction: The New Science of Winning. Harvard Business Press.
Davenport, T.H., 2013. Analytics 3.0. Harv. Bus. Rev. 91, 64-+.
Davenport, T.H., 2009. Make better decisions. Harv. Bus. Rev. 87, 117–123.
Davenport, T.H., Dyché, J., 2013. Big data in big companies. May 2013.

Davenport, T.H., Harris, J.G., Morison, R., 2010. Analytics at work: Smarter decisions, better results. Harvard Business Press.
Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 319–340.
Delen, D., 2010. A comparative analysis of machine learning techniques for student retention management. Decis. Support Syst. 49, 498–506. https://doi.org/10.1016/j.dss.2010.06.003
Deloitte, 2016. The evolving role of the chief data officer in financial services: From marshal and steward to business strategist. URL https://www2.deloitte.com/content/dam/Deloitte/uy/Documents/strategy/gx-fsi-evolving-role-of-chief-data-officer.pdf (accessed 4.19.19).
DuBrin, A.J., 2007. Leadership research findings, practice, and skills 5th edition, 5th ed. Houghton Mifflin Company, Boston.
Eckerson, W., 2007. Benchmarking your BI Maturity. Benchmarking Your BI Matur. URL http://download.101com.com/tdwi/Webinar/benchmarkingBIMaturity/files/lobby.html (accessed 8.11.15).
Eckles, J., ecklesj@rhodes. edu, Stradley, E., 2012. A social network analysis of student retention using archival data. Soc. Psychol. Educ. 15, 165–180.
Economist Intelligence Unit, 2011. Big data: Harnessing a game-changing asset. The Economist.
Eisenhardt, K.M., 1989. Building theories from case study research. Acad. Manage. Rev. 14, 532–550.
Eivers, E., Flanagan, R., Morgan, M., 2002. NON-COMPLETION IN INSTITUTES OF TECHNOLOGY: AN INVESTIGATION OF PREPARATION, ATTITUDES AND BEHAVIOURS AMONG FIRST YEAR STUDENTS.
Fass, M.E., Tubman, J.G., 2002. The influence of parental and peer attachment on college students' academic achievement. Psychol. Sch. 39, 561–573.
Fayol, H., 1916. General principles of management. Class. Organ. Theory 2, 57–69.
Fiedler, F.E., 1967. A theory of leadership effectiveness.
Fike, D.S., Fike, R., 2008. Predictors of First-Year Student Retention in the Community College. Community Coll. Rev. 36, 68–88.
Fleishman, E.A., 1970. Manual for the supervisory behavior description questionnaire. American Institutes for Research, Washington, DC.
Fleishman, E.A., Harris, E.F., Burtt, H.E., 1955. Leadership and supervision in industry; an evaluation of a supervisory training program. Ohio State Univ. Bur. Educ. Res. Monogr., Yes.
Fleming, T., 2011. The Struggle for Recognition in Hegel, Honneth and Higher Education: What non-traditional students say?, in: CAVE Conference on Bildung in the Contemporary University. Dublin, Trinity College.
Fleming, T., Finnegan, F., 2011. NON-TRADITIONAL STUDENTS IN IRISH HIGHER EDUCATION.
French, J.W., 1953. The description of personality measurements in terms of rotated factors.
Fritz, J., 2011. Classroom walls that talk: Using online course activity data of successful students to raise self-awareness of underperforming peers. Web Min. High. Educ. Introd. Spec. Issue 14, 89–97. https://doi.org/10.1016/j.iheduc.2010.07.007

Gartner, 2010. ITScore Overview for Business Intelligence and Performance Management | 1433813 [WWW Document]. URL http://www.gartner.com/id=1433813 (accessed 9.21.13).

Gatenby, M., Rees, C., Truss, C., Alfes, K., Soane, E., 2015. Managing Change, or Changing Managers? The role of middle managers in UK public service reform. Public Manag. Rev. 17, 1124–1145. https://doi.org/10.1080/14719037.2014.895028

Gemme, E.M., 1997. Retaining customers in a managed care market. Mark. Health Serv. 17, 19.

Gerdes, H., Mallinckrodt, B., 1994. Emotional, Social, and Academic Adjustment of College Students: A Longitudinal Study of Retention - Gerdes - 2011 - Journal of Counseling & Development - Wiley Online Library. J. Couns. Dev. 72, 281–288.

Glaser, B., Strauss, A.L., 1967. Strauss (1967): The Discovery of Grounded Theory: Strategies for Qualitative Research. Lond. Wiedenfeld Nicholson.

Gomez, D., 2013. LEADERSHIP BEHAVIOR AND ITS IMPACT ON STUDENT SUCCESS AND RETENTION IN ONLINE GRADUATE EDUCATION. Acad. Educ. Leadersh. J. 17, 13–37.

Hagerty, J., 2006. AMR Research's Business Intelligence/Performance Management Maturity Model, Version 2. AMR Res. Najdeno 25.

Hales, C., 2002. 'Bureaucracy-lite'and continuities in managerial work. Br. J. Manag. 13, 51–66.

Halpin, A.W., Winer, B.J., 1957. A factorial study of the leader behavior descriptions. Lead. Behav. Its Descr. Meas. 39–51.

Harris, S.G., Sutton, R.I., 1986. Functions of parting ceremonies in dying organizations. Acad. Manage. J. 29, 5–30.

Hayashi, Y., Hsieh, M.-H., Setiono, R., 2010. Understanding consumer heterogeneity: A business intelligence application of neural networks. Knowl.-Based Syst. 23, 856–863. https://doi.org/10.1016/j.knosys.2010.05.010

He, J., Bailey, J., Rubinstein, B.I., Zhang, R., 2015. Identifying at-risk students in massive open online courses, in: Twenty-Ninth AAAI Conference on Artificial Intelligence.

He, W., 2013. Examining students' online interaction in a live video streaming environment using data mining and text mining. Spec. Sect. Youth Internet Wellbeing 29, 90–102. https://doi.org/10.1016/j.chb.2012.07.020

Healy, M., Carpenter, A., Lynch, K., 1999. Non-completion in Higher Education: A study of First Year Students in Three Institutes of Technology IT Carlow, Dundalk IT, IT Tralee. Carlow: Carlow Institute of Technology.

Honig, M.I., Coburn, C., 2008. Evidence-based decision making in school district central offices: Toward a policy and research agenda. Educ. Policy 22, 578–608.

House, R.J., 1971. A Path Goal Theory of Leader Effectiveness. Adm. Sci. Q., Yes 16, 321–339. https://doi.org/10.2307/2391905

HP, 2009. Business Intelligence Maturity Model: Describing the BI journey. [WWW Document]. URL http://www.computerwoche.de/fileserver/idgwpcw/files/1935.pdf (accessed 12.5.15).

HP, 2007. The HP Business Intelligence Maturity Model: describing the BI journey. URL www8.hp.com/h20195/v2/GetPDF.aspx%2F4AA3-9723ENW.pdf (accessed 11.24.15).

Hribar Rajterič, I., 2010. Overview of business intelligence maturity models. Manag. J. Contemp. Manag. Issues 15, 47–67.
Hu, S., 2011. Reconsidering the Relationship Between Student Engagement and Persistence in College. Innov. High. Educ. 36, 97–106.
IBM Institute for Business Value, 2016. The Chief Data Officer's Playbook.
Jago, A.G., 1982. Leadership: Perspectives in theory and research. Manag. Sci. 28, 315–336.
Joffe, H., Yardley, L., 2004. 4 CONTENT AND THEMATIC ANALYSIS. Res. Methods Clin. Health Psychol. 56.
Johnson, R.S., 1996. Setting our sights: Measuring equity in school change. Achievement Council.
Kelly, K., Patrocínio, C., Marshall, C., 2012. Prediction of Student Performance in Engineering Programs. Eng. Educ. 23, 26.
Kirkpatrick, S.A., Locke, E.A., 1991. Leadership: do traits matter? The executive 5, 48–60.
Kouzes, J.M., Posner, B.Z., 1987. The leadership challenge: How to get extraordinary things done in organizations. San Franc. Lossey-Bass, Yes 30–35.
Kuh, G., 2009. What matters to student success.
Kuh, G.D., 2003. What we're learning about student engagement from NSSE: Benchmarks for effective educational practices. Change Mag. High. Learn. 35, 24–32.
Kuh, G.D., 2001. The National Survey of Student Engagement: Conceptual framework and overview of psychometric properties. Bloomingt. Indiana Univ. Cent. Postsecond. Res. 1–26.
Kuh, G.D., Cruce, T.M., Shoup, R., Gonyea, R.M., 2008a. Project MUSE - Unmasking the Effects of Student Engagement on First-Year College Grades and Persistence [WWW Document]. URL http://muse.jhu.edu/login?auth=0&type=summary&url=/journals/journal_of_higher_education/v079/79.5.kuh.html (accessed 9.4.13).
Kuh, G.D., Cruce, T.M., Shoup, R., Kinzie, J., Gonyea, R.M., 2008b. Unmasking the Effects of Student Engagement on First-Year College Grades and Persistence. J. High. Educ. 79, 540–563.
Lachat, M.A., Smith, S., 2005. Practices that support data use in urban high schools. J. Educ. Stud. Placed Risk 10, 333–349.
Landy, F.J., 1985. Psychology of work behaviour. Dorsey Press, Homewood IL.
Lau, L.K., 2003. Institutional factors affecting student retention. Educ.-Indianap. THEN CHULA VISTA- 124, 126–136.
Lee, H., Lee, Y., Cho, H., Im, K., Kim, Y.S., 2011. Mining churning behaviors and developing retention strategies based on a partial least squares (PLS) model. Decis. Support Syst. 52, 207–216. https://doi.org/10.1016/j.dss.2011.07.005
Lee, Y., Madnick, S.E., Wang, R.Y., Wang, F., Zhang, H., 2014. A cubic framework for the chief data officer: Succeeding in a world of big data.
Leigh, T.W., Marshall, G.W., 2001. Research priorities in sales strategy and performance. J. Pers. Sell. Sales Manag. 21, 83–93.
Likert, R., 1961. New Patterns of Management, Yes. McGraw-Hill Book Co., New York.
Lincoln, Y.S., 1985. Naturalistic inquiry. Sage.
Loftus, M., McGlynn, H., 2012. Report for Programmatic Review Panel on CIT's Faculty of Science & Informatics 2009 - 2011.

Lord, R.G., De Vader, C.L., Alliger, G.M., 1986. A meta-analysis of the relation between personality traits and leadership perceptions: An application of validity generalization procedures. J. Appl. Psychol. 71, 402.
Lowe, K.B., Kroeck, K.G., Sivasubramaniam, N., 1996. Effectiveness correlates of transformational and transactional leadership: A meta-analytic review of the MLQ literature. Leadersh. Q. 7, 385–425.
MacNealy, M.S., 1997. Toward better case study research. Prof. Commun. IEEE Trans. On 40, 182–196. https://doi.org/10.1109/47.649554
Mann, R.D., 1959. A review of the relationships between personality and performance in small groups. Psychol. Bull. 56, 241.
McAfee, A., Brynjolfsson, E., Davenport, T.H., 2012a. Big data: the management revolution. Harv. Bus. Rev. 90, 60–68.
McAfee, A., Brynjolfsson, E., Davenport, T.H., Patil, D.J., Barton, D., 2012b. Big data. Manag. Revolut. Harv. Bus Rev 90, 61–67.
McGregor, D., 1960. The human side of enterprise. N. Y. 21, 166.
McKenzie, K., Schweitzer, R., 2001. Who succeeds at university? Factors predicting academic performance in first year Australian university students. High. Educ. Res. Dev. 20, 21–33.
Mellon, C.A., 1990. Naturalistic inquiry for library science.
Milem, J.F., Berger, J.B., 1997. A modified model of college student persistence: Exploring the relationship between Astin's theory of involvement and Tinto's theory of student departure. J. Coll. Stud. Dev. 38, 387.
Muchinsky, P.M., 1983. Psychology applied to work. Dorsey Press, Homewood IL.
Muntean, M., Bologa, A.-R., Bologa, R., Florea, A., 2011. The use of multidimensional models to increase the efficiency of management support systems. IJM3AS 8, 1334–1344.
Murtaugh, P.A., Burns, L.D., Schuster, J., 1999. Predicting the retention of university students. Res. High. Educ. 40, 355–371.
Nagle, T., Sammon, D., 2017. THE DATA VALUE MAP: A FRAMEWORK FOR DEVELOPING SHARED UNDERSTANDING ON DATA INITIATIVES.
Nagle, T., Sammon, D., Doyle, C., 2016. Meeting in the middle: bridging the practice research divide from both sides, in: ECIS 2016: Twenty-Fourth European Conference on Information Systems. AIS Electronic Library (AISeL).
National Survey of Student Engagement, 2007. Student engagement: Pathways to collegiate success. Indiana University, Center for Postsecondary Research, Bloomington, Indiana.
National Survey of Student Engagement, 2004. Student engagement: Pathways to collegiate success. Indiana University, Center for Postsecondary Research, Bloomington, Indiana.
Naylor, R., Baik, C., Arkoudis, S., 2018. Identifying attrition risk based on the first year experience. High. Educ. Res. Dev. 37, 328–342.
NCLBAct, 2002. No child left behind act of 2001. Publ L 107–110.
NIST, 2015. NIST Big Data Interoperability Framework: Volume 1, Definitions [WWW Document]. NIST. URL (accessed 8.25.17).
Northouse, P.G., 2012. Leadership: Theory and practice. Sage Publications.
Northouse, P.G., 1997. Leadership: Practice and theory. Thousand Oaks, CA: Sage.
Othman, A.E.A., Suleiman, W., 2013. An Analysis of Causes of Poor Attitude to Work. 9th Int. Conf. Cogn. Sci. 97, 194–200. https://doi.org/10.1016/j.sbspro.2013.10.222

Pascarella, E.T., Terenzini, P.T., 2005. How college affects students: A third decade of research (Vol. 2). San Francisco: Jossey-Bass.
Pascarella, E.T., Terenzini, P.T., 1980. Predicting freshman persistence and voluntary dropout decisions from a theoretical model. J. High. Educ. 60–75.
Pascarella, Terenzini, 1991. How college affects students: Findings and insights from twenty years of research. Jossey-Bass, San Francisco.
Peltier, G.L., Laden, R., Matranga, M., 2000. Student persistence in college: A review of research. J. Coll. Stud. Retent. Res. Theory Pract. 1, 357–375.
Picciano, A.G., 2012. The Evolution of Big Data and Learning Analytics in American Higher Education. J. Asynchronous Learn. Netw. 16, 9–20.
Punch, K.F., 2005. Introduction to social research: Quantitative and qualitative approaches. Sage.
Quinn, R.E., Rohrbaugh, J., 1983. A spatial model of effectiveness criteria: Towards a competing values approach to organizational analysis. Manag. Sci. 29, 363–377.
Raber, D., Winter, R., Wortmann, F., 2012. IEEE Xplore - Using Quantitative Analyses to Construct a Capability Maturity Model for Business Intelligence. Presented at the International Conference on System Sciences, IEEE Computer Society, Hawaii.
Raths, D., 2012. Focus on KM in higher education. KM World 21, 10–11.
Redman, T., 2015. Friday Afternoon Measure. YouTube.
Redman, T.C., 2008. Data driven: profiting from your most important business asset. Harvard Business Press.
Redman, T.C., 1998. The impact of poor data quality on the typical enterprise. Commun. ACM 41, 79–82.
Robbins, S.B., Lauver, K., Le, H., Davis, D., Langley, R., Carlstrom, A., 2004. Do psychosocial and study skill factors predict college outcomes? A meta-analysis. Psychol. Bull. 130, 261.
Romero-Zaldivar, V.-A., Pardo, A., Burgos, D., Delgado Kloos, C., 2012. Monitoring student progress using virtual appliances: A case study. Comput. Educ. 58, 1058–1067. https://doi.org/10.1016/j.compedu.2011.12.003
Smith, V.C., Lange, A., Huston, D.R., 2012. Predictive Modeling to Forecast Student Outcomes and Drive Effective Interventions in Online Community College Courses. J. Asynchronous Learn. Netw. 16, 51–61.
Stogdill, R.M., 1948. Personal factors associated with leadership: A survey of the literature, in: Leadership: Selected Readings. Penguin Books Ltd, Harmondsworth, Middlesex, England, pp. 91–133.
Stogdill, R.M., Coons, A.E., 1957. Leader behavior: Its description and measurement.
Thomas, G., 2010. How to do your case study: A guide for students and researchers. Sage.
Thomas, L., 2002. Student retention in higher education: the role of institutional habitus. J. Educ. Policy 17, 423–442.
Tinto, 1993. Leaving college: Rethinking the causes of student attrition (2nd ed.), 2nd ed. University of Chicago Press, Chicago.
Tinto, V., 2010. Enhancing Student Retention: Lessons Learned in the United States. Presented at the National Conference on Student Retention, Dublin, Ireland.
Tinto, V., 2006. Research and practice of student retention: what next? J. Coll. Stud. Retent. Res. Theory Pract. 8, 1–19.

Tinto, V., 2005. Taking student success seriously: Rethinking the first year of college, in: Ninth Annual Intersession Academic Affairs Forum, California State University, Fullerton. pp. 05–01.
Tinto, V., 1975. Dropout from higher education: A theoretical synthesis of recent research. Rev. Educ. Res. 89–125.
Tinto, V., Pusser, B., 2006. Moving from theory to action: Building a model of institutional action for student success. Natl. Postsecond. Educ. Coop. 1–51.
Umbach, P.D., Wawrzynski, M.R., 2005. Faculty do matter: The role of college faculty in student learning and engagement. Res. High. Educ. 46, 153–184.
Vukšić, V.B., Bach, M.P., Popovič, A., 2013. Supporting performance management with business process management and business intelligence: A case analysis of integration and orchestration. Int. J. Inf. Manag. 33, 613–619. https://doi.org/10.1016/j.ijinfomgt.2013.03.008
Webster, A.L., Showers, V.E., 2011. Measuring Predictors of Student Retention Rates. Am. J. Econ. Bus. Adm. 3, 296–306.
Westbrook, L., 1994. Qualitative research methods: A review of major stages, data analysis techniques, and quality controls. Libr. Inf. Sci. Res. 16, 241–254.
Wirth, R., Hipp, J., 2000. CRISP-DM: Towards a standard process model for data mining, in: Proceedings of the 4th International Conference on the Practical Applications of Knowledge Discovery and Data Mining. Citeseer, pp. 29–39.
Woosley, S.A., Miller, A.L., 2009. Integration and institutional commitment as predictors of college student transition: Are third week indicators significant? Coll. Stud. J. 43, 1260.
Xu, F., Zhan, H., Huang, W., Xin (Robert) Luo, Xu, D., 2016. The Value of Chief Data Officer presence on Firm Performance. Presented at the PACIS, p. 213.
Yin, R., 2003. Case study research: Design and methods. Sage Publ. Inc 5, 11.
Yin, R.K., 2009. Case study research: Design and methods. Sage.
Yin, R.K., 1981. The case study crisis: some answers. Adm. Sci. Q. 26, 58–65.
Yu, B.T.W., To, W.M., 2013. The effect of internal information generation and dissemination on casino employee work related behaviors. Int. J. Hosp. Manag. 33, 475–483. https://doi.org/10.1016/j.ijhm.2012.11.007
Yukl, G., Gordon, A., Taber, T., 2002. A hierarchical taxonomy of leadership behavior: Integrating a half century of behavior research. J. Leadersh. Organ. Stud. 9, 15–32.
Yukl, G.A., 2002. Leadership in organizations.
Yukl, G.A., 1994. Leadership in organizations. Pearson Education India.
ZDNET, 2019. What is a Chief Data Officer. URL https://www.zdnet.com/article/what-is-a-chief-data-officer-everything-you-need-to-know-about-the-cdo-role/
Zhao, C.-M., Kuh, G.D., 2004. Adding value: Learning communities and student engagement. Res. High. Educ. 45, 115–138.