The Impact of Higher Education Performance Evaluation Frameworks on University Decision Making: A Systems Thinking Approach

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Abstract:

The last 25 years have been very unsettling for higher education providers with a changing student profile, accompanied by an increase in external performance measurement in the form of a series of surveys, frameworks and league tables. In this pressured environment, to ensure that the decisions that are being made are efficient and effective, some form of performance measurement was required.

The adoption of a performance measurement system has enabled the higher education provider to track and monitor their performance and has also provided information to support and enhance their decision-making. This performance measurement system has been developed using the balanced scorecard approach for the framework.

The decision-making and performance measurement activities that are undertaken are not straightforward because the higher education provider is a dynamically complex system. This dynamic complexity is caused by the presence of interconnected components, time delays, feedback and non-linear relationships and leads to policy resistance and decisions that lead to unintended consequences.

This research recommended the adoption of a systems thinking approach to help overcome the complexity that is present in the system. This research thus integrated the balanced scorecard approach with the system dynamics methodology to create a performance measurement system. The research took the format of a case study of a higher education provider based in England where students pay to study. The research process adopted included interviews and group workshops to elicit tacit knowledge, and the data gathered was analysed using an approach informed by grounded theory.

The performance measurement system included a causality map that evidenced the complexity that exists within the higher education provider and explained how this impacted the decision-making that is undertaken. The causality map informed the production of a strategy map that linked the higher education provider's strategy to the operational level decision-making undertaken. This causality map demonstrated the concurrent decision-making that needed to occur to ensure success and informed the production of the strategy map which incorporated the appropriate KPIs.

The process of engaging stakeholders in the elicitation of tacit knowledge provided the decision makers with an opportunity to reflect on their mental models which has the potential to lead to mental model enhancement as well as sustained individual knowledge and enhancing organisational learning.

The contributions to theory are the extensions and challenges to the three theoretical underpinning theories in this research namely: the adoption of the BSC as the framework for the PMS; the acceptance of the concept of bounded rationality; and the applications of the systems thinking perspective. The contributions to practice are the creation of an environment that facilitates individual and organisational learning, the adoption of the outputs to support continuing professional development of current and future leaders, and the identification of the key areas that drive success.

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List of abbreviations

AACSB	Association to advance collegiate schools of business
A&F	Assessment and feedback
APC	Attainment, progression and continuation
BSC	Balanced scorecard
CLD	Causal loop diagram
CMT	Central management team
CPD	Continuing professional development
DBSC	Dynamic balanced scorecard
DCS	Dynamically complex system
DPL	Deputy programme leader
ECR	Early careers researcher
FTE	Full time equivalent
GMB	Group model build
GOS	Graduate Outcomes Survey
HE	Higher education
HEP	Higher education provider
HESA	Higher Education Statistics Agency
IBP	Internal business processes
KEF	Knowledge Exchange Framework
KEEP	Knowledge Exchange and Embed Partnerships
KPI	Key Performance Indicator
KTP	Knowledge Transfer Partnership
L&G	Learning and growth
L&T	Learning and teaching
LRC	Learning resources centre
NCIHE	National committee of inquiry into higher education
NPM	New public management
NSS	National Student Survey
OfS	Office for students
PEF	Performance evaluation framework
PG	Postgraduate

PL	Programme leader
PLT	Programme leader team
PM	Performance measurement
PMS	Performance measurement system
PRES	Postgraduate Research Experience Survey
PTES	Postgraduate Taught Experience Survey
QR	Quality related research
QSD	Qualitative system dynamics
RAE	Research Assessment Exercise
REF	Research Excellence Framework
RIT	Research informed teaching
SBU	Strategic business unit
SMT	School management team
SSM	Staff satisfaction and motivation
SSR	Staff student ratio
TEF	Teaching Excellence Framework
TKE	Tacit knowledge elicitation
UG	Undergraduate
UGC	University Grants Committee
VL	Visiting lecturer

Chapter 1 Introduction

1.1 Chapter introduction

This chapter will present the history through to the current status of performance measurement in higher education. It will then consider the response by higher education providers to the ongoing performance measurement they are experiencing. The term higher education providers (HEP) is adopted throughout as a term that includes not only universities but all other providers of higher education.

In addition to a discussion of the existing performance measurement that is being undertaken, the impact that this external performance measurement has on decision-making within the higher education providers will also be considered. The chapter will then review the sources of complexity present within the system of higher education and consider an approach that could be adopted to incorporate that complexity.

Following this, the rationale for the research will be explored which will lead to the suggested research aim, questions and outcomes. The research design will then be presented, and the final section of the chapter will provide an overview of the thesis.

1.2 External performance measures of higher education providers

Over the last 40 years successive governments have shown an increased interest in measuring the performance of higher education providers. Historically governments have taken a Keynesian approach to the public sector, this means that they would intervene in the economy by increasing public expenditure on public services. However, during the 1970s as inflation rates doubled, policymakers began to look at new ways to manage the economy and monetarist theories suggested by economists such as Friedman were adopted (McKevitt and Lawton, 1994). The main thrust of the monetarist ideology was that the public sector would be treated like a free market, and these ideas came into the political mainstream when Margaret Thatcher came to power in 1979. During the 1980s, many former state industries were privatised and any public services that were considered unsuitable for privatisation were encouraged to mimic market-based approaches.

This quasi-marketisation led to performance becoming evaluated and incentivised and extended to higher education providers (McKevitt and Lawton, 1994). The Conservative Party had been particularly concerned that higher education providers could prove their value, and in 1985 Sir Alex Jarratt (then Chairman of Reed International and Chancellor of Birmingham University) was commissioned to undertake an efficiency study of universities.

The findings and recommendations from the Jarratt Committee report (Jarrett, 1985) proposed that there was no reliable way of assessing quality within higher education providers, suggesting that decision-making was only partially based on quantitative data and that the data used related to input measures only (Beerkens, 2022). The publication of the Jarratt report emphasised the need for each HEP's governing body to engage more in the determination and monitoring of their policy. Taylor and Baines (2012) noted that the HEPs struggled to resolve the tension between this managerial approach and the more traditional collegial approach of academic self-governance. Jarratt had made recommendations about the governance and management of universities, proposing that Vice

Chancellors effectively become chief executives responsible for overseeing the corporate management of the university (Kennedy and Clare, 2003).

Kennedy and Clare (2003) suggested that by requiring higher education providers to work to clear objectives and achieve "value for money", the Jarratt report (Jarrett, 1985) was effectively recommending the introduction of performance indicators for use by the HEP managers. The report had in fact suggested a series of performance indicators that could be applied, these were divided into three categories: internal, external, and operating performance indicators (Ball and Halwachi, 1987).

The Jarratt report was the first of many initiatives set up by successive governments to control and measure the performance of higher education providers. During this time the key performance indicators (KPIs) that were to be measured went through several iterations and higher education providers currently find themselves being evaluated by a series of measures that includes surveys (NSS, PTES, PRES and GOS) and frameworks (REF, KEF and TEF). There is no collective term for this series of performance measures and so for the purpose of clarity the term performance evaluation frameworks (PEF) is proposed and will be referred to throughout this thesis.

These PEFs measure all of the outputs and outcomes of the higher education providers including student performance, satisfaction and employability, as well as research success and knowledge exchange. The current PEFs in use are the Research Excellence Framework (REF), Graduate Outcomes Survey (GOS), National Student Survey (NSS), Postgraduate Research Experience Survey (PRES), Postgraduate Teaching Experience Survey (PTES), Teaching Excellence Framework (TEF) and the Knowledge Excellence Framework (KEF). In addition to these PEFs, higher education providers are also evaluated on their league table position which is calculated using many of the same measures that are included in the PEFs.

1.3 Performance measurement and decision-making in higher education providers

The increased marketisation of higher education resulted in higher education providers beginning to engage in strategic management and planning activities, and this included some form of performance measurement (Jacobs and Van Der Ploeg, 2006; Lynch and Baines, 2004). The strategic management activities within the higher education provider included the creation of a vision that was accompanied by a strategic plan as to how the higher education provider's goals would be achieved. Once this top-level strategic plan had been developed, the higher education provider needed to communicate this to the business (faculty) and operational levels. At the operational level, the implementation decisions that are made concern how the inputs and processes can be effectively deployed to ensure that the higher education provider strategy is achieved (Lowson, 2003; Slack and Brandon-Jones, 2019; Stacey, 2007; Whittington et al., 2017).

In addition to achieving their goals, higher education providers aimed to be successful in both the PEFs and in their league table position. To achieve this success they needed to engage in effective decision-making accompanied by an ongoing review of the results arising from those decisions (Goodall and Baker, 2015; Sarrico and Dyson, 2000; Trowler, 2002). The decision-making that is necessary to achieve the desired performance outcomes is made complicated by a number of factors: the high stakes challenges the higher education provider faces; the need to satisfy many stakeholders; the pressure to be successful in the decision-making at the operational level; and the

difficulties experienced in resource allocation decision-making (Kezal and Eckel, 2004; Whitchurch and Gordon, 2007).

As well as the decision-making being complicated in higher education, the necessary performance measurement to evaluate the outcomes of those decisions is also complicated as there are many possible measures that could be used. Sarrico and Dyson (2000) noted a tension as higher education providers try to both establish their own quality measures as well as provide the necessary external performance metrics. One approach to address this is to create a performance measurement system (PMS) that is informed by the metrics used in the PEFs calculations, which also inform the league tables (Dill and Soo, 2005; Hazelkorn, 2007).

This is unlikely to be a straightforward activity because the higher education provider is an example of a complex social system with many levels and sources of complexity present in both the environment in which the HEP operates and within the HEP itself (Galbraith, 1999). This complexity creates difficulties in the management and decision-making that needs to occur for a higher education provider to be successful in achieving their desired performance outcomes.

1.4 Addressing the complexity present in higher education

The higher education provider can be considered to be a dynamically complex system because of its characteristics, namely: it has many interconnected components, multiple feedback loops, non-linear causality relationships and major time delays. These characteristics make any decision-making activity subject to policy resistance and unintended consequences (Ghaffarzadegan et al., 2017; McGee and Edson, 2014).

Assidmi (2015) recommends the adoption of a systems thinking approach to help overcome the complexity that is present in the system. The systems thinking paradigm moved thinking away from the use of traditional management reductionist and cause effect thinking, to thinking about the role of the individual parts within the system (Daellenbach & McNickle, 2005). Systems thinking draws upon a collection of interdisciplinary fields and enables the researcher to select methods and theories from these fields to gain insights from the stakeholders to examine the system (McGill et al., 2021). The approach provided a quick and powerful means of gaining a qualitative overview of the many challenges facing organisations and offered a range of concepts and a series of practical methodologies that can assist in tackling real-world problems and can be applied within any discipline (Mingers, 2015; Warren, 2008).

1.5 Rationale for the research

Government interest in measuring the performance of higher education providers has a history going back over the past 40 years. Originally KPIs were suggested as an optional activity but, the introduction of a series of PEFs, together with an increasingly competitive environment, means that HEPs no longer have a choice but to engage in some form of performance measurement. This has also meant that higher education providers have had to engage in strategic management and planning activities, which has included the development of a vision with associated objectives and targets that can track performance success (Jacobs and Van Der Ploeg, 2006).

The inherent complexity of HEPs makes management and decision-making more difficult especially when aiming to enhance performance to achieve the best possible outcomes in all of the different PEFs. The adoption of a performance measurement system, that can monitor how effectively and efficiently resources are being allocated and track attainment towards the performance goals, would be beneficial (ter Bogt and Scapens, 2012). Traditionally many higher education providers have not possessed a performance measurement system due to the difficulties associated with its creation and acceptance (Broad and Goddard, 2010). The Balanced Scorecard (BSC) is one framework that could be used to provide a foundation from which a performance measurement system could be developed. Not only would the adoption of a PMS enable the higher education provider to track and monitor the performance that is occurring, but the information provided can also be used to support and enhance the decision-making activity.

It was noted earlier that the complexity present in the system of education generally, and also within the HEP system, creates difficulties in the management and decision-making that needs to occur. One way to overcome the issues associated with the presence of this complexity is the adoption of a systems thinking approach. One such approach is the system dynamics methodology; this is a set of principles that uses modelling techniques to tackle the dynamic problems that exist in complex systems. The adoption of the system dynamics methodology provides users with a better understanding of their position in the system, this is achieved through the identification of the underlying feedback structures and the potential to highlight the consequences of any decisions made on the system (Barnabè, 2004, Barnabè and Busco, 2012; Bérard, 2010).

Barlas and Diker (2000) also support the application of system dynamics and say that it is particularly applicable to this research because of the dynamic and perennial nature of performance measurement problems in HEPs. The integration of the system dynamics methodology with the traditional balanced scorecard could be one possible approach to use to produce a performance measurement system. The PMS would show how the strategic plan is linked to the operational level, the key performance indicators included would measure the results of any management decisions that are made, and thus they can be used to identify where any improvement in the performance achieved is necessary (Barnabè and Busco, 2012).

The production of this PMS would have other advantages in that it could help decision makers overcome any cognitive challenges they might possess as it offers a visualisation of the strategic goals being pursued (Banker et al., 2011). As the contents of any PMS would be derived from the end users' tacit knowledge, it will also provide a representation of their mental models and this has potential to improve operational decision-making (Humphreys et al., 2016; Ossadnik et al., 2013). Lastly, the process by which a performance measurement system is produced, will enable both individual and organisational learning to occur as their involvement would lead to improvements in their mental models (Barnabè and Busco, 2012).

Although there are many examples of balanced scorecard applications, there has been considerably less research about the adoption of the BSC for use in a higher education provider (Philbin, 2011). Moreover, there is a lack of research with regards to the implementation and evaluation of the use of the balanced scorecard combined with a system dynamics methodology to produce a performance measurement system. Thus this research presents an opportunity to address this gap and produce such a performance measurement system, which could add to the body of existing work in both the field of balanced scorecard applications in higher education and the field of system dynamics.

This research will integrate the balanced scorecard approach with the system dynamics methodology to create a performance measurement system that addresses the HEP management problems both holistically and dynamically. This will be achieved as the PMS will incorporate a strategy map that links the HEP's strategy to the operational level decision-making undertaken. The production of the strategy map will require the construction of a set of KPIs, these will be representative of the participants' views and therefore are more likely to be acceptable.

The data that is required to create the PMS will be acquired through the elicitation of tacit knowledge, engagement in the process will provide the participants with an opportunity to surface and test their mental models in both individual and group settings. This process will both sustain individual knowledge and foster organisational learning. Devising this performance measurement system also presents an opportunity to inform the researcher's own personal practice as a senior manager in an HEP.

In summary, this research has great potential, as firstly, it will evidence the complexity that exists within the higher education provider and explain how this impacts the decision-making that is undertaken. Secondly, the research will demonstrate the concurrent decision-making that needs to occur to ensure success in the PEFs. Thirdly, the process that is undertaken to acquire the necessary information to achieve this, will provide decision makers with an opportunity to reflect on their mental models which has the potential to lead to mental model enhancement. Fourthly, the resulting PMS will include a set of KPIs that are aligned to the PEFs and show the relationships between the decisions made and the outcomes achieved and thus these KPIs will support future decision-making.

Finally, the research could also inform and support decision makers in other higher education providers and across a wider educational context. Consequently, the purpose of this research is to critically investigate the impact of higher education performance evaluation frameworks on decision-making within a higher education provider while adopting a systems thinking approach. This has not been undertaken at the scale proposed here nor has anything similar been produced within the context of the UK higher education system.

1.6 Research aim, questions, and outcomes

The above rationale led to the development of the following research aim: to produce a performance measurement system that can support the decision-making activity to successfully achieve the desired performance outcomes. This performance measurement system framework will be created by utilising the system dynamics methodology to ensure that the complexity present in the system is captured during the data collection, the adoption of this methodology will also create an environment that will support participant and stakeholder learning.

To achieve this aim the following research questions were developed:

RQ1: What are the KPIs that translate the strategy of the HEP into performance indicators to measure attainment and act as proxies for the desired performance to be achieved in the PEFs?

This research question recognises that within higher education there are multiple KPIs and therefore the research aims to identify those KPIs that the participants and stakeholders deem most appropriate in the attainment of the PEFs.

RQ2: How can an HEP be represented as a dynamically complex system? How is this complexity captured in the system's causality map of the HEP?

This research question is aiming to see whether participants and stakeholders recognise the complexity that is present in the system. Once this data has been collated it will be used to create a causality map of the system.

RQ3: How can the system dynamics methodology be employed to create an environment to facilitate learning?

This research question will consider whether participant and stakeholder engagement in the process has provided an opportunity for learning.

RQ4: Can a framework, that demonstrates the interdependencies between the KPIs and shows how the underlying perspectives that create performance are interlinked, be created to support decision-making?

This research question will address the objective of determining the format of and creating a PMS that can support decision-making.

By addressing the research questions, the outcomes from this research will thus be:

1. the creation of a set of KPIs that represent the desired performance outcomes;
2. the production of a systems causality map that captures the complexity present in the HEP;
3. a justification of how the system dynamics techniques could be employed in the context of this research;
4. the production of a strategy map that forms the basis for a performance measurement system that can be used to guide decision-making but that will also, through its application, create an environment that can support and enhance individual and organisational learning.

1.7 The research study

This research will adopt the system dynamics methodology, this is an interpretivist paradigm where knowledge is shared as participants are engaged and involved in the process of creating the PMS. The philosophy adopted is that of critical realism, system dynamics epitomises the major premises of critical realism by its nature of being rooted in a system's view and focused on the importance of feedback loops. This research will take the format of a case study in a new HEP, the researcher is a senior manager in the HEP and has an active role in the decision-making activity that occurs within the HEP while also undertaking their academic research. The research process to be adopted will include stakeholder interviews and group workshops, the data that is elicited will be analysed using a coding method that is influenced by the grounded theory approach.

The theoretical underpinnings of this research are firstly, the adoption of the BSC as the framework for the PMS. The second theoretical underpinning is the acceptance of the concept of bounded rationality as this represents one of the main justifications for the research. And the third theoretical underpinning is the applications of the systems thinking perspective and specifically the qualitative system dynamics methodology as this will enable the research aims to be achieved.

1.8 Thesis overview

The remainder of the thesis is structured as follows:

Chapter 2 Performance measurement in higher education and the response by higher education providers

This chapter provides an overview of the history of performance measurement in higher education, from the introduction of KPIs through to the introduction of the current set of PEFs. The chapter then goes on to review the literature relating to the strategic management and planning response to this and considers how and why decision-making in higher education providers is challenging and complicated. Next, the use of performance measurement systems in higher education is evaluated. Lastly, the chapter suggests that a balanced scorecard approach is adopted, together with a strategy map, to provide a foundation on which to develop a performance measurement system for the higher education provider.

Chapter 3 System dynamics methodology and its applications in higher education providers

The purpose of this chapter is to explore the complexity in which the higher education provider operates, this is achieved by reviewing the sources of dynamic complex present in the system, namely: feedback, time delays, and non-linear relationships. The chapter continues by explaining how these characteristics lead to the presence of bounded rationality and policy resistance. The chapter goes on to suggest system dynamics as a suitable methodology for addressing such complexity, discussing the principles behind it as well as evaluating prior research of the application of the methodology in higher education generally and in the creation of a PMS that is based on the adoption of a BSC.

Chapter 4 Creating a conceptual framework for decision-making in a higher education provider

The aim of this chapter is to develop a conceptual framework that will guide the direction of the research and provide a foundation to ensure credibility by making research findings more meaningful and rigorous and ensuring generalisability (Adom et al., 2018). The conceptual framework will be based upon the balanced scorecard methodology and shows how system dynamics techniques will engage participants in the creation of a framework to support decision-making.

Chapter 5 Research philosophy and methods

This chapter will consider the different research philosophies, paradigms and frameworks available. It will then review the use of the system dynamics methodology and discuss the methodological approach adopted by the researcher. The next part of the chapter will present the research strategy to be adopted and explain the choice of the research methods.

Chapter 6 Causal loop diagrams – creation and discussion

This is the first of two chapters that will present the findings of this research. This chapter will discuss the outcomes from the data collection and analysis stages. Following the individual interviews the causal loop diagrams will be first developed and then validated. Each individual causal loop diagram will be discussed in detail.

Chapter 7 Stakeholder engagement workshops

This is the second of the two chapters that will present the findings of this research. This chapter will discuss how the individual causal loop diagrams will be combined to produce one causal loop diagram that will represent all of the decision-making activity that needs to occur across the school to ensure PEF attainment. The resulting causal loop diagram for the school will be presented first to the school management team and then to the central management team and this chapter will also discuss the outcomes from those two workshops.

Chapter 8 Discussion of findings

The main findings for this research will be presented in this chapter and they will be evaluated against prior research and the conceptual framework. The chapter will also address the research questions.

Chapter 9 Creation of a framework to support decision-making

This chapter will discuss how a strategy map to support the school management team's decision-making process can be developed, it will go on to critique this strategy map against the conceptual strategy map that was proposed in chapter 4.

Chapter 10 Conclusion

This chapter will present the overall findings and recommendations from this research. The chapter will consider the significance of this study, as well as the contribution to theory and to practice. The chapter will also consider the limitations and present any recommendations for further research.

1.9 Chapter conclusion

This chapter has considered the history of performance measurement in higher education and the response by the higher education providers. It was established that the development of a performance measurement system would be beneficial to both support decision-making and track performance outcomes. The research aim was then provided alongside the research questions that would address this aim and the outcomes that would result from the research that was undertaken.

The next chapter will provide a more detailed review of performance measurement in higher education and the response by higher education providers.

Chapter 2 Performance measurement in higher education and the response by higher education providers

2.1 Chapter introduction

The purpose of this chapter is to explain the context in which higher education is currently operating. It will provide a brief review of the history of new public management to show where calls for increased accountability and performance measurement arose from. The chapter will then introduce the key areas that need to be addressed in order to successfully manage an organisation, more specifically a higher education provider (HEP). These entail strategic planning, performance measurement and a consideration of the decision-making activity that is required to attain the level of performance desired.

2.2 The history of performance measurement in higher education

Over the last 40 years, there has been an increase in the interest of performance measurement in Higher Education Providers (HEPs). The legacy of the neo-liberal agenda and its dedication to new public management essentially created a marketised approach to the provision of government services. The marketisation of higher education had been part of the Conservative Party's reform agenda since the late 1960s, but the ideas were not applied directly to universities until the mid-1980s (Middlehurst, 2004; Parker and Gould, 1999). Specifically, there were calls for higher education providers to justify the expenditure of public funds and demonstrate 'value for money' (Deem, 1998).

These calls, to make the sector and individual institutions more efficient and market-oriented in accordance with the characteristics of new public management, led to the creation of a series of policies concerned with areas which included: standardisation, responsiveness, effectiveness, efficiency, funding, quality, performance, consumerisation, corporatisation, competitive funding, student fees, output formats and performance reporting (Bleiklie and Michelsen, 2013; Capano, 2011; Deem, 1998; Howson and Buckley, 2020; Marginson, 2013).

The first wave was 'new managerialism' which spread throughout public sector organisations during the 1980s; this consisted of a package of management ideas which focused on financial management, budgetary controls, efficient use of resources, emphasis on productivity, use of performance indicators, development of consumerism and the discipline of the market (Randle and Brady, 1997). This emphasis on accountability and measuring output meant that the UK was the first European country to introduce an assessment of efficiency, and the Education Secretary at that time, Sir Keith Joseph, commissioned a committee to undertake an efficiency study of universities (Ball and Halwachi, 1987).

2.2.1 The introduction of key performance indicators

In the subsequent report, Jarratt (1985) suggested that there was an increased need for performance measurement due to the requirement for increased accountability, which was driven by an expansion in student numbers, increasing diversity in the student population, diminishing resources, increased competition, greater expectations of students, the need for flexible provision and

increased collaborative activities (Becket and Brookes, 2006). As education became available to a mass audience there was now a perceived need to measure and monitor performance.

However this had not been a practice that HEPs had previously adopted and thus unsurprisingly the report declared that there was a lack of systematic use of key performance indicators (KPIs) by HEPs. The report thus recommended that institutions should develop and use reliable and consistent KPIs, in order to improve the institutional management in higher education (Pollard et al., 2013). Interest in the design and use of KPIs continued throughout the 1980s, and in 1987, the Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom and University Grants Committee (UGC) set up a joint working party to address a green paper, published after the Jarratt report, which strongly advocated the proposal for the development of KPIs to be used in resource allocation (Ball and Wilkinson, 1994).

The 39 KPIs proposed considered expenditure on students, staff, administration, library, computer services, premises, research income, the number of postgraduate students, staff-student ratio and graduate occupations. The KPIs were to be used as a tool to encourage better performance in public sector organisations by setting targets and encouraging an ongoing performance measurement culture (Goh, 2012; Larsen and Lomi, 2002; Morrissey, 2013). In their research, Ball and Halwachi (1987) concluded that KPIs, used appropriately, could provide useful insight into HEP performance but they needed to align to a clear set of goals in the HEP.

Although the use of KPIs was prevalent across the sector of higher education, they were produced at individual HEP level, and it was not until after the Dearing Report (NCIHE, 1997) was published that KPIs began to take the form that is still in use today (Robertson, 1999). The Performance Indicators Steering Group was set up in 1998, and the first formally condoned group of KPIs for UK universities was established by the Higher Education Funding Council for England and published in 1999. The KPIs covered five broad measures of performance: participation of under-represented groups, student progression, learning outcomes (including non-completion), efficiency of learning and teaching, and research output (Breakwell and Tytherleigh, 2010; Pollard et al., 2013).

2.2.2 Other acts

In addition to the growing interest in measuring performance, there have been other major changes in the sector. First, the 1986 and 1988 Education Acts made changes to the provision and funding of higher and further education and placed the funding councils under government control (Filippakou et al., 2010). The 1990 Education (Student Loans) Act introduced 'top-up' loans for students in higher education and began to phase out student grants, and which became one of the major policies that led to the change in the 'competitive landscape' and the increased marketisation of the sector (Kwiek, 2008).

Capacity continued to grow with the Further and Higher Education Act in 1992 (when former polytechnics gained charters allowing them to become universities), leading to a threefold increase in the number of universities between the 1960s and the 1990s, by 2000 there were almost 100 universities, in 2023 this number had grown to 166 universities and as of 2022 there were over 2.86 million students at UK universities. The 1992 Further and Higher Education Act also aligned regulation in the form of quality assessment to funding which could be revoked if the quality was deemed unsatisfactory (Brown, 2000).

The passing of these acts in 1990 and 1992 marked the start of a shift in the direction of greater accountability and responsiveness to student choices (Robertson, 1999). Following calls for more coherence in higher education statistics, the Higher Education Statistics Agency (HESA) was established in 1993 as the official agency for the collection, analysis, and publication of measurable information about universities.

This interest in accountability continued with Lord Dearing's National Committee of Enquiry into Higher Education (NCIHE), which revisited the purposes of higher education as defined by the Robbins report in 1963. The report produced in 1997 led to the establishment of the Quality Assurance Agency to safeguard the standing and meaning of awards and further recommended the use of key indicators to enable HEPs to measure progress against their objectives and enable governing bodies to compare HEP performance (Brown, 2000).

The section above has shown that as the status of higher education has changed from a small number of students attending a few elite universities to HEPs catering to a considerably larger student body. These HEPs have concerns relating to funding, widening access and quality which has prompted policymakers in the HEPs to develop rudimentary systems of indicators and targets in order to clarify the lines of accountability and increase efficiency (Hillebrandt and Huber, 2020). By the end of the century the government was calling for universities to establish and use KPIs to monitor their performance.

2.2.3 Performance evaluation frameworks

Despite the interest that the government had in establishing a set of KPIs to be used by HEPs for reporting purposes, by 2000, what those KPIs were to be was still not agreed upon (Sarrico and Dyson, 2000; ter Bogt and Scapens, 2012). Instead of a disparate set of indicators, a series of performance evaluation frameworks (PEFs) were developed as a response to the increased consumerisation in higher education as well as a drive to be more efficient (Coaldrake and Stedman, 1999; Temple et al., 2014; Willmott, 2003).

Each PEF had a slightly different focus, and they were introduced over a 20-year period. The current PEFs in use are the Research Excellence Framework (REF), Graduate Outcomes Survey (GOS), National Student Survey (NSS), Postgraduate Research Experience Survey (PRES), Postgraduate Teaching Experience Survey (PTES), Teaching Excellence Framework (TEF) and the Knowledge Excellence Framework (KEF). These PEFs will be described in more detail below.

2.2.3.1 Research Excellence Framework

The Research Excellence Framework (REF) was originally called the Research Assessment Exercise (RAE) and was established in 1992 to provide the UGC with a mechanism to allocate funding. In 2014 the REF was introduced to replace the RAE, but its primary purpose was still to assess the quality of research, and the funding bodies would continue to use the assessment outcomes to inform the selective allocation of research grants. The last REF was in 2021, and the next exercise is planned for 2029.

2.2.3.2 Graduate Outcomes Survey

The first employability survey was the National Survey of 1980 Graduates and Diplomates, undertaken by Social and Community Planning Research on behalf of the Department of Employment and the Department of Education and Science. Since then, the survey has been through several iterations: in 1994, it became the First Destination Survey; in 2003, it was replaced by the Destination of Leavers from Higher Education; and in 2018, it became the Graduate Outcomes Survey (GOS). The purpose of this PEF is to capture the perspective and current status of graduates, with the aim being that the results will provide current and future students an insight into career destinations and help HEPs evaluate and promote their offerings. It also helps the government, charities, journalists, researchers, and others to understand the higher education sector and the state of the graduate labour market (Graduate Outcomes, 2018).

2.2.3.3 National Student Survey

The National Student Survey (NSS) was first mooted in the 2003 white paper, The Future of Higher Education, which introduced the idea of a comprehensive survey of students' views which led to the NSS being launched in 2005. The survey is undertaken independently by Ipsos MORI and asks twenty-seven questions relating to student experience gathering opinions from approximately half a million final year undergraduate students across the UK. It is an influential source of public information commissioned by the Office for Students on behalf of the UK funding and regulatory bodies.

2.2.3.4 Postgraduate Research Experience Survey

The Postgraduate Research Experience Survey (PRES) was launched in 2007 as a biennial survey to gather insight from postgraduate research students about their learning and supervision experience. Data from PRES can be used to benchmark HEP's postgraduate provision against others in the sector at both a departmental and institutional level, and nationally the results are also used to inform sector bodies and policymakers about the broad experience students can expect from HEPs across the UK.

2.2.3.5 Postgraduate Taught Experience Survey

The Postgraduate Taught Experience Survey (PTES) was launched in 2009, this was developed by the Higher Education Academy to collect feedback from current taught postgraduate students on their experiences.

2.2.3.6 Teaching Excellence Framework

The Teaching Excellence Framework (TEF) was originally trialled in 2016 to assess excellence in teaching at HEPs as well as to establish how the HEPs ensure excellent outcomes for their students in terms of graduate-level employment or further study. Publicly funded HEPs in England with a TEF award may charge the higher maximum tuition fee. The last Teaching Excellence Framework (TEF) exercise was undertaken in 2023.

2.2.3.7 Knowledge Excellence Framework

The Knowledge Excellence Framework (KEF) is the most recently introduced PEF, originally proposed in 2017, it was eventually introduced in 2021. This annual exercise aims to explore data that explains the different ways HEPs collaborate with external partners, from businesses to community groups, for the benefit of the economy and society. The aim of the KEF is to increase efficiency and effectiveness in the use of public funding for knowledge exchange and to further a culture of continuous improvement in universities.

The composition of the PEFs, together with other data from HESA, are used to inform the league tables and ranking systems (LTRS). In 2007, the first league table was published in The Daily Telegraph named the Good University Guide, and in 2008, the Times Higher Education paper published their first league table. These LTRS have become increasingly important as they provide information to students, stakeholders, and policymakers as well as identify areas of weakness and strength in an HEP in comparison to other HEPs (Dill and Soo, 2005; Hazelkorn, 2013).

There are many issues with the use of LTRS, Keasey et al (2000) suggested that their use can lead to measure fixation and dysfunctional behaviour in managers, which can include risk-seeking behaviour and manipulation of metrics to increase their ranking. Hazelkorn (2007) also noted certain methodological flaws, including the use of arbitrary weightings that are changed from one year to the next, and inconsistent units of comparison that also do not take the HEP's relative size into account.

Despite the issues, to be competitive in the marketplace, it is necessary to be attractive and, in the sector of higher education this is measured by PEF attainment together with the LTRS position (which is based on the components of the PEFs). This is because the data is widely available and continues to be used by a wide audience including the government, senior management, prospective students and their parents, employers, research sponsors and potential academic staff (Breakwell and Tytherleigh, 2010; Dearlove, 1998; Hazelkorn, 2013; Singh, 2002). In her groundbreaking research, Hazelkorn (2007) found that a positive LTRS (and therefore PEF) result had helped HEP reputation and aided publicity, thereby attracting students, increasing academic partnerships and collaboration, enhancing programme development and boosting staff morale.

As it can be seen in the section above, government intervention in the management and performance measurement occurring in universities has a history going back over the past 40 years. (Henceforth the term HEP will be used solely to include all providers of higher education). When KPIs were first introduced it was only a suggestion that HEPs adopt them, eventually this led to the introduction of the PEFs that also inform LTRS and thus this is no longer an optional activity an HEP can decide whether to participate in or not if they wish to be competitive.

The response of HEPs to this increased corporatisation and marketisation of higher education, was to engage in strategic management and planning activities and develop strategic responses in the form of visions, missions, objectives, and targets to ensure performance success (Jacobs and Van Der Ploeg, 2006). This response has also included attempts to introduce performance measurement, and within that activity, the adoption of a performance measurement system (PMS) that could monitor how effectively and efficiently resources were being allocated (ter Bogt and Scapens, 2012). The following section will consider these strategic management and planning activities in more detail.

2.3 Strategic management and planning

The practice of strategic management within an organisation is concerned with determining the organisation's goals and strategies that are necessary to achieve the desired level of performance. It also incorporates the process of assessing progress and results. Although traditionally these activities were associated with profit-making private organisations, the public sector had become increasingly engaged in strategic management activities. The higher education sector was one such public service, and as government intervention increased in this sector, HEPs responded by increasingly engaging in strategic management activities to be able to address any requirements made upon them to continue to secure government funding (McKevitt and Lawton, 1994)

The Jarratt Report (Jarratt, 1985) had already challenged the traditional system of university governance back in 1985, suggesting that the managerial systems adopted needed to be more streamlined (Dearlove, 2002; Middlehurst, 2004; ter Bogt and Scapens, 2012). Many contemporary 'new universities' (i.e. those established in the 1960s) adopted a managerial stance that included the creation of a senior management team consisting of vice-chancellors and pro vice-chancellors and sometimes Deans and registrars (Scott, 1993). Increasingly HEPs were applying managerial techniques that had traditionally been used in medium and large 'for profit' businesses in an attempt to become more 'business-like', creating new administrative and managerial structures that focused on control and regulation (Camilleri, 2021; Deem, 1998).

The increased use of strategic management techniques in HEPs has become necessary given the government's increased interest, and to some extent intervention, in their performance measurement. The first stage in a strategic management exercise, is to develop a strategy as this is essential to be able to achieve the performance goals (Fountain and Fountain, 2013). This activity is especially relevant to HEPs given the changing expectations of higher education together with the fact that, historically, they have not excelled in this activity (Kotler and Murphy, 1981; Powell and Rey, 2015). Strategic development or planning is part of this practice, and it is through a series of discussions, decisions and actions that the strategy is formed (Bryson et al., 2007; Slack and Brandon-Jones, 2019; Whittington et al., 2017). There are three levels of strategic planning which will be discussed next.

2.3.1 Levels of strategic planning

Within an organisation there are three levels of strategic planning required: corporate, business and operational. Each level needs to be aligned and linked to the other levels in order to produce a successful strategy as it is the decisions that are made across all three levels of planning that will impact the performance attained (Augier and Teece, 2009; Whittington et al., 2017). The traditional approach suggested for a strategic planning exercise is typically top-down, whereby:

- the corporate, long-term level is concerned with the organisation's overall purpose and scope, it is determined by the 'top management' and communicated to
- the business unit, medium-term level which is concerned with how to compete successfully and is translated into
- the operational, short-term level, which is concerned with the implementation decisions regarding how resources, processes and people can effectively deliver the corporate and business strategies.
  (Lowson, 2003; Slack and Brandon-Jones, 2019; Stacey, 2007; Whittington et al., 2017).

2.3.2 Strategic planning in higher education

The purpose of the corporate strategic planning exercise is to determine the HEP's priorities and strategies; address questions that relate to the values, key markets and services provided; and improve the effectiveness of the education and research processes while responding to the expectations of the major stakeholders (Fountain and Fountain, 2013; Kotler and Murphy, 1981). AN HEP needs to create a strategic plan which will identify the areas that it wishes to deliver (typically reputation, teaching and learning quality, excellence in research, strong community relationships and financial management) and then each of these areas will have associated objectives which should be translated into to a set of corresponding KPIs (Galbraith, 1998b).

The business unit strategy is concerned with how to compete successfully in particular markets or how to provide the best value and decisions at this level relate to profit centres or strategic business units and should clearly identify how each unit contributes to the corporate strategy (Slack and Brandon-Jones, 2019; Whittington et al., 2017). In HEPs decisions at a business unit level align to the SBU level budgets, decisions about what programmes are offered, teaching and learning strategies, research aspirations, academic support services, recruitment and employability targets (SBUs are typically school or faculties but also professional services such as centre of library and computing services) (Fountain and Fountain, 2013; Kotler and Murphy, 1981).

The operational strategy relates to the resources and processes used to deliver the product or service, this includes the people, technology, products, facilities and equipment (Slack and Brandon-Jones, 2019; Whittington et al., 2017). In HEPs these decisions relate to the educational processes that need to be undertaken to transform an incoming student into a graduate, such as timetabling, teaching and assessment and programme support (Belohlav, 1984). Typically, HEPs have focused more on the operational level of planning than the other levels, and this is likely because it is of key importance in resource-limited organisations such as HEPs (Fountain and Fountain, 2013; Kotler and Murphy, 1981).

Thus far, this chapter has reviewed the continued interest the government has shown in measuring the performance of higher education providers. The response has been for these HEPs to increasing engage in some form of strategic management and planning activity in order to determine a suitable strategy, a plan to compete and the requisite operational decisions to achieve the strategy. Decision-making is therefore key to achieving success, as it is this activity that determines the utilisation of the resources and the processes that are adopted that result in the outputs achieved, and this then underpins the HEP's performance. The next section will consider the decision-making activity that occurs within the HEP.

2.3.3 Decision-making to support strategic success in higher education providers

Decision-making in HEPs is challenging and complicated and this is due to a number of factors. Firstly, the changing focus of academic governance means that all decisions that are made are concerned with the high-stakes challenges HEPs face in a marketised environment, such as decisions about competition and market direction (Kezar and Eckel, 2004).

Secondly, this high-stakes decision-making undertaken within an HEP has to be shared with both internal stakeholders (academic board, faculty, administration, students) and external stakeholders

(government, employers, potential students, parents) (Kezar and Sam, 2014). Making decisions that can satisfy both the internal and external stakeholders can create complexity as members of this influential and diverse group of stakeholders will each have their own set of values, goals, and objectives (Blanchette, 2010; de Boer and Goedegebuure, 2009).

A third issue that will impact the success of any decisions made, is that HEPs often have decentralized organisational structures where SBUs/schools/departments act independently of each other. This can lead to loose coupling, a lack of coordination between these units, and thus corporate and operational decisions are made separately (Blanchette, 2010; Cohen et al., 1972; Reponen, 1999). When actions in one area are only loosely coupled to the events occurring in another area 'ordered disorder' occurs (Harrison, 1999; Orton and Weick, 1990). The presence of this loose coupling can affect the HEP's ability to make decisions and achieve the HEP level goals (Hardy, 1990).

The fourth issue is due to the pressure to achieve successful operational decision-making, this is necessary because these decisions relate to the allocation of resources and the processes adopted which are the underlying drivers of the performance achieved (Lowson, 2003; Stacey, 2007; Slack and Brandon-Jones, 2019; Whittington et al., 2017). Operational decision-making is a difficult activity due to the scarcity of resources, the existence of multiple and conflicting goals and decision variables, uncertainty in the environment, complexity in the relationships between the resources and the presence of multiple stakeholders (Boxall, 1996; Jacobs and Van der Ploeg, 2006; Kennedy and Clare, 1999; Warren, 2005).

The scarcity of resources means that any decisions made regarding the allocation of those resources need to be made concurrently (Kennedy, 1998b). The resource allocation decisions are both informed by, and inform, the overall strategy, and thus senior management need to provide strategic guidance in order to minimise the localised decision-making that often occurs in HEPs due to the presence of multiple and conflicting goals (Johnstone, 1998). Resource allocation decisions are also complicated by the nature of academic work itself; as it is a mixture of teaching, research and administration, with staff required to perform many diverse roles (Coaldrake and Stedman, 1999; Whitchurch and Gordon, 2007).

After the operational decision-making has occurred, there is a considerable delay until the PEF results are published. Thus, to ensure that the HEP is on track to achieve the desired results, some form of PMS would be necessary. A PMS should incorporate both external and internal measures which represent the strategic aims of the HEP and relate to the PEFs. The internal measures, the KPIs, would enable the HEP to monitor how it is performing against the strategic objectives and be able to identify whether it is necessary to review the decision-making process to better align resource allocation and operations processes to ensure that the desired objectives can be met (Charlaris et al., 2014; Wu et al., 2011; Zangoueinezhad and Moshabaki, 2011).

This section has considered the increased strategic management and planning activity that is occurring within higher education. It has also shown that the decision-making that is required is complicated due to a number of factors, and this will be discussed more in the next chapter. The next section will review the origins of performance measurement through to its application in contemporary HEPs.

2.4 Measuring performance

The traditional approach to strategic planning is concerned with the design of the strategy but does not consider aspects of measuring and monitoring the actual output against desired performance. In order to know whether the strategic and operational plans are able to attain performance success, they will need to be translated into a set of measurable targets (Moore, 2009; Warren, 2005). This is an important activity though, as strategies that operate without targets are simplistic and only adequate when conditions are favourable and do not vary much (Warren, 2008).

The function of performance measurement is to provide the means to achieve the objectives that fulfil the organisation's mission, vision and strategy, by helping managers to identify performance goals, set targets and then demonstrate success or failure in achieving these targets (McAdam and Bailie, 2002). The creation of performance targets thus is an important activity to ensure the success of the organisation's strategy and performance is judged as the ability to meet the targets which relate to either organisational outputs (quantifiable results) or outcomes (impact of that output) (Scholes et al., 2002). Targets are typically set to reflect the corporate objectives and are cascaded down through to the SBUs/schools/departments (Scholes et al., 2002).

The origins of performance measurement go back to the early 13th century when double entry bookkeeping was first introduced but the field of business performance measurement has only really gained momentum in the last 30 years and now incorporates the disciplines of: operations, strategic control and management accounting (Bititci et al., 2012; Brown, 2012). The performance measurement that is mostly presented in the literature has its foundations in the concepts of operations and accounting and takes a rational approach focussing on the mechanisms necessary to achieve control and provide early warnings, however this has led to a negative culture of command and control (Bititci et al., 2012).

Since the late 1980s performance measurement has become increasingly important due to the rapidly changing business environment in both the private and public sectors (McAdam and Bailie, 2002). Performance measurement started to become less backward-looking and accountancy-based, and more market and customer focused incorporating elements such as quality, time, flexibility and customer satisfaction. This led to the act of measuring performance being viewed as a multi-dimensional domain that required more integrated and balanced approaches (Bourne et al., 2000).

2.4.1 Measuring performance in organisations

There are many ways to measure organisational performance, but the two basic approaches are to measure the direct economic performance, for example sales growth, profit margin, share price; or overall organisational effectiveness, which is a broader set of performance criteria that would also reflect internal operational efficiency measures (Whittington et al., 2017).

Regardless of the industry, managers often found developing useful KPIs to be a difficult activity; many of the indicators give useful but partial views, some are qualitative in nature, but the hard quantitative KPIs tended to be dominated by financial measures (Scholes et al., 2002). The typical approach adopted by organisations was to monitor financial performance only and compare actual expenditure against budget which, as a form of monitoring, is both short-term and simplistic and it may not be consistent with other objectives such as growing market share or improving reputation (McAdam and Bailie, 2002; Neely et al., 2002; Stacey, 2007; Warren, 2008).

In the public sector, performance measurement was even more complex. For those organisations that were not privatised, in the absence of a genuine market, performance was originally controlled by price capping. As competition increased, regulators were appointed and suggested the use of KPIs to ensure competitive performance was maintained (Scholes et al., 2002). The focus of performance moved from being about the control of resources (the inputs) and started to be about the control of outputs (service provided) and outcomes (the impact of the service provided) (Scholes et al., 2002).

Despite the proliferation of KPIs across the public sector, progress was tardy and the KPIs remained an imperfect and often ineffective instrument of control (Carter in McKevitt and Lawton, 1994). This is because public sector performance comprises of two aspects – policy making and policy implementation; the performance of a service is a combination of the policy decisions taken (often over an extended period of time) and the processes that translate the policies into action (Day and Klein in McKevitt and Lawton, 1994)

Performance measurement and management in the public sector is an area that has grown out of the mainstream performance measurement literature (Bititci et al., 2012; Taylor and Baines, 2012). However, increasingly the effectiveness of performance measurement in improving the performance of public sector organisations is being questioned as there are many barriers, challenges and problems associated with its implementation in a public-sector environment (Goh, 2012).

In the public sector it is not sufficient to define performance in terms of outputs alone as there are many outcomes that also need to be considered (for example the number of students who graduate is an output, whereas student satisfaction is an outcome) (Stuart and Ransom in McKevitt and Lawton, 1994). Multiple levels of performance monitoring need to be in place, from simple measures of efficiency through to more difficult measures of effectiveness and assessment of impact and value added (Stuart and Ransom in McKevitt and Lawton, 1994).

2.4.2 Measuring performance in higher education providers

So far, it has been shown that to achieve success in the PEFs HEPs need to make appropriate operational decisions which are aimed at attaining the desired performance and are measured by the KPIs; the HEPs also need to engage in an ongoing review of the results that arise from these decisions (Galbraith, 1998a; Goodall and Baker, 2015; Sarrico and Dyson, 2000; Trowler, 2002).

In the field of education, there has been a long history of using performance measures such as staff-student ratios and exam results. However, after the Jarratt Report, universities attempted to outline their own comprehensive set of KPIs (Carter in McKevitt and Lawton, 1994). These KPIs were often problematic because there were too many, they were often focused on input measures (i.e. the resources required) and there were very few or no KPIs related to the outputs or outcomes (Carter in McKevitt and Lawton, 1994).

The issue of how best to assess performance has been a challenge for many years with many measures of accountability in HEPs focusing on broad objectives or approaches (El-khawas and States, 2009; Kennerley and Neely, 2002). As a starting point, the educational framework that consists of input-process-output stages is one of the most general and common approaches taken when developing KPIs (Coates, 2010; Renaud and Murray, 2007). The Jarratt Report (1985) noted that measures of input were better developed than measures of output, although both are important (Coates, 2010; Johnes, 1992).

Input indicators consider how the HEP is set up and include tariff, enrolment and staff characteristics; process indicators consider the way the HEP functions and its internal efficiency and include teaching quality and physical characteristics; and output indicators consider productivity and impact and include graduation rates, employability, student satisfaction, teaching experience, teaching quality, reputation, funding levels, research performance and successful doctoral completions (Canning, 2014; Coates, 2010; López, 2006; Renaud and Murray, 2007; Salmi and Saroyan, 2007).

The first KPIs to be measured were primarily financial, gradually other measures were introduced until there was a proliferation of indicators but they were not necessarily the most appropriate as the evolution process had not been well managed, which resulted in HEPs having large numbers of KPIs to measure, many of which were actually irrelevant (Fryer et al., 2009). These might be measures of effectiveness (such as graduate salaries or the number of doctoral students) or measures of efficiency (such as staff-student ratio) and these are problematic because they do not say anything meaningful about the quality of the education provided or the student experience (Kanter and Summers in McKevitt and Lawton, 1994).

There are many methodological problems associated with devising meaningful KPIs, this includes ensuring that they are relevant (i.e. they measure something that is appropriate), feasible (i.e. they are quantifiable, the data is available and not overly onerous to collect and collate), and they are verifiable (i.e. replicable) (Coates, 2010; Sizer, 1987). In addition, despite the presence of extensive literature relating to the development of KPIs to monitor HEP performance, there is no one set of agreed KPIs. In any case, whatever measure is used, they all look back to past performance and enshrine, at best, current presuppositions as to what constitutes good practice (Barnett in Scott, 1999).

It is also worth noting that KPIs need to be well-defined targets relating to the HEP's performance aspirations as stated by the vision, strategy and goals (Breakwell and Tytherleigh, 2010; Franco-Santos and Bourne, 2005; Goh, 2012; Larsen et al., 2009). The KPIs should be objective and able to be evaluated and developed to align to the HEP's goals to ensure that the long-term objectives are achievable (Wu et al., 2011). Moreover, it is necessary to monitor the KPIs to evaluate the strategic objectives and thus selecting appropriate measures is critical to ensure the alignment of the operational decisions to achieve the strategic direction sought by the HEP (Charlaris et al., 2014; Zangoueinezhad and Moshabaki, 2011).

One sensible approach may be to align the internal KPIs with the metrics that form the PEFs as it is these that are used in the LTRS calculations which provide information to students (and other stakeholders) (Dill and Soo, 2005; Hazelkorn, 2007). Thus using the PEFs as a starting point, a careful consideration of the components of each PEF will suggest a set of the most appropriate KPIs. Once this set of KPIs have been determined, it is necessary to develop tools and frameworks to understand and improve strategic performance (Warren, 2008). Without a PMS, it would not be possible to progress towards the desired goals and identify and subsequently take any necessary corrective actions (Walters and Rainbird, 2006). The next section will consider the development and use of a PMS in an HEP.

2.4.3 Use of performance measurement systems

Neely et al. (1995a:81) define a performance measurement system as 'the set of metrics used to quantify both the efficiency and effectiveness of action'. Keasey et al. (2000) state that the practice

of organisations adopting a PMS that utilises a range of KPIs linked to various aspects of corporate strategy has become widespread. Owais and Kiss (2020) supported this and in their literature review suggest that PMSs have been proven to provide multiple benefits to organisational performance which may be why they are one of the most accepted and widely used tools that organisations adopt to help them implement their strategies.

A PMS can help support the achievement of the HEP's goals by setting targets and reporting on both the efficient use of resources (inputs) and also the effectiveness of the results achieved (outputs) (Neely et al., 1997). Once the PMS has been developed the indicators become less of a set of disparate items but instead can be used collectively as a tool, this tool can enable senior managers to determine how well the strategy is being implemented and the actions necessary to achieve the strategy (Sieger, 1992; Warren 2008).

Before the PMS can be created and applied, one of the most important components to be determined are the KPIs (Bourne et al., 2000). Neely et al. (1997) warn that any PMS adopting a narrow uni-dimensional focus and inadequately designed performance measures will lead to dysfunctional behaviour such as short-termism. However, a well-designed PMS will be an integral part of planning and control (Neely et al., 1997). The next section will consider the creation of a PMS that is suitable for application in an HEP.

2.4.3.1 Performance measurement systems in higher education

Many HEPs have failed to possess any form of PMS, and this is likely to be due to several reasons which may include a traditional lack of accountability in HEPs; difficulty in clarifying suitable performance measures; managerial resistance; the activity not being viewed as important; and the complexity of the system in which HEPs operate (Broad and Goddard, 2010).

It is likely that the first reason (the lack of accountability in HEPs) is partially caused by the second reason (difficulty in clarifying suitable performance measures). KPIs need to be developed and then used to encourage an ongoing performance measurement culture by tracking the success of the strategy and identifying any gaps between desired and actual performance attained, such that their use can indicate when appropriate interventions need be made in order to reduce any gaps (Fryer et al., 2009; Norris and Pounton, 2008).

However, as HEPs increasingly find themselves stuck between external evaluations and self-evaluation, with a requirement to respond and react to both sources of performance measures, this can cause further resistance to the adoption of a PMS (Sarrico et al., 2010). One solution is to use the PEF and LTRS results to trigger strategic planning and quality improvement exercises (Dill and Soo, 2005; Hazelkorn, 2007). In her comprehensive study of HEPs, Hazelton (2007) notes that some HEPs held a formal process to review the published results, and this became part of their strategic process which led to structural and organisational changes to improve the results achieved the next time around.

The KPIs, the internal measures of performance, would thus represent the desirable outcomes in the external measures i.e. the PEFs. The KPIs should be objective as well as measurable and adaptable, furthermore, they should align to the HEP's goals to ensure that the long-term PEF objectives are achieved (Wu et al., 2011). The selection of appropriate measures is critical to ensure the alignment

of the operations to the strategic direction sought by the HEP (Charlaris et al., 2014; Zangoueinezhad and Moshabaki, 2011).

To minimise any problems that may arise in the adoption of KPIs in the HEP, it is necessary that the HEP possesses a clear plan of how they will measure their performance. The adoption of a PMS would support this and should include the HEP's objectives, KPIs, a plan for how the KPIs will support decision-making as well as a consideration of any potential corrective action to be taken (Sarrico et al., 2010). The next section will consider a potential framework that could be adopted to form the basis of a PMS.

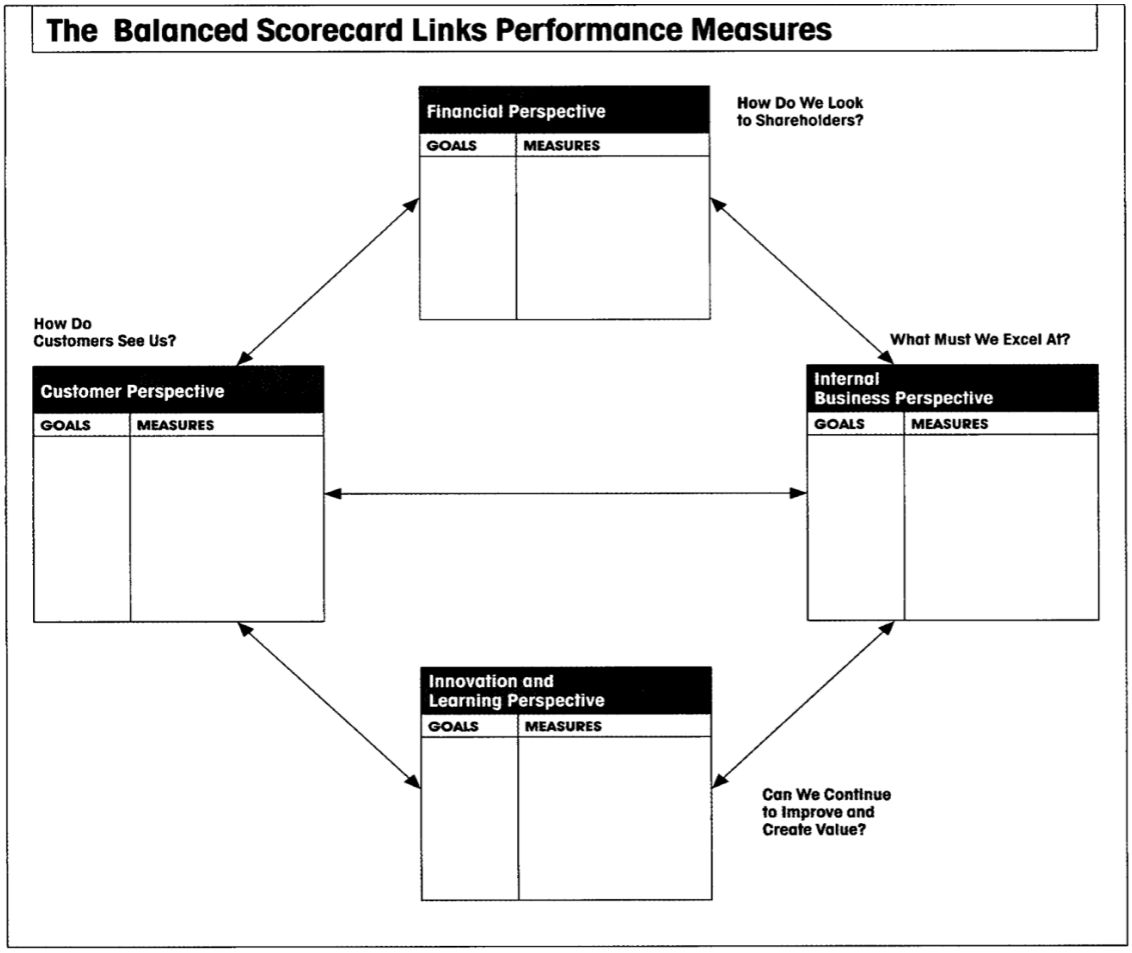
2.5 Balanced scorecard

In the private sector, there have been attempts to introduce performance management systems, most commonly by using the balanced scorecard (BSC) as a strategic performance measurement tool. Kaplan and Norton first introduced their groundbreaking framework, the BSC, in 1992 with the purpose of allowing managers to review performance measures within four perspectives (financial, internal business processes, customer, and learning and growth) as well as to consider the links that exist between these perspectives (Kaplan and Norton, 1992).

The BSC starts by translating the vision and strategy into tangible and operational objectives, targets and KPIs that are a balance between the external measures (related to finance and stakeholders) and the internal measures (related to business processes and innovation, and learning and growth) (Beard, 2009; Eltobgy and Radwan, 2010). The BSC also incorporates the long-term strategic dimensions of the organisation and considers how the organisation delivers the results, while monitoring its overall strategic health (Baporika, 2015). To achieve this, the BSC requires a clear alignment between the KPIs and the organisation's mission, vision and strategies (Brown, 2012).

The BSC is composed of four perspectives (shown below in Figure 1), these need to be derived from the organisation's vision but are typically customer, financial, international business perspective, and innovation and learning (Kaplan and Norton, 1992). Each of these perspectives has an associated question. The financial perspective relates to the results of actions already taken and thus considers how the organisation looks to the shareholders. The other three perspectives are all operational and relate to the drivers of future financial performance: the customer perspective considers how the customers view the organisation; the internal business perspective considers what the organisation needs to excel at; and the innovation and learning perspective considers how to the organisation can continue to improve and create value.

Figure 1: Balanced scorecard, Kaplan and Norton (1992)



The framework has the advantage of not only being linked to short-term outputs but also considers the way processes are managed, as both are crucial to achieve long-term organisational success (Scholes et al., 2002). It is the most popular PMS used in industry, and there is evidence to suggest that nearly 40 per cent of FTSE 100 companies are using this (Cullen et al., 2003; Fryer et al.; 2009).

2.5.1 Balanced scorecard operationalisation in higher education

When applied in the context of an HEP, typically the most suitable perspectives are financial, customer/stakeholder, internal business processes and innovation, and learning and growth (Al-Zwyalif, 2012; Baporika, 2015; Voelpel et al., 2006). The four perspectives should incorporate outputs (typically past measures related to finance and stakeholders) as well as drivers (internal business processes) and enablers (learning, growth and innovation) (Alani et al., 2018; Aljardali et al., 2012; Bailey et al., 1999).

The financial perspective is likely to focus on outputs related to productivity, growth, and sustainable strategies (Farid et al., 2008; Philbin, 2011; Umashankar and Dutta, 2007). The stakeholder perspective is also focused on outputs, and includes students, employers, faculty, alumni and parents (Bailey et al., 1999). The measures in this perspective are likely to relate to price, quality, partnerships and community service (Farid et al., 2008).

The next perspective focuses on the internal business processes that are the drivers that deliver the critical services, create value and drive performance (Papenhausen and Einstein, 2006; Weerasooriya, 2013). Farid et al. (2008) suggest that this could be measured by teaching excellence, curriculum excellence, quality of faculty, and effectiveness and efficiency of service. The last perspective supports the internal business processes and is enables performance by focusing on learning, growth and innovation, this will include programmes and teaching innovations and human, information and organisational capital (Bailey et al., 1999; Farid et al., 2008; Papenhausen and Einstein, 2006).

Each of the perspectives should have its own strategy from which objectives could be developed that align with the organisation's overall strategy (Brown, 2012). In each of these perspectives, it was suggested that up to four measures should be developed that represent the critical success factors necessary for continued organisational success (Otley, 1999). The BSC can be further extended to include actions to achieve these targets which would then expand it into a performance improvement plan that provides an integrated perspective on goals, targets and progress measures (Brown, 2012; Kaplan and Norton, 1992).

2.5.2 Advantages of the balanced scorecard

The BSC is an extremely popular way to incorporate a range of indicators to produce a rounded picture of performance and ensure that different stakeholders' views are incorporated and reflected in a PMS (Kaplan and Norton, 1992). The incorporation of a range of KPIs and stakeholder views can increase the effectiveness of the performance information available and allow managers to observe whether improvement in one area has come at the expense of improvement elsewhere (Perkins et al., 2014; Taylor and Baines, 2012).

One major strength of the BSC is that it emphasises the link between performance measures and achieving the desired strategy of the business (Otley, 1999). It does this by providing a comprehensive framework that can translate an organisation's vision and strategy into a coherent and linked set of performance measures; this has the potential to enhance management capabilities and increase understanding of the business and of the causal relationships between non-financial and financial measures (Barnabè, 2011; Kaplan and Norton, 1992).

The BSC would be best utilised as a communication, information, and learning system, and not a traditional control system (Kaplan and Norton, 1992). It can then become a valuable starting point to facilitate organisational learning because it is developed in an interdisciplinary way and has the potential to enhance senior management capability as they increase their understanding of the business (Barnabè and Busco, 2012).

Other advantages are that because the BSC adopts a comprehensive view it guards against sub-optimization as all the important operational measures are considered concurrently (Kaplan and Norton, 1992). It also has the advantage of reducing information overload by minimising the measures used, yet, at the same time, it can convey a systemic view of the organisation by displaying the causal relationships that exist between the performance measures (Barnabè and Busco, 2012; Humphreys et al., 2016; Kaplan and Norton, 1992; Ossadnik et al., 2013).

Due to the increased need to measure and monitor performance the adoption of a PMS was suggested. The balanced scorecard is proposed as the basis for this because it is a comprehensive

strategic performance measurement tool that provides a balanced performance system as it is not solely reliant on financial indicators (Coskun and Nizaeva, 2023). It is also an appropriate foundation for a PMS as it allows the HEP to define which perspectives are most relevant to the attainment of their own strategy. There are some limitations to the BSC, however, which will be considered in the next section.

2.5.3 Limitations of the balanced scorecard

Each perspective requires the user to translate the vision, strategy and goals into specific measures, and there is little guidance given on how to set performance targets (Kaplan and Norton, 1992; Otley, 1999). There are also difficulties associated with creating a balance between the different perspectives, understanding how trade-offs are made between the different measures used or how best to link the strategic measures to the operational measures (Cullen et al., 2003; Otley, 1999; Taylor and Baines, 2012). Measures tend to be lagging, static and with a focus on financial outputs and the quality of the BSC is largely dependent on the developer (Capelo and Dias, 2009; Khakbaz and Hajiheydari, 2015). The BSC can lack key external and environmental measures (especially the absence of a competitive dimension), and lead to information overload if used injudiciously (Taylor and Baines, 2012).

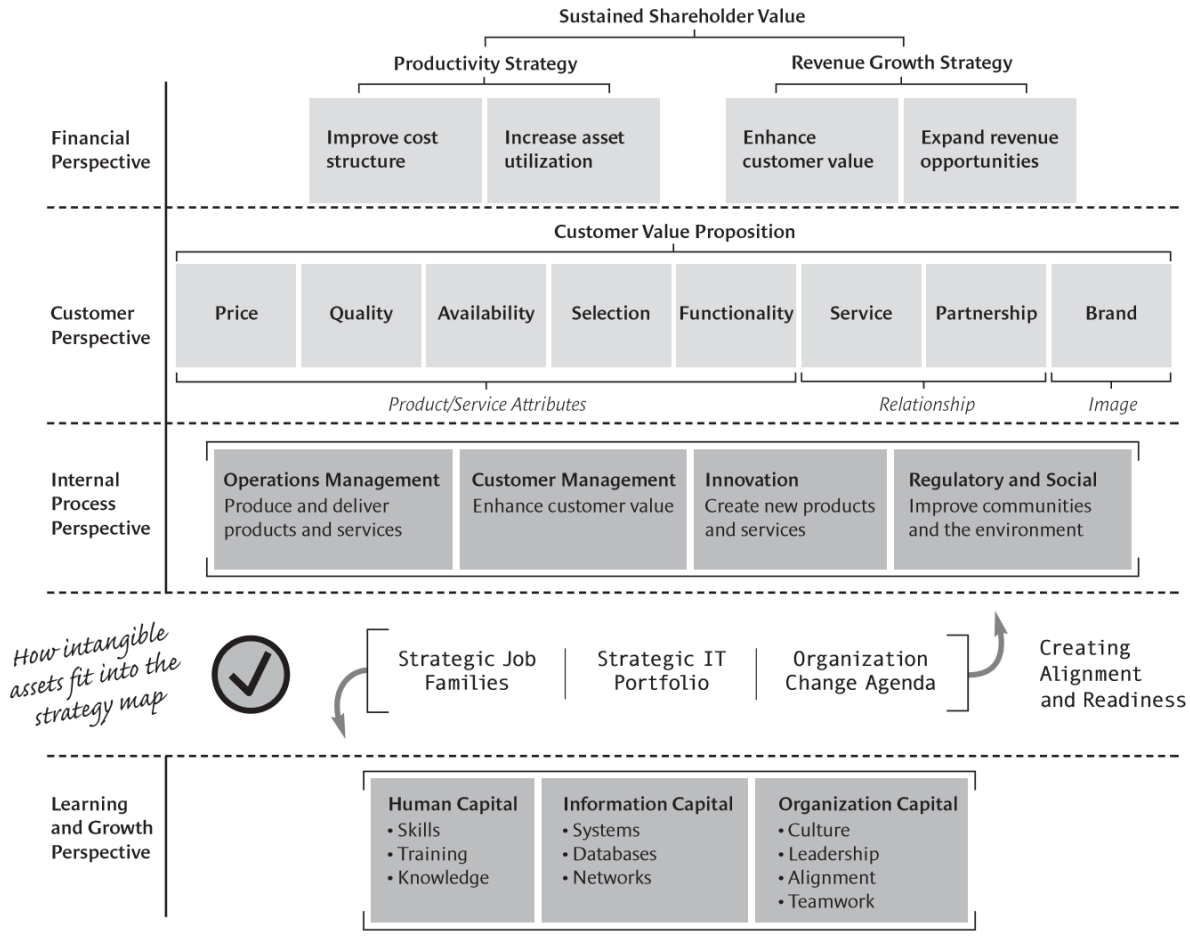
There are also considerable issues with the BSC and its application with many public-sector organisations struggling to successfully adopt it however, this is likely due to a lack of time and effort in customising it to meet their needs (Cullen et al., 2003; Fryer et al., 2009). Although it may encourage measuring and monitoring KPIs, its implementation does not guarantee improved quality (Taylor and Baines, 2012). Perkins et al. (2014) also note that although the BSC appears to be one of the most influential concepts in performance measurement, there is little empirical evidence to support the view that the adoption of the BSC has led to any performance improvement.

Finally, there is some concern that the BSC adopts a linear approach, simplifies reality and often exhibits weak linkages to operational strategies (Otley, 1999; Taylor and Baines; 2012). However, this can be refuted somewhat as the fundamental premise of the BSC is the fact that the perspectives are interdependent and the model recognises the cause-and-effect relationships between the strategic goals (Cullen et al., 2003; Sayed, 2012).

2.5.4 Strategy maps

To overcome some of the limitations discussed above, the potential of the BSC can be greatly increased when a strategy map (see Figure 2 below) is developed in consultation with the management team (Akkermans and Van Oorschot, 2005). The use of a strategy map was introduced as an enhancement to the original BSC and it provides a visual framework of the corporate objectives within the four key perspectives of the BSC (Perkins et al., 2014; Taylor and Baines, 2012). In addition, it is a specific type of causal map which provides a graphical representation of the cause-and-effect linkages that connect the desired strategic outcomes with the drivers that create them, including how the intangible assets are transformed into tangible customer and financial outcomes (Barnabè and Busco, 2012; Brown, 2012; Papenhausen and Einstein, 2006).

Figure 2: Strategy Map, Kaplan and Norton (1992)



2.5.4.1 How the use of strategy maps can inform strategic planning

The development of a strategy map should enhance knowledge sharing across the HEP and encourage employees to align their efforts to the HEP's objectives leading to improved organisational performance by enhancing clarity and focus (Aljardali et al., 2012; Junior and Alves, 2023). It can also help decision makers overcome cognitive challenges and thus lead to more consistent performance evaluation judgements that are in line with the strategic objectives (Banker et al., 2011). In addition to enabling managers to translate long-term strategy into performance measures, the map can help the organisation visualise their strategic goals and incorporate representations of the mental models of the participating experts, this has the potential to improve operational decision-making and monitor whether these decisions generate results that are consistent with the causal linkages assumed (Banker et al., 2011; Humphreys et al., 2016; Ossadnik et al., 2013).

Brown (2012) says that the strategy map is an invaluable resource because it expresses the causal links between the different perspectives. Kaplan and Norton (2004) suggest that for nonprofit organisations the mission should be at the top and then the perspectives ordered such that the customer perspective feeds into the mission which is impacted by the internal business processes which is influenced by the learning and growth perspective; the financial perspective is the foundation but not the primary goal.

2.5.5 Examples of the application of the balanced scorecard in higher education providers

The BSC has been adopted in many organisations in the for-profit sector; however, there has been considerably less research regarding the adoption of the BSC in HEPs (Beard, 2009; Chang and Chow, 1999; Philbin, 2011; Umashankar and Dutta, 2007). The lack of literature regarding the application of the BSC to HEPs may be due to a lack of knowledge and awareness of the technique or a resistance to adopting business practices, rather than any perceived incompatibility between the application of the BSC and strategic planning in higher education (Beard, 2009; Taylor and Baines, 2012).

It is also crucial to note that the entire design and implementation process can take up to 2 years, and successful implementation requires organisational commitment and widespread stakeholder participation, where every member of the HEP both understands and contributes to the successful attainment of the HEP's strategy (Bailey et al., 1999; Chang and Chow, 1999; Papenhausen and Einstein, 2006; Sayed, 2012; Taylor and Baines, 2012)

HEPs need to ensure that appropriate resource is invested to increase the chance of BSC adoption, this might include the identification of a champion together with the creation and roll-out of a training programme for all employees (Brown, 2012; Sayed, 2012; Taylor and Baines, 2012). The process requires a change in the HEP's culture and is a continuous improvment initiative, requiring financial resources and staff buy-in (Al-Hosaini and Sofian, 2015; Al-Zwyalif, 2012; Farid et al., 2008; Kim et al., 2006; Papenhausen and Einstein, 2006; Taylor and Baines, 2012;).

Ensuring staff buy-in is difficult in an academic context, where HEPs can operate as 'organised anarchies' as academic staff have academic freedom and are 'free spirits' (Chang and Chow, 1999). It may be easier to get staff buy-in if employee performance is linked to rewards as is more common in the for-profit sector (Baporikar, 2015).

Traditional PMS do not reflect the full range of stakeholder interests, and the inclusion of stakeholders' expectations is paramount to an HEP as performance is heavily dependent upon the knowledge, innovation and skills of the stakeholders (Cullen et al., 2003; Sayed, 2012). Staff feedback will not only help determine the cause-and-effect linkages across the perspectives but the process of collecting this intel should take the form of conversations that establish shared values and increase staff commitment (Farid et al., 2008).

It is important to recognise that a failed attempt to apply the BSC may well lead to reduced staff morale, leaving the HEP worse off than before (Chang and Chow, 1999). However, developing a BSC should be seen as a starting point on a journey toward continuous improvement and enhancement and thus it may be more advantageous for the HEP to do something rather than wait for the 'perfect' solution (Farid et al., 2008). Most BSC failures relate to the mismanagement of the performance metrics or KPIs, with the measures being either inappropriate or excessive (Sayed, 2012). Thus, to successfully establish a PMS, appropriate KPIs driven by stakeholder needs must be generated, and these become the vehicle by which the HEP is able to monitor performance against strategic goals (Al-Hosaini and Sofian, 2015; Alani et al., 2018).

In order to achieve their desired goals, the KPIs must provide a clear representation of the long-term strategy to be achieved (Papenhausen and Einstein, 2006). The identification, communication and evaluation of these KPIs is an important aspect of strategic planning (Beard, 2009). They should align to the HEP's strategic objectives, be simple yet meaningful, and incorporate any data that is already

collected. Moreover, a sub-set of KPIs could be identified that represent the core performance that needs to be achieved (Taylor and Baines, 2012). KPIs should not all be focused on outcomes but should also include performance drivers, and there should not be too many typically no more than 30 KPIs should be used (Bailey et al., 1999; Brown, 2012; Eftimov et al., 2016).

The adoption of a BSC should improve the purpose and clarity of the mission, vision and strategy which will have a positive impact on both internal and external communication (Alani et al., 2018; Baporikar, 2015; Chang and Chow, 1999). The process of designing the BSC will also help the HEP determine what really matters to the stakeholders, as well as aid the HEP in the articulation of what it is and where it wants to be (Beard, 2009).

Finally, the cascading nature of the BSC should result in the alignment of the performance measures across all levels of the HEP, and the engagement and cooperation across the levels should promote collaboration and alignment, which are key motivators when pursuing continuous improvement strategies (Brown, 2012). Thus, if designed and implemented appropriately, the BSC should enhance managerial decision-making and problem-solving by providing feedback on the impacts of the actions and initiatives taken (Aljardali et al., 2012; Baporikar, 2015; Chang and Chow, 1999; Eftimov et al., 2016).

The key concepts that arise from the literature are thus concerned with which are the most appropriate perspectives, the reasons why the BSC might not be adopted in an HEP, who are the stakeholders that should be included, and which KPIs should be incorporated. The prior research in the field of BSC application in HEPs has fallen into the following categories (see Table 1):

- theoretical discussions about the potential of the BSC (Al-Hosaini and Sofian, 2015, Al-Zwyalif, 2012, Baporikar, 2015, Junior and Alves, 2023; Sayed, 2012)
- case of actual BSC applications (Beard, 2009)
- theoretical BSC created (Bailey et al., 1999)
- creation and adoption of BSC in HEP (Aljardali et al., 2012; Chen et al., 2006; Farid et al., 2008; Lassoued, 2018; Papenhausen and Einstein, 2006; Philbin, 2011; Schobel and Scholey, 2012; Taylor and Baines, 2012; Umashankar and Dutta, 2007)
- creation and adoption of BSC in specific area within an HEP (Chang and Chow, 1999; Cullen et al., 2003).

Table 1: Prior research investigating the application of the balanced scorecard in higher education

Author(s) and year	Setting, methodology and context	Application to this research and main findings
	Theoretical application of the BSC	
Al-Hosaini and Sofian, 2015	Literature review of prior research that considered the application of BSC to HEPs.	Suggests the prerequisites for successful adoption of BSC in HE environment. Identifies the relevant perspectives for HEPs.
Al-Zwyalif, 2012	Reviews suitability and awareness of the BSC use in Jordanian private universities.	Suggests the prerequisites for successful adoption of BSC in HE environment. Identifies the relevant perspectives for HEPs.
Bailey et al., 1999	Considers the application of BSC to HEPs and created a theoretical BSC based on a survey of business school deans.	Produced a BSC for application in a business school that incorporated multiple KPIs.
Baporikar, 2015	Literature review providing an overview of BSC and its adoption in HEPs.	Suggests the prerequisites for successful adoption of BSC in HE environment. Identifies the relevant perspectives for HEPs.
Junior and Alves, 2023	Undertook a systematic literature review on the BSC methodology implemented in the educational sector.	Suggests the prerequisites for successful adoption of BSC in HE environment. Identifies the advantages of the use of a strategy map.
Sayed, 2012	Literature review to examine the use of BSC in HEPs.	Suggests the prerequisites for successful adoption of BSC in HE environment. Identifies the relevant perspectives for HEPs.
	Case studies of BSC design and application in HEPs	
Aljardali et al., 2012	Created a BSC and a framework to enable the HEP to implement the BSC.	Produced a BSC that incorporated multiple KPIs.
Beard, 2009	Paper reports on two BSCs of HEPs who were awarded the Malcolm Baldrige National Quality Award.	Identifies the relevant perspectives for HEPs.
Chang and Chow, 1999	Reviewed the BSC applicability in accounting education.	Proposed a BSC that suggested perspectives and KPIs that underpin the successful delivery of accounting education.

Chen et al., 2006	Case study of the application of a BSC in a private Taiwanese university.	Proposed a strategy map and a BSC.
Cullen et al., 2003	Case study of the application of a BSC in a faculty of business and management.	Proposed a strategy map and BSC that focused on enhancing overseas students and franchise income.
Farid et al., 2008	Studies the application of the BSC in HEPs.	Proposed a strategy map, BSC, and implementation guide for HEPs in an Iranian context.
Lassoued, 2018	Case study of the application of a BSC in a business college.	Proposed a strategy map and a BSC.
Papenhausen and Einstein, 2006	Case study of the application of a BSC in a business school.	Proposed a strategy map and a BSC.
Philbin, 2011	Designed and implemented a BSC at an HEP.	Prepared a strategy map and suggested a BSC and KPIs.
Schobel and Scholey, 2012	Case study of the application of a BSC in HE.	Proposed a strategy map and a BSC in a HE distance learning environment.
Taylor and Baines, 2012	Undertook a qualitative study of the application of the BSC in 4 universities.	Suggests the prerequisites for successful adoption of BSC in the HE environment.
Umashankar and Dutta, 2007	Literature review underpinning the production of a BCS for application in Indian HEPs.	Proposed a strategy map and a BSC.

2.6 Chapter conclusion

The literature thus far has shown that HEPs are operating in an environment of increased accountability, which has led them to participate in more strategic planning and become engaged in how to define and measure performance. Once a strategy has been articulated and the desired performance determined, decisions regarding the allocation of resources and the processes adopted need to be made. To ascertain whether the strategy has been successful, the resulting performance needs to be measured and monitored, and this is done using some form of PMS.

The BSC is the first of the three theoretical underpinnings in this research. Even though the BSC is not without limitations, it has been suggested as a framework for a PMS as it is arguably the most well-known framework for a PMS and is very adaptable, which includes the ability to be extended into a strategy map. In their research, Schobel and Scholey (2012) established that despite the debate about the application of the BSC in HEPs, there have been more examples that demonstrated their value than there are detractors. There are, however, many levels and sources of complexity in the environment in which HEPs are operating (Kabanoff, 1991). If the desired performance outcomes goals are to be achieved, the PMS will need to be capable of working in an HEP that resides within a complex environment. The next chapter will explore this complexity in more depth.

Chapter 3 System dynamics methodology and its applications in higher education provider management

3.1 Chapter introduction

The previous chapter explained the context in which higher education is currently operating, by providing a brief review of the history of new public management. The chapter then introduced the key areas that need to be addressed in order to successfully manage an HEP, namely strategic planning, performance measurement and the decision-making activity. The chapter concluded by recognising that there are many levels and sources of complexity in the environment in which an HEP operates and that this complexity creates difficulties in the management and decision-making that needs to occur for an HEP to be successful in achieving the desired performance outcomes.

The purpose of this chapter is to explore this complexity in more depth, specifically by exploring how it is that an HEP can be considered to be a dynamically complex system. This can be achieved by first defining the concept of a "system" and then describing the main drivers of a dynamic and complex system, namely feedback, delays, and non-linear relationships. This leads to an explanation of the concepts of bounded rationality and policy resistance. The chapter will conclude with a discussion about the use of the system dynamics methodology for addressing such complexity.

3.2 A system's view of higher education providers

The concept and terminology of higher education as a system is not new; in 2011 the white paper "Higher Education: Students at the Heart of the System" discussed the changes being made to higher education funding that aimed "to make the English higher education *system* more responsive to students and employers" (Department for Business, Innovation and Skills, 2011:27). To go back a step, the starting point is to consider what is a system? Daellenbach et al. (2017) defined a system as an entity that is comprised of components that are interacting and interdependent and form a unified whole, receiving inputs from and transferring outputs to the environment. There are financial, social, political, production and educational systems and each of these systems consists of components interconnected in such a way that they have a purpose and form and produce their own pattern of behaviour over time (Barlas, 2007; Meadows, 2008).

The way that a system behaves is fundamental because it is the behaviour of the system that transfers the inputs into the outputs. Typically the inputs present in a system are the raw materials and resources (typically funds, labour, expertise) these are transferred using a series of processes into the outputs (typically goods, services and information) (Daellenbach et al., 2017). The entire education sector can be considered to be a system, within the system of education sits the higher education sector, which is another system, and within the system of higher education sits the HEP (itself a system) (Ismail et al., 2017). In the HEP, the inputs (which include students, staff, facilities) are transformed by the processes (which include teaching, student support services) to produce outputs (which include graduates, student experience as well as the measures of performance that form the PEFs).

The HEP possesses the characteristics of a dynamically complex system which are the presence of: many interconnected components, multiple feedback loops, non-linear causality relationships, major delays and the ability to adapt to changed circumstances (McGee and Edson, 2014). The presence of

these characteristics means that any decision-making that occurs can produce solutions that are ineffective, make the situation worse and/or lead to unintended consequences (Ghaffarzadegan et al., 2017). The next section will consider the sources and impact of dynamic complexity in more detail.

3.3 The sources of dynamic complexity in higher education providers

Dynamic complexity stems from the connections and interdependencies that exist between the variables present in the system and leads to dynamic management problems (Barlas, 2007). The term dynamic means changing over time and dynamic problems are such that the variables present in the system change significantly over time as their behaviour is influenced by the interactions occurring within the system (Barlas, 2007). Even a simple system can display dynamic complexity which arises from the circular interactions (feedback) between the variables over time, as well as the time delays and non-linear relationships that also exist within the system (Sterman, 2000).

When decisions, or policies, are made within the system in an attempt to control the behaviour of its variables to achieve the desired performance, the change that occurs in one part of the system sooner or later has an impact elsewhere in the system and this impact is not always obvious and is often counter-intuitive (Morecroft, 2015). In section 3.1, the concept of the HEP being considered to be a dynamically complex system was introduced and it is the presence of feedback, non-linearity and time delays that are particularly central to the concept of dynamic complexity and thus will be explored further below.

3.3.1 Feedback loops

The feedback that exists within a complex system is a major source of its puzzling behaviour and can lead to difficulties being experienced when introducing new policies (Ford, 1999; Sterman, 2000). The lack of understanding about the feedback in the system is what leads policymakers to make decisions that have unintended and unforeseen consequences (Sterman, 2000). When decision makers fail to adopt a systems thinking approach and separate out the system processes that are actually linked, policies can lead to unintended consequences for example the introduction of salary savings measures can lead to staff attrition and a need for further spending which offsets the cost savings (Galbraith, 1999).

There are two types of feedback loops: reinforcing feedback where any initial change leads to further change in the same direction (amplifying what is happening in the system) and balancing feedback where any initial change leads to consequences that counter and oppose the change (correcting what is happening in the system) (Sterman, 2000; Warren, 2005). In a system, all dynamics arise from the interaction of these two types of feedback loop and a complex system can easily contain thousands of interrelated and integrating feedback loops (Bérard, 2010; Sterman, 2000).

HEPs have many feedback loops, some examples of these are presented below:

1. an increase in student enrolment leads to higher income which can be used to employ more staff, who can be deployed to increase the size of the cohort and hence the amount of places available on the course, which can lead to an increase in student enrolment producing a reinforcing feedback loop (Galbraith, 1999; Merkulov et al., 2015);

2. as student enrolment increases, so can staff workload; high staff workload will impact staff motivation and thus teaching quality will likely decline and as this feeds into the NSS which impacts student enrolment producing a balancing feedback loop (Barlas and Diker, 2000);

3. staff burnout will impact effectiveness in teaching and research and as performance suffers, morale declines, low morale can have a negative impact on staff effectiveness resulting in a further decline of morale and eventually leading to staff turnover, which creates a vicious cycle where remaining staff have higher workloads and hence are more likely to experience burnout producing a reinforcing feedback loop (Kim and Rehg, 2018);

4. the higher the ranking of an HEP the more likely that the HEP will be successful in general (for example receiving research projects, ensuring placements and graduate employability), all of which feed into the PEFs and will continue to increase the HEP's ranking producing a reinforcing feedback loop (Merkulov et al., 2015);

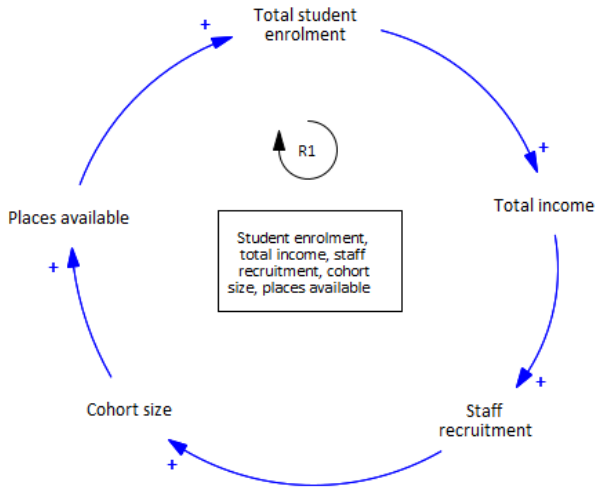
5. the higher the number of research projects being undertaken at an HEP, the more research income is likely to be generated which gives the potential for investment into staff resource which leads to an increase in research capacity and research productivity producing a reinforcing feedback loop (Merkulov et al., 2015);

6. a higher UG student tariff is likely to lead to higher completion rates, these affect the ranking and reputation of an HEP and make the HEP more attractive, thus enabling future tariff to be set at a higher level producing a reinforcing feedback loop (Merkulov et al., 2015).

As stated before, there are two types of feedback loops, reinforcing and balancing. In a reinforcing feedback loop the relationship between the variables is self-perpetuating (aka a vicious or virtuous cycle). In a balancing feedback loop the relationship between the variables is seeking to stabilise the behaviour in the system. Within any feedback loop the relationships between the variables is displayed by the polarity that is assigned to the arrow; such that a + sign represents that the variables move in the same direction and a – sign represents that the variables move in the opposite direction. An example of each will be presented below.

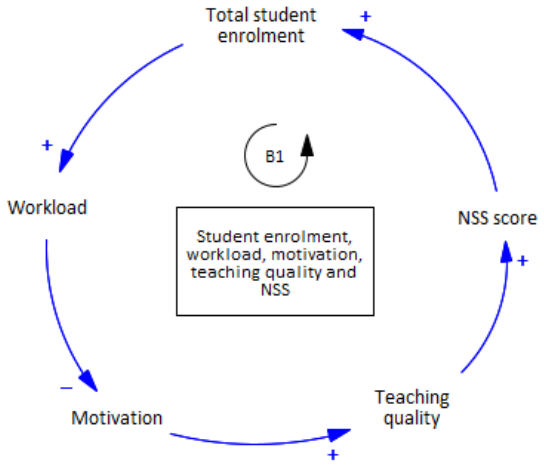
An example of a reinforcing feedback loop can be seen below (Figure 3), this loop is based on example 1 from above. The diagram shows that as student enrolment increases as does total income, this leads to an increase in staff recruitment, which enables the HEP to increase the cohort size and thus the number of places available on the course and thus student enrolment etc. Conversely, a decrease in total student enrolment would lead to a decrease in total income, which would impact staff recruitment and thus the capacity and cohort size etc. The label in the middle of the loop identifies the type and number of the loop, R1, i.e. this is the first reinforcing loop and the detail in the box is the loop name.

Figure 3: Example of reinforcing loop



An example of a balancing feedback loop can be seen below (Figure 4), this loop is based on example 2 from above. The diagram shows that as total student enrolment increases as does workload, workload impacts motivation such that as workload increases motivation decreases, motivation impacts teaching quality so that high levels of motivation lead to increased teaching quality which feeds into the NSS and thus impacts student enrolment. Unlike the loop above, some of the variables work in the opposite direction, so as student enrolment increases the overall effect is a decrease in the NSS which leads to student enrolment decreasing. As student enrolment decreases, workload decreases, and teaching quality improves and therefore so does NSS. Thus this loop displays a balancing and counteracting behaviour as the system self-regulates in an attempt to become stable. The label in the middle of the loop identifies the type and number of the loop, B1, is the first balancing loop and, as before, and the detail in the box is the loop name.

Figure 4: Example of a balancing loop

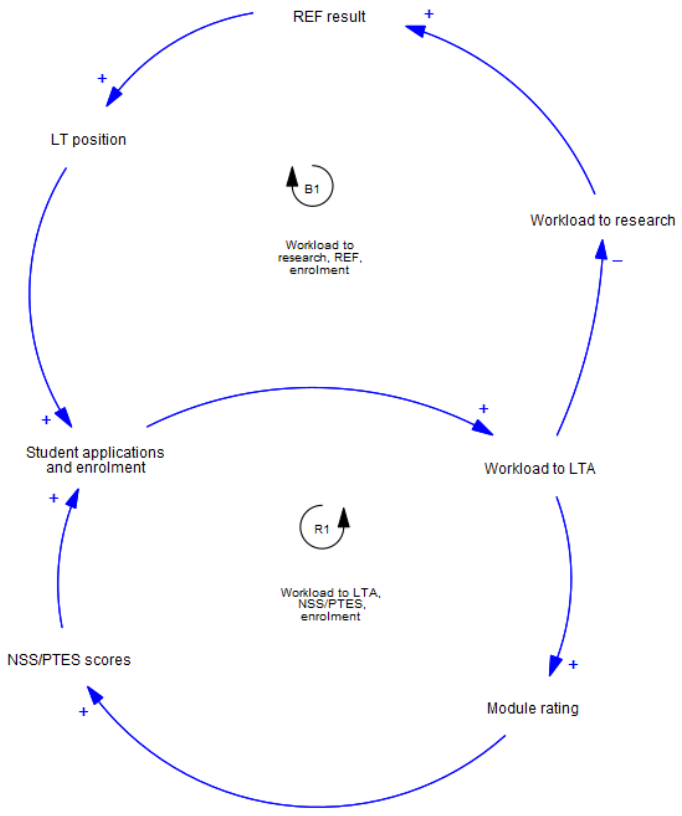


Although there are only two types of feedback loop in any system when coupled with the presence of multiple time-delays and non-linearities the multiple loops that interact generally make it impossible to determine the dynamics of the system by intuition (Sterman, 2001). In systems thinking a causal loop diagram (CLD) is a visual representation that can be used in to illustrate the causal relationships between different variables within a system and are constructed by showing how the feedback loops present in the system are all connected.

An example of a small CLD is presented below (Figure 5), this CLD shows the interaction between the NSS/PTES scores and REF performance. The top feedback loop, labelled B1 and is a balancing feedback loop, shows that the higher the workload allocated to research the better the REF result, this in turn will impact the LTRS position and thus lead to increased student applications and enrolment. However, more students will mean that more workload is required for learning, teaching and assessment (LTA) activities and thus the workload allocated to research will decrease which will impact the REF result and thus the LTRS position leading to decreased student applications and enrolment.

The bottom loop, labelled R1 and is a reinforcing feedback loop, shows that the higher the workload allocated to LTA the better the module rating and thus the NSS/PTES scores which will lead to increased student applications and enrolment. Again, more students mean more workload is required for learning, teaching and assessment (LTA) activities and thus the cycle repeats. Thus in the CLD it can be seen that the two feedback loops are working in opposition, an investment in workload allocated to research will impact the student enrolment. Unless the student enrolment target is fixed or new staff are recruited to cope with demand, workload allocated to research will continue to reduce and this will have an ongoing negative impact on the REF result.

Figure 5: Example of a causal loop diagram



3.3.2 Non-linear relationships

Dynamically complex systems include non-linear relationships and there are two forms of non-linearity that occurs in relation to policies, the first occurs when the cause-and-effect interactions between the variables are not proportional (Barlas, 2007). This means that the effect of a policy on the input variable is not proportionate to the input itself (for example a small change to assessment policy can have a large impact on student attainment) (Forrester in Morecroft and Sterman, 1994).

The second form of non-linearity occurs when the policy decisions are not independently responsive to the causative input variables but instead a product of inter-relationships between other variables (for example student attainment is the result of many interactions including tutor experience, student entry qualifications and student engagement). The concept of non-linearity is important because the presence of non-linear relationships confounds expectations about how the system will react to a policy that is implemented (Meadows, 2008).

3.3.3 Time delays

In systems, time delays occur for two reasons; firstly in the time taken to measure and report the information needed to make decisions and secondly for the decisions to impact the state of a system (Sterman, 2000; 2001). Delays can exist in both material or resource flows (for example staff recruitment, student enrolment) and information flows (for example NSS results as students complete the NSS survey between January and April, but the results are not published until August) (Zaini et. al, 2017). These flow delays lead to further delays between when a decision or policy is made and when the organisation experiences the effects of that policy, which may lead to further attempts to implement policies in the interim period, which can negatively affect the system's performance.

One example of a time delay present in a higher education provider includes the impact of a change in the student tariff which can impact student results and their attainment, progression and continuation and their subsequent employment, however this impact will not be evidenced until several years after the tariff has been changed. Another example of a time delay is the impact of a lag in staff recruitment which can lead to increased workloads and staff fatigue experienced during the delay in recruitment. These delays often result in policies that have counter-intuitive outcomes for example a policy to drive up student enrolment may be to reduce the entry tariff required, this is likely to affect students' graduation results and employability rates, and these variables impact the PEFs and thus the HEP's league table position and therefore their reputation and attractiveness to future potential students after a period of several years (Galbraith, 1999).

All decision-making relies on and responds to delayed information and thus it will always be off target with actions that are either too much or too little to achieve the decision maker's goals (Meadows, 2008). Beliefs and expectations are based on the information available to the decision maker at that time and a person's mental model does not change immediately upon the receipt of new information (Sterman, 2000).

The presence of feedback, non-linearity and time delays creates dynamic complexity in the system and complicates decision-making as the response to any decisions made to change the system's behaviour cannot be easily predicted (Kennedy, 1998a). The impact of this will be discussed further in the next section.

3.4 The impact of dynamic complexity in higher education providers

The presence of dynamic complexity in a system limits the available knowledge of the real-world that is available to the decision makers and thus impacts the performance of the decision-making activity (Sterman, 2000). This is due to the concept of bounded rationality, which will be discussed below.

3.4.1 Bounded rationality

Simon (1979) originally founded the theory of "bounded rationality" when he noted that the capacity of the human mind for formulating and solving complex problems was very small compared to the size of the problem. Decision makers' thinking becomes short-term and linear and they are unable to adopt a dynamic system perspective as they struggle to incorporate time delays and feedback into their decision-making process (Van den Belt, 2004). Decision makers use the information that they have available to them to make decisions, but this information is incomplete and delayed (Meadows, 2008).

The complexity of the real-world dwarfs human cognitive capabilities and thus bounded rationality arises as decision makers are overwhelmed by the complexity of the system in which they are present and the amount of options available at any one time (Sterman, 2000). The concept of bounded rationality is a key concept in this research and thus is the second theoretical underpinning adopted. The presence of bounded rationality leads decision makers to view the complex system as a series of parts and they then treat each part as a separate entity (Assidmi, 2015). This is reductionism and it leads decision makers to ignore the fundamental dynamic interactions that exist between the parts of the system, thus resulting in unsuccessful decision-making (Gary and Wood, 2011).

3.4.2 Mental models

Bounded rationality means that the policies that decision makers make are impacted by the knowledge that they may or may not possess i.e. their mental models (Simon, 2000). Strategic decision makers use their mental models to inform their decision-making, but the presence of dynamic complexity causes them to rely on rote procedures, habits, and simple mental models (Gary and Wood, 2011). When unable to handle a large volume of complex information, the mental models that are adopted become too simplistic (Gunn and Williams, 2007). This impacts policy making because the reliance on simple mental models that represent separate and different parts of the system makes it difficult to predict the outcomes of the decisions made (Galbraith, 1999).

When the decision maker only has a limited ability to understand the impacts of any decisions that they make, any actions taken may seem sensible in the short-term but may not be appropriate in the long-term (Sterman, 2001). Although decision makers set out to make rational decisions, their decisions will be impacted by both the complex structure of the system and their cognitive limits (Bérard, 2010; Sterman 2006).

The presence of bounded rationality causes decision makers to adopt simplistic mental models which are based on a limited knowledge of the parts of the system that the decision maker understands. Therefore, despite being constructed with the best of intentions, the decisions being made will affect different parts of the systems in completely different ways and lead to decisions that generate

unexpected outcomes, often making the current situation worse (Galbraith and Carss, 1989). This is known as policy resistance and this concept will be explored in more detail in the next section.

3.4.3 Policy resistance

Thus far it has been established that HEPs are dynamically complex systems, and this dynamic complexity leads decision makers to adopt simplistic mental models due to the effects of bounded rationality. The consequence of this is that when policies are made, they often have unintended side effects (Sterman, 2000).

These unintended side effects also occur because decision makers view the world in a linear fashion rather than understanding the feedback that is present, leading them to assume that for every problem there is an easy solution or fix that will 'solve' the problem (Morecroft, 2015). This event-orientated thinking can produce quick actions, but it does not necessarily lead to an understanding of why and how the problem has arisen or provide long-term, sustained solutions. Instead, because of the feedback that is present in the system, when a policy is implemented, there is often an unpredicted response or reaction to this policy in addition to (possibly) solving the initial problem (Sterman, 2000).

The situation whereby a decision or policy leads to the original problem getting worse is known as policy resistance and it occurs when a policy produces effects that differ from those expected as the system responds to defeat those attempts (Assidmi, 2015; Bérard, 2010). This has occurred in HEPs where calls to manage resource more efficiently and effectively has led management to implement policies that have led to counter-intuitive and undesired results. One example of this is when staff-student ratios are increased to reduce the amount of resource required and manage excess capacity, the result has led to reduced student attainment and therefore more resource is required in providing additional classes and support. Another example of policy resistance in HEPs is when the level of student tariff required is reduced to increase enrolment and thus income, but the HEP also experiences an increase in the costs associated with providing additional study support to ensure students succeed.

This is particularly problematic where policies created to address performance related evaluation processes, i.e. those related to student or staff performance, have either no effect or worsen the situation by achieving the opposite result (Barnabè, 2004). Galbraith (1999) provided multiple examples of this including the creation of arbitrary cost centres that stifle management creativity in decision-making; non-systemic thinking such as making staff savings without consideration of the impact on staff retention, satisfaction or motivation; the application of funding formulae that fail to align the timescales with the allocation of the resource required; and the failure when planning to include the impact of conflicting pressures on staff time.

Thus far it has been shown that the HEP is a dynamically complex system, which is caused by the presence of feedback loops, non-linear relationships between the variables and time delays. Because of the mismatch between the complexity in the system and the policymaker's capacity to understand the system, policymakers tend to rely on simplistic mental models and traditional linear approaches to problem-solving (Sterman, 2001; 2006). This leads to policy resistance whereby any policies made will often produce counterintuitive results, and thus a new approach to decision-making is required.

3.5 A methodology to support strategic decision-making in a dynamically complex system

HEPs face long-term, strategic management problems that are dynamic and persistent in nature such as unbalanced growth in the student body, infrastructures that cannot keep up with the growth in enrolment, increased staff-student ratios, concerns about the quality of the instruction, heavy competition for limited funding for research, and heavy competition among HEPs for limited student demand (Barlas and Diker, 2000). Problems such as these must be addressed by high level, strategic policy-making mechanisms within the HEP (typically the vice chancellor, pro-vice chancellors and deans) but the decision-making required to solve these problems will also need to be undertaken at an operational level from heads of department through to those academics that are student facing (Barlas and Diker, 1996).

The adoption of a systems thinking perspective is the third theoretical underpinning of the research as it is an important approach that draws on a collection of interdisciplinary fields and proposes a selection of methods, theories and concepts from these fields to help structure and map problem situations (McGill et al, 2021; Warren, 2008). The adoption of the approach can help the user understand the complex system in which they operate, make informed decisions and understand the implications of any policy proposed, and enhance communication by bringing stakeholders together (Hussein and El-Nasr, 2013; Ismail et al., 2017; Kim and Rehg, 2018; McGill et al, 2021).

The view taken in this research is that the HEP system is composed of interrelated parts and that because the behaviour of the HEP system changes over time (i.e. it is dynamic) it is a complex system (McGill et al, 2021). Several researchers have proposed that system dynamics is one suitable methodology for addressing such complexity (see for example Ghaffarzadegan et al., 2017; Kennedy, 1998a; Kim and Rehg, 2018; Oyo et al., 2008). Barnabè (2004) suggests that the adoption of the system dynamics methodology could allow academic decision makers to keep the complex and dynamic HEP environment under better control by providing stakeholders with a better understanding of their position in the system, as well as highlighting the consequences and possible impacts of any decisions made on the system.

In Chapter 2, the balanced scorecard was suggested as a framework for a performance measurement system, however it was also noted that whatever PMS framework was to be used it would need to be capable of working in the presence of many levels and sources of complexity. The dynamic complexity present in an HEP is one of the main causes of unsatisfactory performance as it becomes harder to identify the drivers that underpin the processes that impact performance (Cosenz, 2014). One way to improve management practice, is to combine the creation of a PMS with the system dynamics methodology (Cosenz, 2014).

The integration of the system dynamics methodology with the traditional balanced scorecard will lead to the production of a framework that enables the strategy to be linked to the operational level, this means that the consequences of any management decisions and policies can be identified which can aid improvement in organisational performance (Barnabè and Busco, 2012). In addition, the process by which this framework will be produced will facilitate both individual and organisational learning as engaging in the process should result in improvements in the participants' mental models (Barnabè and Busco, 2012). The next section will introduce the system dynamics methodology and provide an overview of the history and principles that underpin it. The section will also review some

of the examples of successful applications of the methodology in the context of the creation of a PMS for an HEP.

3.6 System dynamics

The previous section showed that in many organisations, and especially in the public sector, policies are often delayed, diluted or defeated by unforeseen reactions because policy (decision) makers do not understand the dynamic complexity and feedback operating in the system (Ghaffarzadegan et al 2011; Rahmandad, 2008; Sterman 2000). In such a system, one that is complex, dynamic and policy resistant, with an internal causal structure of feedback, delays and non-linear relationships, system dynamics is a powerful methodology that can be used to understand the system and answer problems that are not independent of each other and therefore beyond the capability of the human mind (Barnabè, 2004; Morecroft, 2015; Senge, 2006; Sterman, 2000).

The system dynamics methodology was first introduced in the 1960s by a group of scientists in the Sloan School of Management at Massachusetts Institute of Technology (MIT), and while the original application was in industrial systems, it grew in popularity and scope and is now applied to a range of different systems including ecological, economic, sociological and even psychological systems (Barlas and Diker, 1996; Cosenz, 2022). The growth in its popularity began as the understanding of the dynamics of feedback systems, which emerged from engineering, started to be viewed as an organizing concept for human systems as well (Forrester, 1993).

System dynamics has been adopted by management for the last several decades as it aides their understanding of real-world behavior and supports the implementation of strategic policies; it does this by enabling the exploration of the non-linear dynamic relationships present in the system and studying how the structure and parameters of the system lead to the outcome (Hussein and El-Nasr, 2013). The system dynamics methodology can be applied to different disciplinary contexts but its growth in the area of behavioural research is due to the ability to use the technique to analyse how people understand and make decisions (Cosenz, 2013; Hämäläinen et. al, 2013; Moxnes, 2000).

Decision-making in HEPs is highly dependent upon the human input and the system dynamics methodology can incorporate this aspect which has led to the use of system dynamics models becoming increasingly popular in the analysis of policy and managerial issues (Oliva, 2003). Policymakers can use system dynamics to attempt to address dynamic, long-term policy problems in organisations and system dynamics models are an excellent way of exploring the links between the levers (policies) and the decision outcomes, and it is particularly useful in environments that are resistant to policy change (Barlas, 2007; Hawari and Tahar, 2015).

Oyo (2010) expounded the potential value of system dynamics modelling in addressing higher education quality issues due to its ability to: model feedback in dynamic systems like higher education; incorporate the non-linear relationships that are inherent in higher educational quality issues; address complex situations while experimenting with their behaviour over time; accommodate soft factors such as effectiveness of students teaching, staff competence and quality, and the quality of research; and model the time delays that underpin many higher education policies.

The dynamic complexity underlying academic management represents one of the main causes of unsatisfactory performance levels (Cepiku & Meneguzzo, 2009). System dynamics modelling provides organisational decision makers with an approach by which they can frame the dynamic

complexity, and this can enhance traditional performance measurement approaches (Bianchi, 2016). Any performance measurement approach that is adopted requires the decision maker to focus on the system's problems, issues, and opportunities within the HEP and system dynamics enables this (Cosenz, 2013).

System dynamics has two approaches, qualitative and quantitative, the choice of which to adopt is dependent on the issue under investigation, qualitative system dynamics comprises of diagram construction and analysis and quantitative system dynamics includes a simulation phase (Wolstenholme, 1990). More specifically the qualitative diagramming or causal mapping component in qualitative system dynamics, can be used to analyze the dynamic complexity present in social systems whereas the quantitative system dynamics component of simulation modelling is useful for interpreting the phenomena observed (Barnabè, 2004; Cosenz, 2013; Meadows et al., 2012).

The decision as to whether to adopt a quantitative or qualitative approach will depend on the aims and objectives of the research as well as the scale and scope of the subject being researched. In this research the aim is to understand how the decision makers react to the complexity present in the system, whether an opportunity for learning can be created and how this complexity present in the system can be demonstrated to support decision-making.

Given this a qualitative approach will be adopted which includes a causal mapping approach and the production of causal loop diagrams as a visual method to capture complexity which can help decision makers to identify the most impactful ways to influence the system and they also provide an effective way to communicate concepts between decision makers. Another advantage of adopting this approach is that the process of collecting the data entails the elicitation of the mental models of different stakeholders, this allows for sharing of knowledge and understanding among those involved in the modelling process (Barnabè and Busco, 2012).

The next section will discuss the steps that need to be undertaken to employ the methodology.

3.6.1 Principles and steps in the system dynamics methodology

The system dynamics methodology can be used to address dynamic problems in complex systems using both qualitative and quantitative modelling to conceptualise the underlying feedback structure and simulate the effects of potential decisions over time (Barnabè and Busco, 2012; Bérard, 2010). There are many suggestions of the necessary stages or steps to undertake as part of the modelling process (Martinez-Moyano and Macal, 2013). One example is provided by Sterman (2000), who suggests a 5-step process (problem articulation, dynamic hypothesis, formulation, testing and policy formulation, and evaluation). As this research will adopt a qualitative system dynamics approach, the steps that will be followed that support such an approach have been derived from several sources are defined and presented below.

Step 1 – state the problem

The first activity is to create an issue statement that defines the problem or issue, and a purpose statement that states the objective of the model and the desired behaviour (Bérard, 2010; Lane, 2000; Schwaninger and Groesser, 2008).

Step 2 – create a model overview

The next stage is to identify the causal factors, formulate the policies which transform the information into decisions, and generate a hypothesis to show how the system is creating the troubling behaviour (Forrester, 1994; Lane, 2000). A dynamic hypothesis is a theory that shows how the structure and decision policies generate behaviour by linking observable patterns of behaviour to the micro-level structure and decision-making processes (Oliva, 2003). The formulation of the dynamic hypothesis leads to the development of an influence diagram that represents the hypothesis of the feedback structure of the system and can also be used as a tool to create a shared mental model for a group or organisation (Bérard, 2010).

Step 3 – list the variables in a model boundary chart

The model boundary chart will help to review the scope of the model as it lists the key variables that are endogenous (arise from within), exogenous (arise from without) and excluded (clearly outside the system). The boundary depends on the system, creating the model boundary chart helps the modeller to understand and communicate the sources of change in the variables of interest in the model, establishes reference modes for the variables and also acknowledges the limits of the model (Forrester, 1968; Martinez-Moyano and Macal, 2013; Schwaninger and Groesser, 2008). The variables that will be included will be determined following the data collection and analysis stages that will be undertaken.

Step 4 – create analyse and use causal loop diagrams

Causal loop diagrams (CLDs) are one of the main components of the system dynamics model and represent the feedback in the system by showing the causal links between the variables and assigning polarity to show how the variables impact each other. They are powerful conceptual tools to help visualise the interdependencies and help analysts qualitatively analyse the structure of the system (Morecroft, 2015; Sterman, 2000).
To be able to develop CLDs it is necessary to understand and identify causal relationships by specifying the major factors that affect each variable and in turn what factors those variables affect, this will lead to improved policy and management decision-making, can help decision makers explore strategic alternatives and reduce the likelihood of overlooking any unintended consequences of any well-intended decisions that are made (Moizer and Tracey, 2010).

The CLD diagram presented in figure 5 is small with only two feedback loops, however the final CLD or causal map often contains multiple feedback loops and is considerably harder to analyse and thus use. There are several ways to approach this, one method is to do a thematic analysis of it, either in written form or in a workshop setting with the stakeholders or the CLDs could be explored qualitatively by considering how the feedbacks present might play out with scenarios of variable behaviour to explore how the system might behave over time; introducing the map in steps, themes or colour coded can also help (Barbrook-Johnson and Penn, 2022)

Step 5 – validate the model

Model validation is a very important stage in the research and is necessary to ensure that the model behaviour is consistent with reality and will also increase the potential for the model to be implemented. The validity of each link in a causal loop diagram can be tested, this would be achieved by checking each of the pairs of variables assumed to be in a cause-and-effect relationship

(Burns and Musa, 2001). In order to validate any model that is to be adopted, it is necessary to ensure that the appropriate managers are engaged in the creation of the underpinning CLD so that they can confirm that the structure is appropriate (Qudrat-Ullah and Seong, 2010).

Step 6 – hold workshops to communicate findings

Once confidence in the model has been established, workshops with decision makers can be held to help them understand the detailed complexity of the problem situation, help them overcome their cognitive limitations and therefore support and enhance decision-making (Barlas, 2007; Dangerfield, 1999; Oliva, 2003).

The steps above have been suggested drawing on the literature and only consider the stages necessary to undertake a qualitative system dynamics approach; if a quantitative system dynamics approach was being undertaken there would be an additional two steps included here: building the simulation model and simulation of interventions.

One of the reasons system dynamics was originally developed by Forrester was to create a methodology that could be used to address organisational policy problems (Andersen et al., 2007). To solve real-world problems, it is also necessary to work effectively with stakeholders and to facilitate them in sharing their world views and it is this exercise that will truly foster organisational learning and change in the organisation (Bechky, 2003; Sterman, 2001). The process of capturing the required knowledge in the participants' mental models is known as tacit knowledge elicitation, the process of engaging groups of participants in the model-building process is known as group model building (GMB). The following two sections will discuss these aspects in more detail.

3.6.2 Tacit knowledge elicitation

Stata (1989) proposes that the system dynamics methodology can be used to improve management thinking in complex organisations and it is a powerful tool to facilitate both individual and organisational learning. He goes on to describe organisational learning "as the principle process by which management innovation occurs" as it "entails new insights and modified behaviour through shared insights, knowledge and mental models" (Stata, 1989:64). The final point he makes is that change will not occur unless the major decision makers' thinking is aligned with shared beliefs and goals and a commitment to take any actions necessary (Stata, 1989).

A mental model can be defined as the conceptual representation of a system that a person adopts to help them describe, explain and predict a system's behaviour (Capelo and Dias, 2009). The mental models that managers use for decision-making are imperfect and are frequently only partial representations of a complex situation (Vennix, 1999). If managers were to possess an enhanced mental model their capacity to deal with and manage dynamically complex relationships would be improved and this would have a positive impact on the long-term success of the HEP (Capelo and Dias, 2009).

The process of decision-making is normally such that the decision maker compares the current situation to the desired situation, considers the gap between the two situations and makes a policy that aims to reduce the gap and move the current situation closer to the desired situation (Sterman, 2000). The policy that is applied is determined by the decision maker and will be affected by their

mental model, if their mental model remains unchanged the process is known as single-loop learning (Sterman, 2000).

If the decision maker can incorporate information feedback about the real-world and revise their mental model, different policies will be proposed and yield different results, this is known as double-loop learning (Sterman, 2000). Double-loop learning is more likely to lead to sustained competitive advantage because the approach can generate tacit organisational knowledge and enhance organisational flexibility (Lado and Wilson, 1994).

Dodgson (1993) notes that knowledge is shared through the development of shared meaning among organisational members, this can be achieved by working collaboratively with the decision makers to produce CLDs to represent the operational sectors in the organisation. The next section will discuss the use of group model building (GMB) and stakeholder engagement techniques in more detail.

3.6.3 Group model building and stakeholder engagement

GMB techniques are an integral part of system dynamics and are particularly effective in policy making, strategy development and strategy implementation (Scott et al., 2016). GMB techniques should thus be used to construct system dynamics models, this means working directly with client groups on key strategic decisions (Andersen et al., 2007; Vennix, 1999). The use of GMB techniques supports strategic decision-making as this approach helps to develop a comprehensive understanding of the scope of the system and guide the actions that are conducted (Béraud, 2010; Rouwette, 2011).

The use of GMB techniques helps to create a shared understanding of complex systems by providing a mechanism for managers to exchange information ideas which can provide important insights for system dynamics modelling (Wilkerson et al., 2020). Andersen et al. (1997) suggest that GMB will have an impact at an individual, group and organisational level which include mental model refinement, creating shared consensus and commitment to a decision. The term GMB can mean the system dynamics model-building process in which a group is heavily engaged in the process of model construction (Vennix, 1999) however the broader term stakeholder involvement is probably more appropriate.

Stakeholder involvement in the model-building process has been a key component of system dynamics since its inception, as it is necessary to capture the required knowledge in the mental models of the stakeholder group, it will also increase the chances of implementation and enhance the stakeholders learning process (Rouwette, 2011; Vennix, 1999). The involvement of the stakeholders in the modelling process enhances the model's credibility, and there are key activities when it is necessary to engage with the stakeholders, one of which is during the building of the conceptual model when decisions are made regarding the model assumptions and boundary, what to model and what not to model, based on the user needs and the researcher's approach (Qudrat-Ullah and Seong, 2010). When modelling a messy managerial situation ideally the user should be involved throughout the model building process as their involvement will allow the capture of the required information, enhance implementation success, build confidence and also lead to double loop-learning (Monks et al., 2016; Vennix 1999).

Another key activity is the elicitation and understanding of the stakeholders' mental models which are central to the successful application of system dynamics and since mental models are continually

changing any efforts to elicit, measure, or map them can themselves induce changes and enhance the learning process (Doyle and Ford 1998; Vennix, 1999). Thompson et al (2016:1) explained how when their clients learned to resolve dynamically complex problems in system dynamics model-based engagements they experienced 'critical learning incidents' which they define as "the moment of surprise caused after one's mental model produces unexpected failure and a change in one's mental model produces the desired result".

Thus far this chapter has considered the applicability of the system dynamics methodology to address the inherent complexity present in the system of higher education. The principles and steps were then presented followed by a discussion of two of the major concepts, that of tacit knowledge elicitation and the use of group module building. The next section will explore specific examples of the application of system dynamics to real-world issues and then specifically to higher education.

3.7 The application of system dynamics to real-world issues

As a methodology system dynamics has been successfully applied across a wide range of industries with applications in manufacturing, healthcare, business process reengineering and strategic management (Barnabè and Busco, 2012). A consideration of the most recent SD conference shows the key areas of application in the current research being undertaken are agriculture, climate, energy, financial and economics, healthcare, logistics and supply chain, sustainability, and urbanisation. A sample of recent articles published that have adopted the SD methodology are in sectors such as construction (see for example Bajomo et al., 2022; Ecem Yildiz et al., 2020; Kaya and Dikmen, 2024), healthcare (see for example Bayer et al., 2020; Lebcir and Atun, 2020; Qudrat-Ullah, 2023), project management (see for example Ackermann, 2023; Elia et al., 2021; Xu and Zou, 2021), public policy (see for example Anderson et al., 2023; Guemouria et al., 2023; Malbon and Parkhurst, 2023), strategic management (see for example Gozali et al., 2023; Kunc et al., 2023; Mishra et al., 2023), supply chain (see for example Esenduran et al., 2022; Herrera and Trujillo-Díaz, 2022; Zhou et al., 2022) and sustainability (see for example Cosenz et al., 2020; de Gooyert et al., 2022; Singh et al., 2023). There is an obvious lack of research being undertaken and published in the higher education sector.

The primary role of system dynamics modelling is to gain an insight into a complex problem and influence the thinking and actions of the management team (Barnabè and Busco, 2012). Thus, the use of system dynamics could be particularly helpful within university management and the next section will review the research that has occurred in the area of decision-making to enhance performance measurement in higher education.

3.8 Examples of the application of system dynamics in higher education

The use of system dynamics could be particularly helpful within HEP management with its general complexity and a context characterized by consistently diminishing availability of resource and a government that places increasing demand on the quality of standards (Barnabè, 2004). Given the suitability of system dynamics in this area, there has been some research published where the system dynamics methodology has been applied to the higher education sector, however, as shown by the analysis of the papers presented at the system dynamics conference in 2023, this is not commonplace.

An analysis of the prior research that applied the system dynamics methodology to the context of higher education was undertaken (see table 2). The research that has been undertaken to date has either modelled a subsection of the HEP or, where there have been attempts to model the whole system, it has been with a high level of variable aggregation. The subsections of the HEP that had been modelled are: university management (Galbraith, 1999); graduate instruction sector (Barlas and Diker, 2000); quality control (Hussein and El-Nasr, 2013); enrolment and rankings (Merkulov et al., 2015); academic workforce (van Kersbergen et al., 2016); student enrolment (Al Hallak et al., 2017); quality management (Ismail et al., 2017); faculty performance and morale (Kim and Rehg, 2018); and university choice (Heathcote et al., 2020). Prior work that has attempted to model the whole system, but with high variable aggregation, has been undertaken by Kennedy (1998a), Zaini et al. (2017) and Pavlov and Katsamakas (2020).

It can thus be established that, at the time of writing, there has been no research published that has addressed the research aims of this study. None of the prior research has focused on the attainment of multiple performance objectives, however, two of the articles have focused on performance as an output (Oyo et al. (2008) focused on funding and Ismail et al. (2017) focussed on student satisfaction). Additionally, nearly all of the research published to date has focused on the production of small-scale quantitative models, and the only publication identified that has adopted a qualitative system dynamics approach was by Heathcote et al. (2020).

Table 2: Prior research investigating the application of the system dynamics in higher education

Author(s) and year	Setting, methodology and context	Application to this research	Main findings
Kennedy (1998a)	Kennedy developed a system dynamics model as part of a pilot study to assess the feasibility of modelling the complex, interdependent set of variables involved with the many aspects of quality management in higher education.	He produced an influence diagram that identified the factors underpinning student performance as: quality of teaching, student perception, quality of facilities, class size, student motivation, student contact time, staff motivation, staff performance. As well as a small-scale simulation of the whole system.	He established that to achieve high quality standards of education the key issues that needed to be addressed were staff performance, student performance, research, teaching and learning, administrative support and funding.
Galbraith (1999)	Galbraith produced a systems model to generate behaviours that a typical university exhibits over time with respect to faculty staffing, budgetary conditions, and the impact of incentives to stimulate change and exercise leverage.	His basic generic structure of the university management model considered the inputs (student volume, government funding and research funding) and outputs (investment in research, staff costs and other academic costs) to faculty budget.	He concluded that the major issue raised by the modelling concerned the long-term impact of short-term decisions. Policy and decisions are likely to be unsuccessful if the decision makers rely on non-systemic decision-making.
Barlas and Diker (2000)	They constructed an interactive dynamic simulation model focusing on long-term, strategic problems that must be addressed by high level, strategic policy- making mechanisms within an HEP in Turkey. In 2000 they updated the model and gaming interface.	They produced stock and flow diagrams of the graduate instruction sector (number of programmes, students and faculty), graduate instruction quality sector (teaching, facilities, research, spending and class size), and graduate faculty overhead (allocation to teaching, research, projects and other).	Graduate study orientation has considerable positive effect on research output and that keeping UG class sizes low, may cause problems in maintaining the faculty body.
Oyo et al. (2008)	They developed a model based on higher education literature in the developing world in general and Uganda in particular, to review policies on funding and quality in higher education.	Their CLD representing their dynamic hypothesis considered the relationship between funding, staff costs, research quality, teaching quality and student enrolment. They produced stock and flow diagrams of funding, student capacity and income; the flow of students through the system; research capacity, publications and income; teaching	They concluded that HEPs accept large student enrolment to compensate for inadequate funding but that this undermines the capacity to maintain quality. They also proposed that more research funding is allocated out of tuition funds to enable HEPs to achieve in both their teaching and research goals.

		capacity and quality; and the volume of staff, their qualifications and experience.	
Hussein and El-Nasr (2013)	They produced a system dynamics model of the factors that affect student satisfaction.	Their CLD shows that student satisfaction is impacted by buildings and facilities, courses, marketing, student services, counselling, and research and environmental services. Student satisfaction impacts quality, as does student number and employee satisfaction.	They concluded that the most impactful distribution of resource was in this order: buildings and facilities (37%), LRC (11%), student services (8%), marketing (8%), research and environmental services (7%).
Merkulov et al. (2015)	They developed a model to study the relationship between enrolment and rankings.	Their stock and flow model shows rankings to be impacted by student attainment, progression and continuation, quality of students enrolled, staff-student ratio, class-faculty ratio, employability and alumni reputation.	They determined that the most valuable lever to ensure higher ranking was admissions policy as it impacted student enrolment, acceptance rate and the quality of the students.
van Kersbergen et al. (2016)	They created a system dynamics model to describe the influence of funding regimes and career policies on workforce development and research output over time.	Their CLD shows that the volume of academic staff is impacted by promotion and hiring, appointment capacity, and attractiveness of academic career. The volume of academic staff impacts research output, appointment capacity, promotion and hiring, and share of temporary staff.	Their findings showed that there is a link between an increased focus on competitive funding schemes and the increased focus on staff on temporary contracts.
Zaini et al. (2017)	They built a simple system dynamics model of an HEP.	Their CLD showed the relationships between volume of UG students, faculty load and facilities load.	They showed that as student satisfaction increased as did reputation, and therefore the volume of UG students. However as the volume of UG students increases, the impact of faculty and facility load led to a decrease in student satisfaction. They created a series of balancing loops.
Al Hallak et al. (2017)	They developed a series of simulation models to examine the between student flows, staff ratios and investment in plant and facilities.	Their CLD on HEP growth considers the positive impact of investment on the probability of students applying and thus the rate of enrolment. This is broken down into several CLDs: the first CLD considers the	The study recommends that HEP managers adopt a flexible strategy (regarding revenue, expenses and investment) which is mindful of what strategies are being adopted by the

		impact of ranking, enrolment and graduation rates on total student population. The second CLD considers the relationship between staff recruitment and turnover on staff population and SSR. The third CLD considers the relationship between investment (specifically facilities), revenue and profit.	competition at any given time, as well as other factors in the external environment.
Ismail et al. (2017)	They developed a system dynamics model for investigating the critical success factors of total quality management affecting students' satisfaction.	Their CLD suggests that student satisfaction is impacted by quality of teaching, quality of student learning, cost and the percentage of trained students.	This research identified four CSFs of quality management in HEPs that positively affect students 'satisfaction: percentage of Ph.D. holders, facilities cost per student, quality of teaching, and quality of student learning.
Kim and Rehg (2018)	They produced a set of systems maps to consider how innovation attempts for improving the quality and efficiency of education, affect faculty morale.	Their CLD of faculty workload and morale shows faculty workload as impacted by faculty turnover, faculty hiring, student enrolment and the quality of student-faculty interaction. Faculty workload impacts faculty hiring, class size and burnout.	They determined that it is critical to maintain a sufficient size of competent faculty workforce to support quality teaching, research and high morale.
Heathcote et al. (2020)	The authors applied systems thinking to understand student behaviour. This is the only qualitative study.	They produced four CLDs that considered the students' probability of applying (all, mature, international and young students).	Their research established that the probability of applying was impacted by appeal of the HEP, course suitability, appeal of locality, fear of debt, financial relief, flexibility of programme and current reputation.
Pavlov and Katsamakas (2020)	The authors applied systems thinking to develop a system dynamics module that considers whether US colleges will survive the declining student enrolment.	They produced a CLD that represented the college showing the elements of a tuition-based college (which included faculty, facilities, revenue, debt, reputation and educational outcomes).	Their analysis suggests that solutions such as cutting cost by reducing faculty or seeking to increase revenue by improving campus facilities to attract students may only improve the college's short-term financial position.

3.9 The application of system dynamics to enhance the balanced scorecard

In chapter 2 the BSC was suggested as a framework for a PMS, however it was recognised that this framework needed to be able to operate within a complex environment, such as an HEP. This chapter has suggested that system dynamics is a suitable methodology to address management problems in an environment such as this. Before considering examples of the application of system dynamics to the balanced scorecard in higher education, the following section will review the combination of these techniques in a wider context.

The application of system dynamics techniques to the balanced scorecard framework can be found across a range of industries for example Akkermans and van Oorschot (2005) used systems techniques to model a balanced scorecard for an insurance company; Anjomshoae et al. (2017) proposed conceptual model to the structure of a DBSC in the humanitarian supply chain; showed how the application of a "dynamic" balanced scorecards could significantly improve the planning process in a public utility company; Khakbaz and Hajiheydari (2015) developed a DBSC for a public transportation company; Nazari-Ghanbarloo (2022) created a DBSC to measure supply chain performance; and Sutrisno and Purba (2022) developed a DBSC to analyse the performance of a medical device distributor during covid-19.

3.9.1 Examples of the application of system dynamics to enhance the balanced scorecard in higher education

Following on from the previous discussion, despite the suitability of combining these approaches, there is very limited research that has been published where system dynamics has been combined with the BSC approach in the context of higher education. The only articles that have been discovered are by Hawari and Tahar (2015) and Kalnins and Jarohnovich (2016).

Hawari and Tahar (2015) produced a small CLD to underpin the creation of a dynamic BSC which included the perspectives of customers, learning and growth, internal processes and financial. Using this model they determined that the recruitment policy could be the most effective policy to lever to achieve the HEP's strategic objectives. Kalnins and Jarohnovich (2016) created a strategy map for an HEP with a focus on enhancing its entrepreneurial aspect. The strategy map included the perspectives personal infrastructure, internal processes, consumers and financial. They established that one of the fundamental characteristics necessary to become a successful entrepreneurial HEP is the relationship with stakeholders.

3.10 Chapter conclusion

This chapter has explored how an HEP can be considered to be a dynamically complex system. It was shown that the presence of dynamic complexity created bounded rationality and thus decision makers relied on incomplete and simplistic mental models and make decisions that are policy resistant. Bounded rationality is the second theoretical underpinning of this research because to achieve the research aim and support decision-making in the HEP, it is necessary to understand the impact of the HEP as a DCS on the decision-making process.

The adoption of a systems thinking perspective to support decision-making in the HEP forms the third theoretical underpinning in this research. Specifically, the application of system dynamics was suggested as one suitable methodology for addressing this dynamic complexity as it assisted decision makers in keeping the complex and dynamic environment in which the HEP is situated under better

control. It enabled this by providing decision makers with a better understanding of the system as well as highlighting any consequences and possible impacts of the decisions made.

It was then proposed that the combination of system dynamics together with the adoption of the balanced scorecard, as a foundation for a performance measurement system, can lead to both individual and organisational learning. The application of the system dynamics methodology is highly applicable to this research because of the dynamic and perennial nature of performance measurement problems in HEPs (Barlas and Diker, 2000).

However, although there is a strong justification for the application of system dynamics to enhance the creation of the BSC so that it can be successfully applied, there is limited research that has achieved this. The existing research in the area has rarely focused on applications to HEPs, but in the research that had been undertaken there was a consensus that aligning the traditional BSC architecture to system dynamics principles will better support strategic management decisions (Barnabè, 2011).

While there is published research that supports the use of system dynamics to enhance the BSC (see for example Barnabè and Busco, 2012; Wolstenholme, 1998), there is very little research that uses a system dynamics approach to enhance a BSC in the context of decision-making that leads to performance improvement in HEPs. The aim of this research is to apply the system dynamics methodology to the balanced scorecard approach and produce a framework that supports management decision-making to improve performance. The next chapter will develop a conceptual framework to guide the direction of the research.

Chapter 4 Creating a conceptual framework for decision-making in a higher education provider

4.1 Chapter introduction

Thus far this research has considered the increased and ongoing performance measurement being experienced by HEPs. The application of a balanced scorecard methodology (BSC) was proposed in chapter 2 as a foundation for the development of a performance measurement system. The BSC limitations were then considered, and this resulted in the proposal that the production of a strategy map as an enhancement to the BSC would be more suitable as a performance measurement system (PMS). This PMS would not only support the performance measurement activity but would also guide and enhance the underpinning decision-making that resulted in the performance outcomes.

The following chapter 3 discussed the difficulties associated with decision-making in the environment of higher education due to the presence of dynamic complexity. It was thus suggested that the research adopted a system dynamics methodology to incorporate the impact of the presence of dynamic complexity on decision-making. The application of qualitative system dynamics tools were specifically proposed as a mechanism for both collecting and analysing the data that would be used in the creation of the PMS.

The aim of this chapter is to develop a conceptual framework to underpin the research project. A conceptual framework is a map of what the researcher aims to investigate which includes the concepts and variables, and the relationships between them (Miles and Huberman, 1984). This conceptual framework will guide the direction of the research and provide a foundation for the research to ensure credibility by ensuring that research findings are meaningful and rigorous as well as confirming generalisability (Adom et al., 2018). The conceptual framework will also provide the foundation to address the following research questions:

RQ1: What are the KPIs that translate the strategy of the HEP into performance indicators to measure attainment and act as proxies for the desired performance to be achieved in the PEFs?

RQ2: How can an HEP be represented as a dynamically complex system? How is this complexity captured in the system's causality map of the HEP?

RQ3: How can the system dynamics methodology be employed to create an environment to facilitate learning?

RQ4: Can a framework, that demonstrates the interdependencies between the KPIs and shows how the underlying perspectives that create performance are interlinked, be created to support decision-making?

The conceptual framework will be based upon the balanced scorecard methodology together with the application of qualitative system dynamics tools. The first stage will be to establish the perspectives to be included. The perspectives represent the areas of the HEP that drive performance and they are derived from the HEP's vision, strategy or goals. Typically the most suitable perspectives for an HEP are financial, customer (stakeholder), internal business processes and innovation, learning and growth (Al-Zwyalif, 2012; Baporikar, 2015; Kaplan and Norton, 2007; Voelpel et al., 2006).

Once these perspectives have been determined, the Performance Evaluation Frameworks (PEFs) will be reviewed such that the objectives that represent success in each of the PEFs can be identified. This information can be used to draft a conceptual BSC which will show the objectives for each PEF mapped against each perspective.

4.2 Creation of a conceptual balanced scorecard

The first stage in the creation of a conceptual BSC is to determine the perspectives.

4.2.1 Balanced scorecard perspectives

The perspective headings used in a BSC should reflect the main aims of the HEP's vision, strategy and goals, in this research the PEFs will be used to represent the HEP's goals. The traditional BSC perspectives proposed by Kaplan and Norton (1992) are financial, internal business, customer, and innovation and learning. An analysis of a selection of the research published that considers the application of a BSC in an HEP, suggests the most suitable perspectives to be customer, financial, internal business processes and learning and growth (see Appendix 1 for the list of all proposed perspective headings along with their relative frequency).

To understand the relevance of each perspective the following sections consider each perspective in turn explaining which stakeholder is impacted as well as the areas of decision-making and activity that need to be included. The BSC has traditionally been used to measure the outputs of the organisation according to each perspective. This research will also include the inputs required in each area of activity to attain PEF success. These variables are included because it is the decisions made about the processes and the deployment of the input variables that result in the output produced.

4.2.1.1 Customer perspective

The customer perspective relates to the stakeholders: students, academic staff, administrative staff, board members, alumni, parents, the public, business community, corporations and employers (Dorweiler and Yakhou, 2005; Patro, 2016; Sayed, 2013). The perspective will be concerned with how the HEP is viewed by these stakeholders and focuses on improving customer satisfaction and promoting institutional image (Chen et al., 2006; Lassoued, 2018; Pineno and Boxx, 2011).

4.2.1.2 Internal business processes perspective

The internal business processes are the critical processes that drive the creation of the desired outcomes in an HEP and consider how well the operations are satisfying customer demand (Alani et al., 2018; Bailey et al., 1999; Farid et al., 2008; Papenhausen and Einstein, 2006). The focus of this perspective includes teaching and learning, operational efficiency, management of the HEP, customer management, innovation, and regulatory and social processes (Sayed, 2013; Toteva, 2020).

4.2.1.3 Learning and growth perspective

The priority of the learning and growth perspective is to create a climate that supports organisational change, innovation, and growth and this comes from organisational learning and management, and the quality of the staff members (Chen et al. 2006). The learning and growth perspective determines the culture, skills, training and technology that need to be developed to support the successful application of the internal business processes (Brown, 2012; Papenhausen and Einstein, 2006).

Lassoued (2018) says that the success of the internal business processes are dependent on the human capital, information capital and organisational capital. This research will focus on the human capital aspect that is concerned with the knowledge and skills of the human capital that can be achieved by recruiting quality human resource

4.2.1.4 Finance perspective

The last of the four perspectives is the finance perspective, this is concerned with ensuring an adequate financial structure is in place to enable the HEP to achieve its vision, strategy and goals (Chen et al., 2006). Successful financial management can be achieved by increasing revenue and efficiently utilising resources, having good financial management is dependent upon achieving success in the other three perspectives (Eftimov et al., 2016; Lassoued, 2018). The financial security of the institution will have an impact on any possible investment in infrastructure as well as being able to attract, retain and develop academic staff (Alani et al., 2018).

4.2.2 How do the performance evaluation frameworks and the perspectives interlink?

Having defined the four perspectives and the activities and decisions that they represent, the next stage is to consider the objectives for each perspective. The PEFs that will be used in this research were introduced in chapter 2 and are the NSS/PTES, REF, GOS, TEF and KEF. These PEFs will be reviewed in turn to consider which objectives are relevant to each perspective and this will form the basis of the conceptual BSC.

4.2.2.1 Performance objectives for the National Student Survey / Postgraduate Taught Experience Survey by perspective

The first PEFs to be considered are the NSS/PTES which is comprised of nine objectives: (i) teaching on my course, (ii) learning opportunities, (iii) assessment and feedback, (iv) academic support, (v) organisation and management, (vi) learning resources, (vii) learning community, (viii) student voice and (ix) overall satisfaction. Each of these objectives will be considered in turn to identify which perspectives they align to.

Teaching on my course aligns to the customer perspective because it is the student that reviews the teaching (Aljardali et al., 2012; Farid et al., 2008; Umashankar and Dutta, 2007). This objective also aligns to the internal business perspective as it relates to staff recruitment, including both academic staff and external examiners (Eftimov et al., 2016; Weerasooriya, 2013).

Learning opportunities aligns to the internal business processes perspective because the results students attain are a function of the decisions made relating to the support that they receive with regard to contact time, the staff-student ratio and the use of technology (Weerasooriya, 2013). The objective also aligns to the learning and growth perspective because of the amount of staff development and expenditure on hardware and software required (Bailey et al., 1999).

Assessment and feedback aligns to the learning and growth perspective because it relates to the learning, teaching, and assessment initiatives provided at the HEP (Farid et al., 2008).

Academic support and organisation and management can be considered together as they both align to the customer perspective as they relate to the services and processes that the students experience (Patro, 2016; Schobel and Scholey, 2012). The objective also aligns to the internal business perspective

as the correct processes need to be in place to ensure that the service is effective (Farid et al., 2008; Pineno and Boxx, 2011; Umashankar and Dutta, 2007). Finally this objective aligns to the finance perspective because of the expenditure required on academic staff (Lenton, 2015).

Learning resources aligns to the internal business processes perspective because it relates to ensuring the appropriateness of the facilities, hardware, and software (Bailey et al., 1999). The objective also aligns to the learning and growth perspective because it is necessary to engage staff in appropriate staff training, as well as to review the success of the use of technology in teaching (Farid et al., 2008; Umashankar and Dutta, 2007).

Learning community and student voice can also be considered together, they both align to the customer perspective because it is necessary that students are satisfied with the opportunities provided (Papenhausen and Einstein, 2006). These objectives also align to the internal business processes perspective as it relates to creating the right climate and providing appropriate activities for students to feedback on their experience (Bailey et al., 1999; Weerasooriya, 2013).

Overall satisfaction aligns to the customer perspective as it is the single measure of student satisfaction, although there are multiple factors that impact it (Patro, 2016).

4.2.2.2 Performance objectives for the Research Excellence Framework by perspective

The next PEF to be considered is the Research Excellence Framework (REF) which measures: (i) outputs (research publication, citations and presentations), (ii) impact (demonstrable benefits to the economy, society, public policy, culture or quality of life) and (iii) environment (the research environment which supports research including dissemination and application). Each of these objectives will be considered in turn to identify which perspective they align to.

Outputs align to all four of the perspectives, first it aligns to the customer perspective as it relates to the quality of the faculty as measured by the research contributions and citations (Bailey et al., 1999; Papenhausen and Einstein, 2006). Secondly, the objective aligns to the internal business processes perspective as it relates to staff productivity as measured by publications, conference attendance and bid applications (Eftimov et al., 2016). Thirdly, the objective aligns to the learning and growth perspective which relates to the quality of academic staff development which can be measured by the number of successful conference papers and publications (Chang and Chow, 1999; Patro, 2016; Weerasooriya, 2013). Finally, the objective aligns to the finance perspective as it relates to research revenue and grants (Eftimov et al., 2016; Farid et al., 2008).

Impact aligns to the customer perspective as this includes services to the community in terms of the external and welfare activities undertaken by staff and students (Weerasooriya, 2013). The objective also aligns to the learning and growth perspective as it relates to academic excellence and increased research productivity (Umashankar and Dutta, 2007).

Environment aligns to the internal business processes perspective as it relates to increasing the impact of staff output as measured by submissions, citations and funded projects (Eftimov et al., 2016). The objective also aligns to the learning and growth perspective as it relates to the quality of academic staff development which can be measured by budget available for research, the number of educational development activities available and the number of joint or collaborative activities that are organised by the HEP (Chang and Chow, 1999; Patro, 2016; Papenhausen and Einstein, 2006; Weerasooriya, 2013). Lastly the objective aligns to the finance perspective as it relates to investment in research

including attracting and retaining quality faculty, and resources to support research including research allowances and sabbaticals (Bailey et al., 1999; Eftimov et al., 2016).

4.2.2.3 Performance objectives for the Graduate Outcomes Survey by perspective

The next PEF to be considered is the Graduate Outcomes Survey (GOS) which measures employability and earnings of higher education graduates, it also considers those graduates in further study. Employability and earnings of graduates aligns to the customer perspective which considers the number of jobs offered and the average salary as well as employer satisfaction with graduates (Aljardali et al., 2012; Pineno and Boxx, 2011; Umashankar and Dutta, 2007).

Employability and earnings of graduates also aligns to the internal business processes perspective which considers the currency of the curriculum and placement services and opportunities (Pineno and Boxx, 2011). Lastly, employability and earnings of graduates aligns to the learning and growth perspective which includes partnering with employers for campus recruitment opportunities (Umashankar and Dutta, 2007).

4.2.2.4 Performance objectives for the Teaching Excellence Framework by perspective

The next PEF to be considered is the Teaching Excellence Framework (TEF) which measures (i) teaching quality, (ii) learning environment and (iii) student outcomes and learning gain. Each of these objectives will be considered in turn to identify which perspectives they align to.

Teaching quality is measured by teaching on my course and assessment and feedback. These measures were already considered above under the NSS/PTES perspective where it was determined that this criterion aligns to the customer perspective, the internal business perspective and the learning and growth perspective.

Learning environment is measured by academic support and continuation. Academic support will align to the customer perspective (student satisfaction in the aspects of study), the internal business processes perspective (efficiency and effectiveness of services), and the learning and growth perspective (quality of facilities) (Eftimov et al., 2016; Papenhausen and Einstein, 2006; Weerasooriya, 2013). Continuation aligns to the customer perspective as well as the internal business processes perspective as it is a measure of the effectiveness of the service (Eftimov et al., 2016; Papenhausen and Einstein, 2006)

Student outcomes and learning gain is measured by employment and further study, the same measures as those for the Graduate Outcomes Survey and thus this criterion aligns to the same perspectives discussed above.

4.2.2.5 Performance objectives for the Knowledge Excellence Framework by perspective

The final PEF is the Knowledge Excellence Framework (KEF) which measures (i) Intellectual Property and commercialisation, (ii) local growth and regeneration, (iii) public and community engagement, (iv) research partnerships, (v) skills, enterprise, and entrepreneurship, (vi) working with business and (vii) working with the public and third sector.

Intellectual property and commercialisation are aligned to the customer perspective as knowledge extension and the finance perspective as revenue from research and consulting (Eftimov et al., 2016;

Umashankar and Dutta, 2007). Local growth and regeneration align to the customer perspective as it relates to enhancing relationships with the business community (Bailey et al., 1999). Public and community engagement aligns to the customer perspective as it concerns good citizenship and good public relations and image (Bailey et al., 1999; Pineno and Boxx, 2011; Umashankar and Dutta, 2007).

Research partnerships align to the learning and growth perspective as it relates to the number of joint or collaborative activities that are organised by the faculty (Weerasooriya, 2013). Skills, enterprise, and entrepreneurship aligns to both the customer perspective and the learning and growth perspective as it relates to staff knowledge and skills (Pineno and Boxx, 2011; Umashankar and Dutta, 2007). Working with business, the public and the third sector is aligned to the customer perspective as it concerns enhancing business community relationships, as well as the internal business processes perspective as it relates to faculty currency and learning and growth (Bailey et al., 1999; Chang and Chow, 1999; Farid et al., 2008).

The proposed conceptual BSC is shown in Table 3 below. The four perspectives, shown in the first column, are derived from the literature. Under each perspective there is a definition of who and/or what is considered to be a part of that perspective. The strategy, shown in the first row, is focused on PEF attainment. At the intersection of each PEF with each perspective are the objectives that relate to the associated PEF and can be achieved by the decisions that occur within the aligning perspective.

Table 3: Proposed conceptual balanced scorecard

BSC perspective	NSS/PTES Objectives	REF Objectives	GO Objectives	TEF Objectives	KEF Objectives
Customer Who: Stakeholders – students, staff, employers, local, regional and business community What: Customer satisfaction HEP image	Teaching on my course Academic support, organisation and management Learning community and student voice Student satisfaction	Output Impact	Employability and earnings	Teaching quality Learning environment Student outcomes and learning gain	IP and commercialisation Local growth / regeneration Public engagement Skills, enterprise, entrepreneurship Working with business, the public and the third sector
Internal business processes What: Critical processes that drive the creation of the desired outcomes including - teaching and learning - operational efficiency - management of the HEP - customer management - innovation and regulatory and social processes	Teaching my course Learning opportunities Academic support, organisation and management Learning resources Learning community and student voice	Output Environment	Employability and earnings	Teaching quality Learning environment Student outcomes and learning gain	Working with business, the public and the third sector
Learning and growth What: Culture Skills Training Technology	Learning opportunities Assessment and feedback Learning resources	Outputs Impact Environment	Employability and earnings	Teaching quality Learning environment Student outcomes and learning gain	Research Partnership Skills, enterprise and entrepreneurship
Finance What: Financial structure Financial management Financial security	Academic support, organisation and management	Output Environment			IP and commercialisation

Table contents derived from: Bailey et al., 1999; Chen et al., 2006; Chang and Chow, 1999; Eftimov et al., 2016; Farid et al., 2008; Lenton, 2015; Papenhausen and Einstein, 2006; Pineno and Boxx, 2011; Schobel and Scholey, 2012; Umashankar and Dutta, 2007; Weerasooriya, 2013.

4.3 Developing a performance measurement system for a higher education provider

The conceptual BSC presented above in table 3 will be used as a starting point for the production of a conceptual strategy map, which will be used to inform the final PMS. Before the next stage it is possible to review which PEFs are to be incorporated, the conceptual BSC proposed above included all five PEFs, however only the NSS/PTES, REF and GOS PEFs need to be included in the PMS. This is because the performance objectives for the TEF and the KEF overlap with those in the other PEFs. The measures that impact the TEF will also be considered when investigating the decision-making that underpins the attainment of the NSS (namely teaching quality and learning environment) and GOS (namely student outcomes and learning gain). The measures that impact the KEF will also be considered when investigating the decision-making that underpins REF attainment.

In order to develop a conceptual strategy map, it is first necessary to determine the KPIs for each perspectives as they align to each of the PEFs (Anjomshoae et al., 2017).

4.3.1 Key performance indicators for each perspective

The following section will present the KPIs that align to the NSS/PTES, REF and GOS for each perspective.

4.3.1.1 Key performance indicators for the customer perspective

The objectives that relate to the customer perspective are shown in Table 3 above, Table 4 below presents the KPIs related to this perspective as derived from the literature.

Table 4: Key performance indicators for the customer perspective

NSS/PTES Objective	**KPI**	**Source**
Teaching on my course – teaching quality Quality instruction	Corporate evaluation of curriculum Qualifications of faculty Up-to-date teaching practices Student satisfaction	Farid et al., 2008 Umashankar and Dutta, 2007
Academic support – increasing student satisfaction	Student satisfaction in administration	Eftimov et al., 2016
Student outcomes and learning gain – efficiency of studying	Retention metrics	Eftimov et al., 2016
REF Objective	**KPI**	**Source**
Research outputs – quality of faculty	Level and amount of faculty publications, citations and presentations	Bailey et al., 1999
GO Objective	**KPI**	**Source**
Employability and earnings – hiring quality students	Number of students hired Number of job offers per student Average salaries offered	Pineno and Boxx, 2011 Umashankar and Dutta, 2007

4.3.1.2 Key performance indicators for the internal business processes perspective

The objectives that relate to the internal business processes perspective are shown in Table 3 above, Table 5 below presents the KPIs related to this perspective as derived from the literature.

Table 5: Key performance indicators for the internal business processes perspective

NSS/PTES Objective	**KPI**	**Source**
Teaching on my course – interactive and modern teaching	Internal evaluation by students and peers External evaluation	Eftimov et al., 2016
Academic support – effectiveness of student services	Type and number of services provided	Papenhausen and Einstein, 2006
Continuation – efficiency of service	Percentage of students completing	Papenhausen and Einstein, 2006
REF Objective	**KPI**	**Source**
Research outputs – improving productivity of academic staff	Number of published books and papers Conferences attended Research project applications	Eftimov et al., 2016
Research environment – increasing impact of work	Proportion of submitted and accepted papers Number of citations Funded projects	Eftimov et al., 2016
GO Objective	**KPI**	**Source**
Employability and earnings – curriculum program excellence Efficiency and effectiveness of services	Degree to which curriculum is up to date with business, and commercial trends Placement services and opportunities	Pineno and Boxx, 2011

4.3.1.3 Key performance indicators for the learning and growth perspective

The objectives that relate to the learning and growth perspective are shown in Table 3 above, Table 6 below presents the KPIs related to this perspective as derived from the literature.

Table 6: Key performance indicators for the learning and growth perspective

NSS/PTES Objectives	**KPI**	**Source**
Assessment and feedback – teaching and learning innovations	Assessment initiatives	Farid et al., 2008
REF Objectives	**KPI**	**Source**
Research outputs – faculty growth	Number of conference papers presented Number of publications	Chang and Chow, 1999
Research impact – organisational citizenship	Increased research productivity	Umashankar and Dutta, 2007
Research environment – faculty development	Budget for research	Papenhausen and Einstein, 2006

GO Objectives	KPI	Source
Employability and earnings – partnering with corporations for campus recruitment	Number of firms involved number of joint activities	Umashankar and Dutta, 2007

4.3.1.4 Key performance indicators for the finance perspective

The objectives that relate to the finance perspective are shown in Table 3 above, Table 7 below presents the KPIs related to this perspective as derived from the literature.

Table 7: Key performance indicators for the finance perspective

NSS/PTES Objectives	KPI	Source
Academic support, organisation and management	Investment in Staff	Eftimov et al., 2016 Farid et al., 2008 Lenton, 2015
REF Objectives	**KPI**	**Source**
Research outputs – revenue sources	Research revenue Research grants	Eftimov et al., 2016 Farid et al., 2008

The strategy maps identified in the literature reviewed in chapter 2, were also examined. The KPIs proposed for each perspective can be seen in table 8 below.

Table 8: Key performance indicators proposed in prior strategy maps

Author(s) and year	Customer perspective	Internal business processes perspective	Learning and growth perspective	Finance perspective
Chen et al., 2006	• promote school image • increase customer satisfaction	• establish high quality service process • complete teaching facilities • provide excellent teaching quality	• promote information technology application • established performance leading culture • establish staff administration on ability • increase teacher quality	• increase income • reduce human resource cost • increase asset usage rate
Lassoued, 2018	• price • quality • available • selection • function • service • partnership • brand	• operations management • customer management • innovative processes • social processes	• human capital • information capital • organisational capital	• manage cost • increase asset utilisation • enhance customer value • increase income
Papenhausen and Einstein, 2006	• price • quality • partnerships • community service development	• teaching excellence • curriculum excellence • quality of faculty • efficiency and effectiveness of service	• human capital • information capital • organisational capital	• improve cost structure • increase asset utilisation • expand revenue opportunities • enhance stakeholder value opportunities
Philbin, 2011	• research areas • PhD and MSC education • technical training • skills development	• institute staff • visiting staff • research equipment	• research outputs: journal papers, conference proceedings, other	• programme delivery: funding and access • sustainability strategy: funding and cost avoidance
Umashankar and Dutta, 2007	• quality academic advising • quality instruction • effective student placement	• operational excellence • new product and service development • unique curriculum • internship programme	• professional growth • strategic technologies • climate for action • organisational citizenship	• growth • succeed • improve asset utilisation • improve cost structure

4.3.2 The conceptual strategy map

The conceptual strategy map incorporates the KPIs presented in tables 3-8. The order of the perspectives is informed by the literature (Kaplan and Norton, 2004). The causal relationships between the variables within each perspective are determined by the researcher. Figure 6 below presents the proposed conceptual strategy map.

Figure 6: Proposed conceptual strategy map

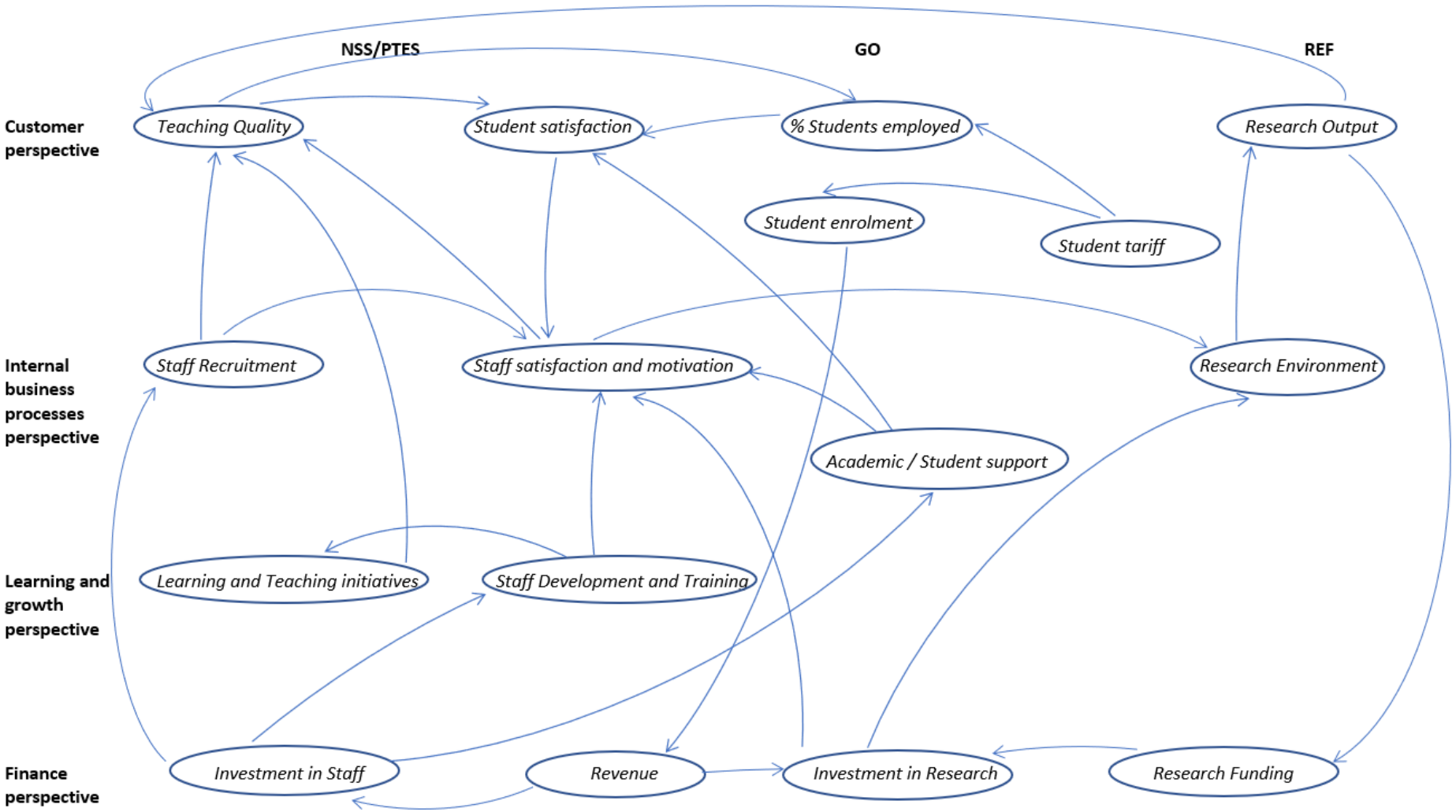


Figure 6 above, the conceptual strategy map, shows the integration of the cause-and-effect concept with the original conceptual BSC, it shows how the KPIs interact within and across the perspectives (Anjomshoae et al., 2017; Oyo et al., 2008). The KPIs for the customer perspective derived from tables 4 and 8 are: teaching quality (quality instruction), student satisfaction, % student employed, research output. The remaining two KPIs, student enrolment and student tariff were added as they were deemed to be of importance. The KPIs for the internal business processes perspective derived from tables 5 and 7 are: academic/student support (student services), staff recruitment and research environment. The remaining KPI, staff satisfaction and motivation was added as it was deemed to be of importance. The KPIs for the learning and growth perspective derived from tables 6 and 7 are: learning and teaching initiatives (expanded) and staff development and training (expanded). The KPIs for the finance perspective derived from tables 6 and 7 are: investment in staff, revenue (income) and research funding (grants). The remaining KPI, investment in research was added as it was deemed to be of importance.

The KPIs fall into three categories: staff, students, and research. All but one of the relationships between the KPIs are reinforcing, for example as student enrolment increases revenue increases which leads to more investment in staff which impacts spending on staff recruitment and therefore positively impacts teaching quality. The one exception is student tariff, as tariff is reduced student enrolment increases as the pool of potential applicants increases. Of course this is a generalisation as some prestigious HEPs may find that a higher tariff stimulates demand. The relationships between the KPIs are explained in more detail below.

4.3.2.1 Interdependencies of the indicators in the customer perspective

The customer perspective has been presented first as it is the pinnacle of all of the activities, processes and decisions that occur within the HEP. The KPIs in this perspective relate to staff (teaching quality as measured by the currency of the curriculum and the teaching practices adopted); students (student satisfaction and percentage of students being employed); and research (outputs as measured by the level and amount of faculty publications, citations and presentations).

The KPI teaching quality is impacted by research output (customer), staff recruitment (IBP), staff satisfaction and motivation (IBP) and the amount and engagement in learning and teaching initiatives (L&G) (Hussein and El Nasr, 2013; Kim and Rehg, 2018; Oyo et al., 2008). Student satisfaction is impacted by the teaching quality (customer), the percentage of students being employed (customer) and the academic and student support (IBP) (Zaini et al., 2013). The percentage of students being employed is impacted by the teaching quality (customer) and student tariff (IBP) (Qian et al., 2016).

The final KPI in this perspective relates to research output which is impacted by the research environment (IBP) (Merkulov et al., 2015).

4.3.2.2 Interdependencies of the indicators in the internal business processes perspective

The internal business processes perspective comes after the customer perspective, this perspective considers the processes adopted that underpin the creation of the desired outcomes. The KPIs in this perspective also relate to staff (staff recruitment, staff satisfaction and motivation and academic and student support.); students (academic and student support, student enrolment and student tariff); and research (research environment).

The KPI staff recruitment is concerned with the amount of staff recruited and the pay and grade offered and is thus impacted by investment in staff (finance) (Merkulov et al., 2015). The KPI staff satisfaction and motivation is impacted by staff recruitment (IBP), student satisfaction (customer), staff development and training (L&G), investment in research (finance) and the academic and student support available (IBP) (Kim and Rehg, 2018).

The next set of KPIs relate to the student, the academic and student support available is impacted by investment in staff (finance) and impacts both staff (IBP) and student satisfaction (customer) (Hussein and El Nasr, 2013). The other two KPIs are student enrolment (which is impacted by student tariff) and student tariff.

The last KPI in this perspective is research environment (as measured by conferences attended, publications and submissions, citations and funding) which is impacted by investment in research (finance) and staff satisfaction and motivation (IBP) (van Kersbergen et al., 2016; Oyo et al., 2008).

4.3.2.3 Interdependencies of the indicators in the learning and growth perspective

The learning and growth perspective includes the learning, growth and innovation activities required to satisfy customer demand and improve process efficiency and effectiveness. There are only two KPIs in this perspective and both relate to staff, the first being the learning and teaching initiatives which is impacted by the second which is staff development and training, which is impacted by investment in staff (finance).

4.3.2.4 Interdependencies of the indicators in the finance perspective

The KPIs in the finance perspective are concerned with incoming revenue (revenue and research funding) and outgoing investment (investment in staffing and investment in research). Revenue is impacted by student enrolment (IBP) (Al Hallak, 2017; Merkulov et al., 2015, Oyo et al., 2008). Research funding is impacted by research output (customer) (Kennedy and Clare, 1999; van Kersbergen et al., 2016). Investment in staffing is impacted by revenue as is investment in research which is also impacted by research funding (Kennedy and Clare, 1999; Merkulov et al., 2015; Oyo et al., 2008).

From the explanations provided above it is possible to create a diagram that displays the interdependencies that occur between the perspectives themselves. This diagram represents the key aspects of the strategy map that will be produced as part of creating a performance measurement system. Figure 7 below shows that the finance perspective impacts both the learning and growth and IBP perspectives. The learning and growth perspective impacts the IBP and customer perspectives. The IBP perspective impacts the customer perspective. And finally the customer perspective impacts the finance perspective.

Figure 7: Framework for the development of a strategy map

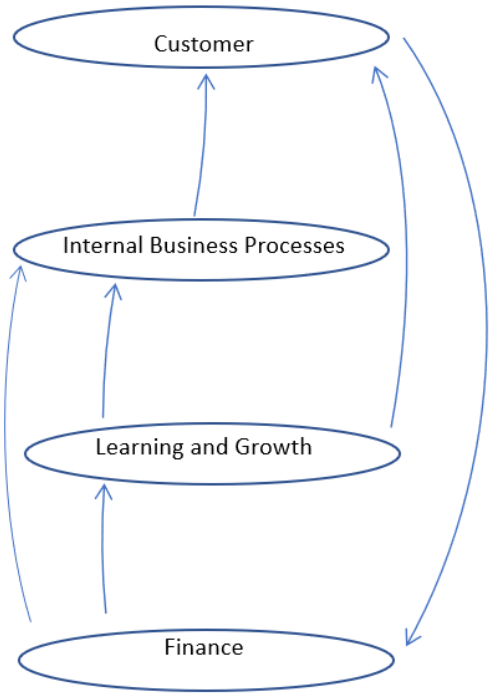


Figure 7 shows the framework that will be used to underpin the development of a strategy map, it was created by extracting the interdependencies between the perspectives, these were determined by reviewing the relationships between the KPIs shown in Figure 6.

In chapter 2 it was established that the BSC is a static representation that assumes that the cause-and-effect relationships between the KPIs are only one way, and it does not display the multiple and dynamic feedback loops that exist between the KPIs (Anjomshoae et al., 2017). This is problematic because there are a lot of complex interactions that exist in educational policy making and a failure to appreciate the alignment between the strategic objectives can result in poor performance. It was thus proposed in chapter 3, that system dynamics should be adopted as a methodology that could enhance the BSC. Furthermore, the use of qualitative mapping tools, such as causal loop diagrams, would be applied to illustrate the complexity in the system. The next stage is to develop a conceptual framework that clearly depicts how the system dynamics and balanced scorecard methodologies can be successfully integrated to achieve the research aim. The next section will expand Figure 7 to show how system dynamics techniques can be used in the production of a performance measurement system that supports decision-making.

4.4 Adopting a system dynamics methodology to incorporate dynamic complexity

The decision and policy making processes in an HEP are difficult and are further complicated by the fact that the HEP is a dynamically complex system. In chapter 3 the features of a dynamically complex system were shown to be due to the presence of feedback, non-linearity, and time delays. The proposed conceptual strategy map, shown in Figure 6, demonstrates the presence of the dynamic

complexity by showing that even a simplified strategy map includes 16 KPIs and 27 links between them. The presence of dynamic complexity is problematic as it can lead to decision makers displaying bounded rationality as they are only capable of possessing a simplistic understanding of the complex system in which they operate.

4.4.1 The effects of bounded rationality on decision-making

Due to this inability to appreciate all of the dynamic complexity present in the system, decision makers rely on limited mental models (Sterman, 2001). The reliance on a limited mental model leads to narrow and reductionist decision-making as it is based on a partial understanding of the system (Sterman, 2001). When the decision maker fails to understand the full impact of their decisions the effect of their decision-making will be limited and the decisions that are made are likely to have unintended consequences which lead to counter-intuitive results and policy resistance (Kim and Rehg, 2018). To improve the situation the decision makers' mental models need to be enhanced such that they are more able to anticipate the dynamics present in the system (Sterman, 2000).

The adoption of the system dynamics methodology, which involves the inclusion of both individuals and groups in the production of a performance measure system, will ensure that individual and group learning is achieved, and this will lead to an enhancement in the decision makers' mental models. The next section will consider how the decision makers are involved in the production of a performance measurement system in more detail.

4.4.2 Engaging with decision makers

The decision makers will be included in the process of creating and validating the causal loop diagrams, the creation of these causal loop diagrams provides an opportunity for the decision makers to see the consequences of their decisions on other areas of activities in the HEP. The individual causal loop diagrams are used in the production of a system's causality map of the HEP. This overall map of the HEP provides an instrument for discussion and learning across the teams, such that groups of stakeholders can interact with the causality map to begin to formulate views about their knowledge and understanding of the system (Lane in Morecroft and Sterman, 1994). The system dynamics methodology proposes that this will be done with stakeholder involvement, and the next section will consider this in more detail.

4.4.3 What is stakeholder engagement and how does it benefit this research?

The use of techniques that involve the stakeholders is one of the central principles to be applied when adopting a systems view as the inclusion of the stakeholders (i.e. the policy and decision makers) is critical. This is because, to develop a PMS that will successfully influence and improve decision-making, it is necessary to access the users' mental models and elicit their tacit knowledge as they are the participants who are most familiar with the variables and relationships present in the system being modelled (Bérard, 2010; Zaini et al., 2013).

This stakeholder-centred approach will enable the researcher to elicit tacit knowledge and to gain insights into the key policy decisions, this information can then be used to start to build a PMS, gradually adding more complexity to the initial conceptual strategy map. The involvement of stakeholders in a group workshop allows for a systemic view to be taken as it provides an opportunity for the participants to examine issues from multiple perspectives, which can lead to mental model

alignment between the different decision makers as well as providing opportunities for learning (Barnabè, 2011; Zaini et al., 2013).

As the policy / decision makers gain a better understanding of the feedback and complexity present in the system, they will begin to appreciate which of the objectives are conflicting and which can be achieved simultaneously (Barnabè, 2011; Ghaffarzadegan et al., 2011). This appreciation occurs as the group setting enables the participants to explore how different issues and actions in their areas have a systems-wide impact (Kim and Rehg, 2018).

The next section will consider the learning that occurs in more detail.

4.4.4 Learning from participation in modelling and interaction with the qualitative model

involving the stakeholders in the production of a causality map will help communicate the complex nature of the HEP to the decision makers as it will demonstrate how decisions made in one part of the system impact outcomes in other parts of the system. The involvement of groups of decision makers in the process will also lead to organisational learning. Organisational learning occurs as the shared understanding changes as the stakeholders interact with the CLD of the HEP (Senge and Sterman, 1992). This overall map will be used to inform the creation of the strategy map that will form the performance measurement system.

The interaction with other members in the group can also lead to individual learning as the decision makers begin to appreciate the impact of their decisions (Sterman, 2000). This individual learning occurs as a participant receives additional information from other participants during the model build which will challenge and improve their existing mental model, and thus future decision-making activities will be more likely to produce the desired outcomes (Lane in Morecroft and Sterman, 1994; Thompson et al., 2016).

The next section will consider how the application of system dynamics will be able to enhance the framework of the strategy map that will result in the production of a performance measurement system.

4.4.5 Creating a Conceptual Framework

The purpose of a conceptual framework is to provide a blueprint for the research design to be undertaken to address the research questions and achieve the research aim. There are four research questions to be addressed. The first is what are the KPIs? This will be answered by the creation of a strategy map. The second relates to capturing the complexity in a causality map, this will be produced using the information elicited from the stakeholder engagement exercise. The third question asks how system dynamics techniques can be best employed to ensure that individual and group learning is achieved? This will be achieved as the stakeholders (decision makers) engage in the production of a causality map. Finally the fourth question relates to the creation of a framework to support decision-making. This refers to the research aim which is to produce a performance measurement system to support decision-making.

Chapter 3 explained how the HEP is a dynamically complex system, and in the conceptual strategy map (figure 6) this complexity was demonstrated. Thus by placing a representation of the strategy map at the centre of the conceptual framework it is possible to see the source of the dynamic complexity. The

presence of this dynamic complexity leads to the decision makers being impacted by bounded rationality and thus they adopt restricted mental models which results in less effective decision-making. In order to overcome this, the decision makers need to possess enhanced mental models, and this can be achieved by applying qualitative system dynamics tools.

The creation of a performance measurement system will utilise qualitative system dynamics tools to enable the production of a causality map, the framework for this is presented in the centre of the conceptual framework. The adoption of the system dynamics methodology will lead to individual and organisational learning and thus will improve decision-making. The resulting conceptual framework is presented in figure 8 below.

Figure 8: Conceptual framework for the production of a performance measurement system in a higher education provider

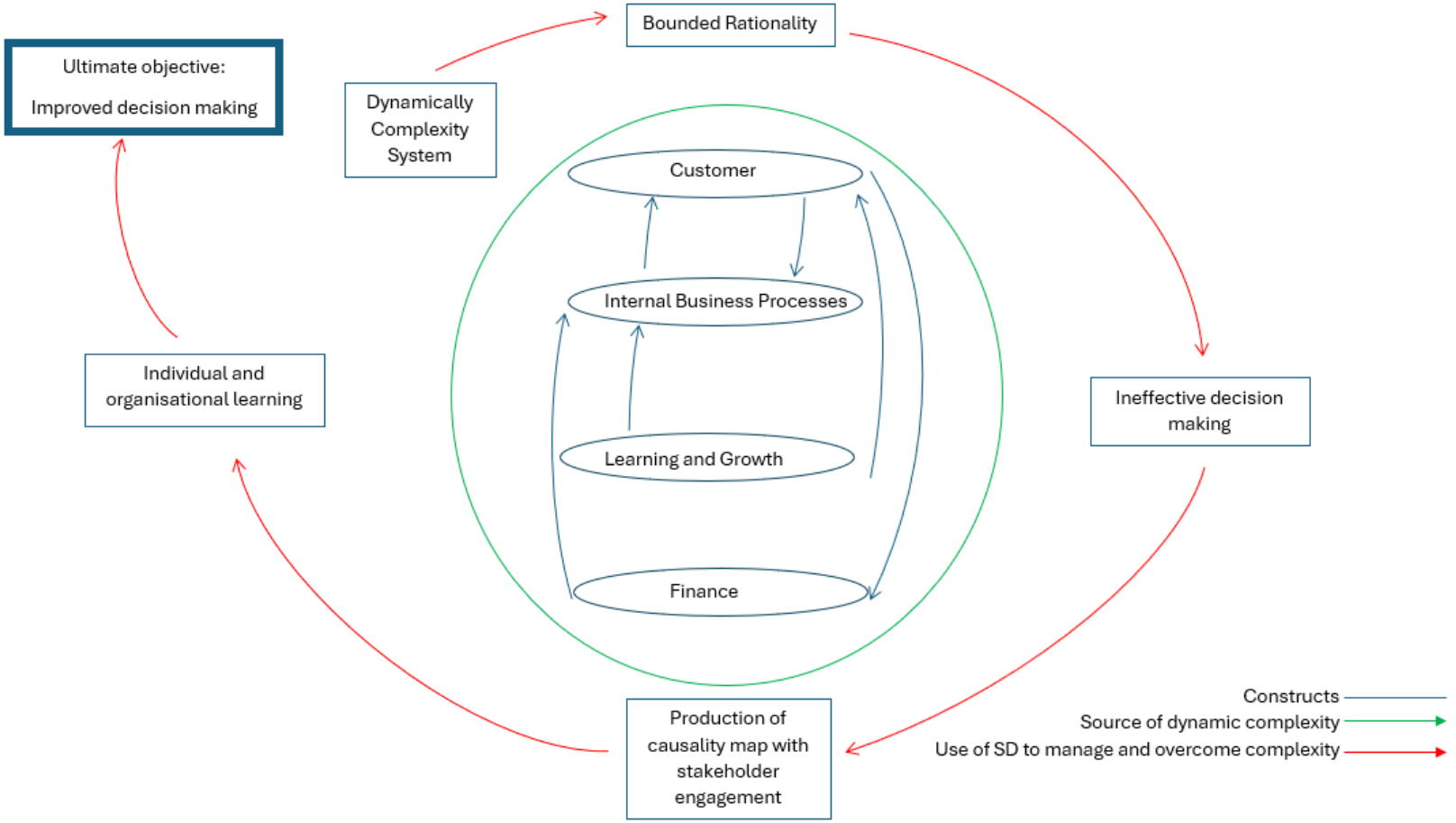


Figure 8 above shows the two levels that need to be considered to address the research questions. The first level relates to the context of the study (displayed in the green circle) which represents the inherent complexity present in the system.

The second level, level (represented by the constructs joined by the red arrows) shows how system dynamics tools can be used to manage and understand how the complexity present in the system influences decision-making. The arrows go on to show that engaging the stakeholders (the decision makers) in the production of a causality map can lead to learning and improved decision-making as they become more aware of the complexity present in the system.

The conceptual framework incorporates the theoretical underpinnings such that the context has been influenced by the perspectives that have been suggested in the balanced scorecard literature to form the foundation for the PMS and demonstrate where the complexity occurs in the system. The second theoretical underpinning incorporated into the conceptual framework is the concept of bounded rationality which occurs because decision-making is occurring within the HEP which is a dynamically complex system. The last theoretical underpinning that has been included, relates to the adoption of a systems thinking perspective and the system dynamics methodology to achieve the research aim.

4.5 Chapter conclusion

In this chapter the conceptual framework, shown in Figure 8, placed the conceptual strategy map at the centre and showed how the application of qualitative system dynamics techniques can be used to engage the participants in the production of a PMS to be used as a framework for decision-making. Figure 8 also showed how participants' mental models could be improved by involving them in the production of the CLDs, this is because the use of qualitative system dynamics interventions that are focused on eliciting causal feedback structures introduces a new 'language' that can initiate conversations and bridge the gaps between the different groups of decision makers (Gary and Wood, 2011; Kim and Rehg, 2018). Stakeholder engagement is integral to the system dynamics methodology and can lead to individual and organisational learning as mental models are shared and participants gain a holistic view of the system as they are able to explore the dynamics present in the system (Barnabè, 2004; Bérard, 2010).

The conceptual framework shows the underpinning research design that is to be employed to address the research questions and thus achieve the research aim. The next chapter will present the research philosophy and methodology and explain the methods that will be applied to create the performance measurement system.

Chapter 5 Research philosophy and methods

5.1 Chapter introduction

In earlier chapters the research questions, aims and objectives were presented. The context in which this research resides was also considered and the application of a system dynamics methodology was proposed. This chapter will introduce the different research philosophies and then go on to consider the methods most appropriate to this study given that a system dynamics methodology will be adopted.

5.2 Research Philosophy

5.2.1 Philosophies, paradigms and frameworks

Saunders et al. (2012) noted that the main research paradigms or frameworks, positivism and interpretivism, have expanded and been enhanced over time such that there is now a broad spectrum of paradigms that also include critical realism, postmodernism and pragmatism. At one end positivism assumes that data are facts that can be objectively measured and are value free, the opposing position is interpretivism (also known as constructivism) which assumes that all 'data' is subjective and value laden. These paradigms are not exhaustive or mutually exclusive but represent a good starting place for a researcher to think about the framework that will set out the methods and techniques to be adopted when conducting the research (Hussey and Hussey, 1997; Saunders and Lewis, 2012).

The philosophical assumptions made when undertaking research shape how the researcher formulates the problem and the research questions, these assumptions relate to the ontology (how reality is viewed), epistemology (what is knowledge), axiology (the role of values) and methodology (the research process) (Creswell, 2013). Each paradigm assumes a particular theoretical stance, in the sub sections below these are explored for the two main paradigms – positivism and interpretivism (which is also known as constructivism).

5.2.2 Ontology – the nature of reality

From an ontological position the researcher is asking 'what is the form and nature of reality', it concerns the study of reality or the things that comprise reality and therefore, what can be known about "how things really are" and "how things really work" (Denzin and Lincoln, 2008; Guba and Lincoln, 1994; Slevitch, 2011). The ontological question that relates to this research is whether decision-making can be considered to be an objective activity that occurs external to the social actors within the system or are the decisions impacted by the perceptions and actions of these actors (Bryman and Bell, 2007).

From a positivism paradigm the ontological beliefs assume a realist perspective whereby reality is objective and thus it is possible to capture it using objective measures; from an interpretivist paradigm the ontological beliefs assume a relativist perspective whereby reality is socially constructed with multiple perspectives and meanings to the data (Hamilton and Corbett-Whittier, 2012).

5.2.3 Epistemology – the study of knowledge

Epistemology is concerned with the study or theory of knowledge, what is accepted as being valid knowledge, and what is the relationship between the knower (the inquirer) and what could be known (or knowledge) (Allison and Hobbs, 2006; Bryman and Bell, 2007; Denzin and Lincoln, 2008; Hussey and Hussey, 1997). From a positivism paradigm the epistemological beliefs assume an objective perspective whereby reality can be known and measured by scientific methods which can prove or disprove a theory; from an interpretivist paradigm the epistemological beliefs assume that knowledge is socially constructed, with each individual constructing their own subjective reality (Hamilton Corbett-Whittier, 2012).

5.2.4 Axiology – the role of values

The axiological assumption is concerned with values whereby positivists believe that the process of research is value free as they are detached from what they are researching, the subjects of their research are observable objects whereas interpretivists believe that the researcher is within the study (Hussey and Hussey, 1997).

The applicability of each of these assumptions to this research and the researcher will be considered below.

5.3 System dynamics methodology

The methodology to be adopted in this research, that is the procedures that will be used to acquire the knowledge needed to address the research questions, will be a qualitative system dynamics methodology. Historically system dynamics research has assumed a mixed methods approach where data is collected from participants with the goal of creating first, a qualitative model, and then a quantitative model that can be used to simulate behaviours and relationships in a specific context. This research will be utilising the qualitative system dynamics component only and will be engaging stakeholders to produce causal loop diagrams.

The creation of these causal loop diagrams will be undertaken in consultation with the stakeholders, including the decision makers, the process will enable their mental models of the system and the feedback present to be made explicit (Wolstenholme, 1990). The purpose of this exercise is to translate the stakeholder's thoughts and assumptions about the systems into a format which can be communicated to others, this will broaden each person's understanding of the system as a whole as well as their role within it (Wolstenholme, 1990). The ensuing series of causal loop diagrams will be used to underpin the creation of a framework that can support decision-making.

The purpose of this research is to aid decision-making and reduce silo thinking, this will be achieved through the use of an agreed framework that aims to ensure a systems approach is adopted. The adoption of this framework will help decision makers understand the complexity present in the system which will help them to possess a better appreciation of the underlying drivers of performance (Coyle, 2000). This framework will be based on a set of causal loop diagrams that will capture and represent all of the decision-making activity that occurs across the HEP. This study thus adopts a subjective and interactive form of system dynamics which includes participants in the process, this will support organisational learning with the use of causal loop diagrams to enable both

the model and model building process to be more accessible to the senior management team (Lane, 1999).

5.4 The philosophical approach adopted by the researcher

The researcher is adopting the system dynamics methodology in an integrative and negotiated way where knowledge is shared as participants are engaged and involved in order to address the research questions. The philosophy adopted is that of critical realism as it is a philosophy that offers an alternative to the hard stance of positivism or the extreme opposite of interpretivism, it also addresses the major divisive issues within the philosophy of science, i.e. positivist vs critical, realist vs constructionist (Mingers, 2000).

This philosophy underpins the adoption of a system dynamics methodology as system dynamics epitomises the major premises of critical realism being rooted in a system's view and focusing on the importance of feedback loops. The philosophy assumes that events are causally generated by something in the underlying system and accepts that expectations may not be realised due to the counterbalancing tendency of another part of the system (Mingers, 2000). Critical realists also accept that there may be causes that are not recognised by or accessible to the actors in an organisation (Johnson and Duberley, 2000). It then would only be possible to answer the research questions if the researcher is able to understand what is occurring in the system and they are able to identify the structures at work that generate those events (Bryman and Bell, 2007).

As well as supporting and aligning to the adoption of a system dynamics methodology, this paradigm is relevant to business and management research as the researcher needs to not only describe a complex business situation, but in order to gain an understanding of what is actually happening, they also need to appreciate the deeper structures and relationships that are not directly observable as they lie beneath the surface of the social reality (Saunders and Lewis, 2012).

5.5 Research strategy

The research strategy to be adopted is that of a case study. A case study is an investigation of a particular contemporary topic within a real-life context, which enables the researcher to gain a detailed understanding of the context and the activity taking place (Saunders and Lewis, 2012). Bryman and Bell (2003) suggest that the most common use of the term relates to the case study being associated with a location. In this research the use of the case study is a choice of what is to be studied, and this is the study of an organisation in a real-life setting (Creswell, 2013). This is an explanatory case study as the research seeks to understand and explain the relationships and drivers behind performance in the organisation and how decision-making impacts that performance (Yin, 2009).

Case studies have been used for decades for analysing business systems and are particularly appropriate when using qualitative system dynamics tools, i.e. causal loop diagrams (Forrester, 1994). The case study approach is appropriate in this research for two reasons, firstly because of the nature of the data collection (interviews and workshops) and secondly because there are clearly identifiable boundaries (the HEP is a bounded system) (Bryman and Bell, 2003). Additionally, it is standard practice to adopt a case study approach in system dynamics as system dynamics models need to be built to represent a specific context (Akkermans and Oorschot, 2005).

This research will thus take the format of a case study that aims to enhance the impact of decision-making activity on performance at a large school in a new HEP, the research will both contribute to academic theory and inform practice within the HEP. The research involves close collaboration between the practitioners (members of the organisation) and the researcher. The researcher is a senior manager in the HEP, who has an active role in planning and implementing change in the HEP while also undertaking their academic research.

5.6 Research methods

The following sections will consider the research methods to be employed.

5.6.1 Why involve participants?

The data will be qualitative which is traditionally the main format for the information needed to develop causal loop diagrams, this is appropriate as qualitative data and judgments are used by management when developing strategy as well as during the decision-making processes (Black and Andersen, 2012). Participant involvement is necessary for several reasons: to elicit the required knowledge from the participants' mental models, to increase the chances of implementation, and to foster opportunities for participant learning to occur as they gain an understanding of the impact of their decisions on future performance (Monks et al., 2016; Vennix, 1999).

The sample of participants will be purposeful so that a selection of all members of academic staff from across the HEP will be interviewed. This will include representation from visiting lecturers, lecturers, senior lecturers with admin roles and/or research allowances, principal lecturers with admin roles and/or research allowances, readers, professors and academic managers. Marshall et al. (2013) recommend that in case study research 15-30 interviews are undertaken. The interviews will be between 45 minutes to 1 hour in duration.

5.6.2 The Research Process

In chapter 3 the different steps in the system dynamics methodology were presented, this section will consider how these will be followed in this research.

5.6.2.1 The steps followed in the qualitative system dynamics methodology adopted in this research

<u>Step 1 – state the problem</u>

The objective of the research is to produce a performance measurement system to support decision-making.

<u>Step 2 – create a model overview</u>

The conceptual framework (shown in figure 8) demonstrated the source of the complexity present in the higher education provider and the impact of this. The conceptual framework also shows how the adoption of a qualitative system dynamics approach would lead to improved decision-making. The conceptual strategy map provides a framework for the final strategy map to be developed to form the basis of a performance measurement system.

Step 3 – list the variables in a model boundary chart

The pilot study involved interviewing a sample of individual participants, these participants were selected from the population of academic staff in the higher education provider. The participants were selected based on purposive or judgement sampling, which is often used in case study research (Saunders et al., 2012). Specifically this was heterogeneous purposive sampling such that the participants were selected based on their characteristics to enable the collection of sufficient data to reveal the key themes (Saunders et al., 2012). The participants were selected from lecturing staff (visiting and permanent, research active and teaching only), research staff (readers and professors), school management (representing key operational and strategic areas) and central management.

The pilot study also provided an opportunity to assess the appropriateness of the interview questions as well as allow for a test run of the logistics of the interviews (i.e. setting up, location, and recording). These interviews also provided confirmation of which variables were endogenous, exogenous, or to be excluded. Once this pilot round of interviews was completed, the questions and logistics were honed before the full phase of interview data collection was undertaken. From the pilot interviews it was established that the interview questions did not yield sufficient data to enable initial causal loop diagrams to be created, this was because the interviews were too unstructured and not of a sufficient duration. The use of a more robust set of interview questions was adopted in the latter interviews. More details about interview preparation are in section 5.6.2.2 below.

Step 4 – create analyse and use causal loop diagrams

Interviews are the most frequently used method for eliciting data in qualitative research, as they offer the opportunity for interaction between the researcher and the participant making clarification, elaboration, and the collection of the participants' own words possible (Luna-Reyes and Andersen, 2003). Individual interviews are undertaken with the participants who have a sophisticated knowledge of the system as it is their expert knowledge that is required to provide the data needed to form the basis of the causal maps to be created (Kim and Andersen, 2012). As before these participants were based on purposive sampling, these participants will be selected based on the impact their decisions would have on the PEFs.

To successfully elicit information from the individual participants semi-structured interviews were undertaken that used questions that were focussed on the dynamics or causation within the system (Kim and Andersen, 2012). Individuals were asked about the interdependencies that existed between the KPIs and the perspectives that drive performance. The data collected from the interviews was used by the researcher to establish and name the variables and constraints and generate feedback loops. To be able to use the data in this way it was first analysed using a coding method that was influenced by grounded theory (Kim and Andersen, 2012).

The method of data analysis to be adopted is inspired by grounded theory and the data-coding techniques associated with grounded theory as suggested by Kim and Andersen (2012). Their coding process uses open coding (to discover the themes in the data and identify the variables and causal relationships) this is then followed by a step, similar to axial coding, to merge variables and causal relationships and generate a causal map (Kim and Andersen,2012).

Step 5 – validate the model

To validate the model a series of validation meetings were held. The participants for this set of meetings were drawn from senior managers across both the school and central management teams and were those individuals who possessed the overall responsibility and accountability in each of the key areas of decision-making. At the meetings the causal loop diagram(s) that align to their area of responsibility were presented and discussed.

Step 6 – workshops to communicate findings

The last step in the research process was to hold two workshops, one with the school management team and one with the central management team. The purpose of these workshops was to elicit information from a group of participants, this was achieved by creating an environment in which they could interact with each other to build on each other's experiences and contributions. More details about the group workshops is in section 5.6.2.3 below.

5.6.2.2 Interview preparation

Interviews are a time-honoured method of collecting data, they are mostly held face to face with participants who are specialists, with their responses being captured either in writing or by being recorded (Black and Andersen, 2012). These individual interviews will be used as part of an iterative process to elicit and map knowledge to provide data to create the causal loop diagrams (Vennix et al., 1994).

Creswell (2013) suggests the following steps to be considered for successful interviewing:

- decide on the research questions to be asked;
- identify interviewees;
- determine which type of interview is most practical and nets the most information;
- use adequate recording procedures;
- determine and use an interview protocol;
- refine the interview questions and procedures through pilot testing;
- determine the place to conduct the interviews;
- obtain consent;
- use good interview procedures.

This research was undertaken, in part, during the Covid-19 pandemic, during the pandemic many people started to work from home, and this led to a boom in the use of online meetings. Post-pandemic the use of online meetings remained popular, although it is still preferable to hold meetings in person because of the possible discussions that may be generated (Wilkerson et al., 2020). If it is necessary to hold interviews online Wilkerson et al. (2020) proposed a set of recommendations as to how to get the most from this technique which includes the selection of an appropriate medium to undertake the interview that also provides a mechanism for the researcher to record the interview and share information easily, if necessary, they also suggested that the researcher had an alternative plan in the case of technology failure (Wilkerson et al., 2020).

All interviews were recorded and transcribed, although this was a time-consuming exercise it improved the researcher's familiarity with the data and enhanced the quality of the data analysis.

5.6.2.3 Group workshops

The effectiveness of a group workshop is correlated to the size of the group, the type of task and the structure of the group process (Vennix et al., 1994). With fewer participants more unstructured techniques are suitable, as the group size increases it is necessary to adopt a more structured approach, for example presenting a preliminary model for consideration and review (Vennix et al., 1994). With larger groups, individuals are less likely to participate and the power dynamics in the group need to be considered because of the possibility of group speak (Rouwette and Vennix, 2006). There were two workshops held that composed of 6-7 participants firstly from the school management team and secondly from the central management team. Workshops lasted one to two hours with the researcher acting as the facilitator keeping the group focused and ensuring that all participants were heard (Luna-Reyes and Andersen, 2003).

Burns and Musa (2001) suggest that any diagram construction exercise that takes place within a group context needs to begin with a statement of purpose, a declaration of mode and a determination of perspective. As time is often scarce among senior management it is important to consider how to structure the model building process to keep the time investment required as low as possible (Vennix and Gubbels, in Morecroft and Sterman 1994). A lack of structure in the process can lead to one person dominating discussions (possibly high-status person domination), inequality of participation or a narrow group focusing only on one thing, although these issues can be overcome with skilled facilitation (Vennix et al., 1994).

The attitude and skills of the facilitator are a critical success factor, and the facilitator attitude needs to remain neutral but inquiring and questioning, fostering reflection and learning (Wilkerson et al., 2020). Facilitator skills should include a thorough knowledge of system dynamics and model building as well as conflict handling and communication (Vennix, 1999). It is important for the facilitator to be careful when developing the CLDs and initial model, if too much of this is created prior to engaging with the stakeholders this can lead to a lack of ownership and reduce group creativity (Vennix et al., 1994).

The use of boundary objects can help facilitate and create interactive conversations between two or more people and is recommended as a way to anchor respondents using concrete and specific content (Black and Andersen, 2012). It is also necessary to be careful with the selection of boundary objects due to potential anchoring where the participant focuses on the material provided and does not provide any new ideas or input (Black and Andersen, 2012). In this research the boundary objects will be the CLDs, but they must be used with careful explanations because these are not easily interpreted by non-experts and thus it is best to use simplified versions (Black and Andersen, 2012).

5.7 Validity, reliability and generalisability

Validity is concerned with whether the research findings really are about what they profess to be about, to what extent does the data collection method accurately produce what it was intended to? (Saunders and Lewis, 2012). In system dynamics modelling, validity is about user confidence in the

model (Wolstenholme, 1990). Throughout the data collection process, it is important to test the model using expert assessment asking specific questions about the model structure, causal relationships and behaviour of the model (Luna-Reyes and Andersen, 2003).

Reliability is concerned with whether the data collection methods and analysis procedures produce consistent findings (Saunders and Lewis, 2012). The use of coding reduces the subjectivity by making the analysis of the data more explicit and traceable, this improves the reliability, adds credibility to the overall results and builds user confidence as the analysis could be replicated if another person were to code the data (Kim and Andersen, 2012).

Regarding generalisability the research is a case study and thus is by its very nature only applicable to this case. However, the process could be adopted by other organisations to aid decision-making and organisational learning. Additionally, it is likely that the resulting CLD could be informative to other HEPs especially those with similar characteristics as the HEP under investigation.

It is important to consider any ethical implications, there is a robust ethical procedure in place at the HEP under investigation that was adhered to. The researcher is a member of the school management team and as such has some preconceived ideas regarding the research findings, it will be necessary to ensure that this is considered during the data analysis stage. It is also important to be mindful of any potential power distance that may exist during the interview process, however as the participants are academics this is less likely to be an issue.

5.8 Chapter conclusion

System dynamics is a technique that sits within the domain of operational research, as such these techniques have traditionally assumed a positivist stance whereby an optimal solution could be found. However increasingly system dynamics has been used to help improve mental models and foster organisational learning and as such more constructionist techniques have been adopted. The philosophical approach of critical realism was adopted in this research as this is a philosophy that can embrace the strengths of both philosophies.

To achieve the research aims, this research adopted a qualitative system dynamics methodology, undertaking a case study of a new HEP. The data collection took the form of interviews which were used to elicit knowledge from participants to gather the data necessary to create the CLDs, this was followed by workshops where participants could interact with the CLDs to work towards the attainment of a collective mental model (Black, 2000; Lane in Morecroft and Sterman, 1994; Luna-Reyes and Andersen,2003). The analysis was informed by a grounded theory approach that guided the identification of the key structures and formulations using the coded data to look for meaning and connections (Kim and Andersen, 2012; Luna-Reyes and Andersen, 2003).

The next chapter will present the findings from the pilot and individual interviews, which were analysed and used in the production of the individual CLDs.

Chapter 6 Causal loop diagrams – creation and discussion

6.1 Chapter introduction

This is the first of two chapters that will present the research findings, the purpose of this chapter is to present and discuss the processes that were undertaken to produce the individual causal loop diagrams (CLDs) that will form part of the final framework. The next section of the chapter will explain the process of creating the CLDs.

6.2 Creating the causal loop diagrams

The school in which the research is being undertaken is situated within a new, large HEP. The school has experienced huge growth over the last 3 years in international postgraduate student enrolment, which has been coupled with diminishing undergraduate student enrolment, together with a push from the central management team for sustained financial security. In addition to student delivery, the school is keen to continue to advance in its research contributions and maintain and improve its REF status. Thus in addition to being one of the largest schools in the HEP, the school also has multiple performance objectives, these relate to student attainment, research performance and financial sustainability.

The aim of this research is to produce a framework to support decision-making, the framework will be created by utilising the system dynamics methodology to ensure that the complexity present in the system is captured during the data collection as well as supporting individual and group learning during the process. One of the outcomes from the research is the production of a systems causality map that captures the complexity present in the school, this systems causality map will be comprised of a series of CLDs. The process undertaken to create the CLDs is presented below.

6.2.1 Process to develop the causal loop diagrams

The process of creating the CLDs was comprised of four stages: data collection, data analysis, developing and validating the causal loop diagrams. These stages will be discussed in more detail below.

6.2.1.1 Data collection (2019 –2021)

The data collection exercise involved two rounds of interviews with participants who were selected based upon the information provided in table 2, i.e. the KPIs that represented the intersection of each of the PEF objectives by each perspective. Using this information the participants that were engaged in the areas of activity and decision-making that resulted in these KPIs could be identified (see Appendix 2).

The participants list comprised those staff that were responsible for the teaching, research, programme management, research leadership, staffing resourcing and allocation, and strategic leadership of the school (see Appendix 3).

The first round of interviews was undertaken as a pilot study, the purpose being to ascertain whether the questions asked managed to elicit enough knowledge to provide sufficient data to enable the creation of the CLDs. Following this first round of data collection, some initial analysis was undertaken (more details on the data analysis exercise are in section 6.2.1.2). This initial analysis aimed to ascertain the areas of activity and decision-making that participants considered critical in the successful attainment of the PEFs.

After completing the first (pilot) interviews, it was determined necessary to undertake a second round of interviews. Before undertaking this second round of interviews, table 2 was used again to identify the most suitable participants but, this time, six specific lines of enquiry were determined (see Appendix 7). For each of these lines of enquiry, the most suitable participants were identified (see Appendix 8). This meant that some of the participants from round 1 were interviewed again, but in addition to those participants, the participant list now included programme leaders, additional senior managers in the school with management responsibilities for staffing, the senior manager in the school with management responsibilities for operations and another, less experienced, lecturer (see Appendix 9).

As well as reviewing the list of participants interviewed, the researcher reviewed the list of semi-structured questions to ensure that each interview thoroughly covered the activities and decisions that resulted in the outputs as measured by the KPIs in each line of enquiry.

The interviews were either held on campus or online depending upon participant availability. The researcher had a list of semi-structured questions, each interview was recorded, and notes were also taken at the time. After each interview, the interview transcripts were typed up (see Appendix 4 for one example transcript, the other transcripts are available to view if required).

6.2.1.2 Data analysis (2019 – 2021)

After the first round of interviews was completed, open coding was used to identify the themes and pairs of relationships that would be used in the creation of the CLDs. The approach adopted was to analyse the contents of the transcripts, the themes were identified using colour coding, and then a list of the main themes arising was produced (see Appendix 5). After the themes had been established, the transcripts were reviewed again to establish the variable pairings that were mentioned in the context of each theme (see Appendix 6).

The majority of the causal links were established during the data collection phase, for example, participant 1 was asked what activities and decisions they thought had an impact on the NSS, they answered staff experience, this variable was coded and contributed to a theme called ‘staff’. Later in the interview the participant discussed the time taken to prepare a teaching session and said that, in their opinion, this decreased as the staff member gained more experience, this was identified as a pair of variables, and the direction of influence was noted.

The same approach, open coding by hand, was adopted to analyse the transcripts from the second round of interviews. There was considerably more data yielded from this round of interviews, this is likely due to the use of an enhanced question set that was created by drawing on the analysis from the first round of interviews. During the coding phase the transcripts were also carefully reviewed to establish variable pairings and the key two themes that the variable pairings related to were noted, a note was made on the transcripts of where the evidence could be found (see Appendix 10). The data

was all inputted into Excel and this enhanced analysis, together with the use of the filter function, made it considerably easier to establish the causal links.

The data collected from the interviews was used to create the first set of CLDs and this is discussed in the next section.

6.2.1.3 Developing the initial causal loop diagrams (2021)

Following on from the data collection and analysis stages discussed above, the CLDs were created using the data generated from the coding of the interview transcripts from the two rounds of interviews. The first task was to determine the theme for each CLD, these were the most commonly occurring themes that arose when participants were questioned about the activities and decisions that needed to occur in order to obtain PEF success. These themes informed the areas for which each CLD was developed and thus the first set of CLDs related to: staff, teaching quality, community, programme leader team, Graduate Outcomes Survey and REF.

It can be seen that two of these CLDs were directly representative of a PEF i.e. Graduate Outcomes Survey and REF; three of the CLDs represented key areas of the NSS, namely teaching quality, community and the programme leader team; and the last CLD represented staff, which is the main resource necessary to achieve the outputs. The CLDs were first created by hand and were subject to multiple adjustments before being drawn in Vensim. Once they were drawn in Vensim the variables were colour coded as green for decisions to be made i.e. policy levers and purple for KPIs.

6.2.1.4 Validating the causal loop diagrams (2022)

After the CLDs were created, the next stage was to hold validation meetings. The purpose of these validation meetings was to check the CLDs, firstly, by confirming that the main variables were included and identifying any that were missing (Sterman, 2000). Secondly, participants were asked to review the feedback loops and policy levers to check that they were representative of what was occurring in the real system (Morecroft, 2015; Sterman, 2000).

The validation meetings occurred in two phases, the first phase was held with participants within the school and the participant list was comprised of a sample of those participants who had been interviewed during the two rounds of data collection (see Appendix 11). The purpose of the first set of validation meetings was to get the participants to confirm that the variable names, direction of relationships and the feedback loops were representative of what was said in the interviews. The original participants were used as these were the people with the best appreciation of what the CLDs were attempting to portray, and it was important to ensure that the CLDs incorporated their knowledge.

The second phase of validation meetings included participants that represented the central management in the HEP and who exerted external influence on some of the variables, policy levers and therefore loops within the school CLD (see Appendix 12). These participants were selected as being those with the most influence in the decision-making occurring in each of the areas represented in the CLDs for the HEP. The meetings were held to ascertain whether the CLDs that were constructed using data from interviews at the school level, held true for the other schools and

for the HEP more generally, and also to get central management buy in for the next stage, the workshops.

As a result of the validation meetings it was confirmed that, in the main, the CLDs were useful representations of the school system that held true for the HEP as well. The variable names and definitions were confirmed, although a few changes were made as appropriate. However, there were a few major changes which were made in Vensim, the changes as compared to the original CLDs were:

- Staff CLD – more variables were added that impacted staff satisfaction and the concept of workload was changed to become burden
- Learning and Teaching CLD – was renamed from the original name, teaching quality, to represent a focus on classroom activities instead of teaching delivery solely
- Student engagement CLD – was renamed from the original name, community, and the amount of variables included was expanded
- Employability CLD –value added was identified as a key variable and added
- PLT CLD – PLT cohesiveness was identified as a key variable and added
- Research CLD – all research output was consolidated (bids, impact cases and publications) and all variables relating to doctoral student activity were added into this CLD
- Finance CLD – was added

Having completed the validation meetings the final CLDs were created.

6.3 The final causal loop diagrams

In this section each of the final CLDs will be presented and discussed. In each of the CLDs the KPI's (purple) and policy levers (green) are colour coded. Within the description of each CLD the main components will be considered alongside the variables and causal links within that component. The feedback loops will then be presented and explained and lastly the policy levers, decision makers and delays within the CLD will be discussed.

6.3.1 Staff causal loop diagram

The CLD for the staff sector (see Figure 9 below and Appendix 13) has three main areas of activity or components, namely: staff satisfaction, staff motivation and staff recruitment and retention; it can be seen that these all interlink such that staff satisfaction impacts and is impacted by motivation, staff satisfaction impacts retention, and retention levels impact the levels of recruitment necessary (see Appendix 14 for a list of all of the variables in the staff CLD).

The first component in the CLD relates to staff satisfaction, although staff satisfaction is subjective, as it is a measure of how an individual feels, this CLD shows the multiple variables that influence it, some of which are KPIs (shown in purple) but some of which are policy levers (shown in green) and thus the school has some capability to influence it. Staff satisfaction impacts retention level, which is also impacted by the salary paid (itself impacted by salary increments and pay rises, which is impacted by the fraction invested in staff salaries, this variable also impacts the salary offered). The variables that influence staff satisfaction are:

- Levels of non-financial awards (for example opportunities to travel and attend conferences, staff wellbeing support, internal recognition awards)
- Organisational fit (i.e. how well the member of staff assimilates into their environment and is impacted by interviewer skills and appropriateness of job design)
- Quality of line manager support (impacted by quality of line manager T&D)
- Physical and psychological environment (impacted by SBU staff facilities spend in relation to an office / desk space but also how safe a member of staff feels in the workplace)
- Amount of burden – workload (i.e. the amount of work allocated to the member of staff)
- Trust in CMT (relates to how the member of staff feels about the central management of the HEP, do they feel listened to? Do they have faith in their leadership?)
- Appropriateness of policies and procedures (this relates to their working conditions for example sick, annual, and compassionate leave)
- Academic community morale (impacted by staff motivation)
- Staff motivation (impacted by staff satisfaction)

The decision makers responsible for the policy levers within the first component that impact staff satisfaction are both internal (the school management team) and external (the central management team) to the school. Of the 6 policy levers that impact staff satisfaction, only 3 can be leveraged by the SMT. These are amount of burden – workload, physical and psychological environment and levels of non-financial awards. All of these would be determined by the dean and the heads of department and could have a positive impact on the level of staff satisfaction. This would eventually impact student satisfaction and therefore the NSS and eventually student enrolments.

The second component of this CLD relates to staff motivation. This variable impacts a lot of the activities that occur in the HEP (staff satisfaction, academic community morale, staff enthusiasm for teaching and engagement in CPD). In turn staff motivation is impacted in a reciprocal fashion by staff satisfaction, but also by student motivation (this is part of a feedback loop discussed below), chance of promotion and growth (impacted itself by the opportunities provided by the HEI) and levels of fatigue and burnout (which will be discussed as part of another feedback loop below).

The decision makers responsible for the policy levers within the second component that impact staff motivation are also both internal and external to the school. The decisions that relate to CPD are made by the director of HR, however the decisions that relate to opportunities for promotion and growth are made within the school. Any positive impact on the staff motivation would impact student satisfaction and therefore the NSS and eventually student enrolments.

The third component of this CLD is that relating to staff recruitment and retention. Retention is impacted by both staff satisfaction and by levels of fatigue and burnout (this is part of a feedback loop discussed below). Retention impacts the academic capacity available and thus the academic capacity gap. The academic capacity gap relates to the academic capacity required which depends on the amount of teaching and academic support required based upon the amount of students that enrol, as well as the type of student (the students' attributes will also impact the level of support needed) and any subsequent decisions that are made about how the students will be supported. Any shortfall in the academic capacity gap is met through recruitment of permanent and visiting staff recruitment.

The amount of permanent staff recruited depends on the amount of vacancy that is approved by the school management team but also the number of suitable applicants, which is impacted by the use of recruitment agencies, the organisational design (i.e. the job description) and the attractiveness of the HEP as an employer. This last variable is impacted by many variables, both KPIs and policy levers, namely: salary offered, competition for jobs, existing staff recommendations, appropriateness of advertising, league table position, reputation and attractiveness of the package offered.

Within the third component the decisions that impact staff retention and recruitment are all made outside of the school. These decisions relate to salary, amount of vacancy approved and use of recruitment agencies and have far reaching consequences. Any shortfall in recruitment leads to an increase in the academic capacity gap and will impact retention and staff motivation and eventually the NSS and future student enrolments and therefore failure to invest in this area will lead to a downturn in income in the future.

There are eight feedback loops in this CLD which are going to be described next. The first feedback loop (labelled R1 on the CLD) is named staff and student motivation. This reinforcing feedback loop shows that staff motivation increases staff enthusiasm for teaching this increases the teaching on the course rating which enhances student satisfaction which in addition to feeding into the NSS/PTES scores also impacts student motivation which in turn improves staff motivation.

The second feedback loop (labelled R2 on the CLD) is named morale, satisfaction and motivation. This small reinforcing feedback loop shows that staff motivation feeds into academic morale which impacts staff satisfaction which in turn feeds back into staff motivation. In a similar fashion the third feedback loop (labelled R3 on the CLD), which is named satisfaction and motivation, simply represents the reciprocal impact of staff satisfaction on staff motivation.

The fourth feedback loop (labelled R4 on the CLD) is named motivation, CPD and promotion. This reinforcing feedback loop shows that staff motivation impacts the level of engagement in CPD (in this CLD, CPD is continuing professional development in the areas of both pedagogic and subject specialist), this impacts the member of staff's chance of promotion and growth (which is also impacted by the opportunities for promotion and growth that are provided by the HEP) which in turn impacts staff motivation.

The level of engagement in CPD is impacted by staff motivation but in addition to this it is also impacted by the need to engage in mandatory training and the availability of appropriate CPD opportunities (which is impacted by the fraction invested in CPD by the HEP). This variable forms part of the fifth feedback loop (labelled R5 on the CLD) is named CPD and performance. This reinforcing feedback loop shows that engaging in CPD enhances levels of performance, this means that there is less likely to be a performance measurement issue leading to members of staff being encouraged to engage in CPD.

The sixth feedback loop (labelled R6 on the CLD) is named academic staff capacity and retention. As mentioned above the academic staff retention level is impacted by staff satisfaction, but also by salary and chances of promotion (i.e. reward and recognition factors), it is also impacted by burden which leads to fatigue and burnout. This reinforcing feedback loop shows that the academic staff retention level impacts the amount of academic capacity available, and depending upon the amount of academic capacity required, there will be an academic capacity gap. The higher this academic

capacity gap is, the more burden staff will feel and therefore they will be more likely to leave thereby creating a bigger gap and further exacerbating the situation.

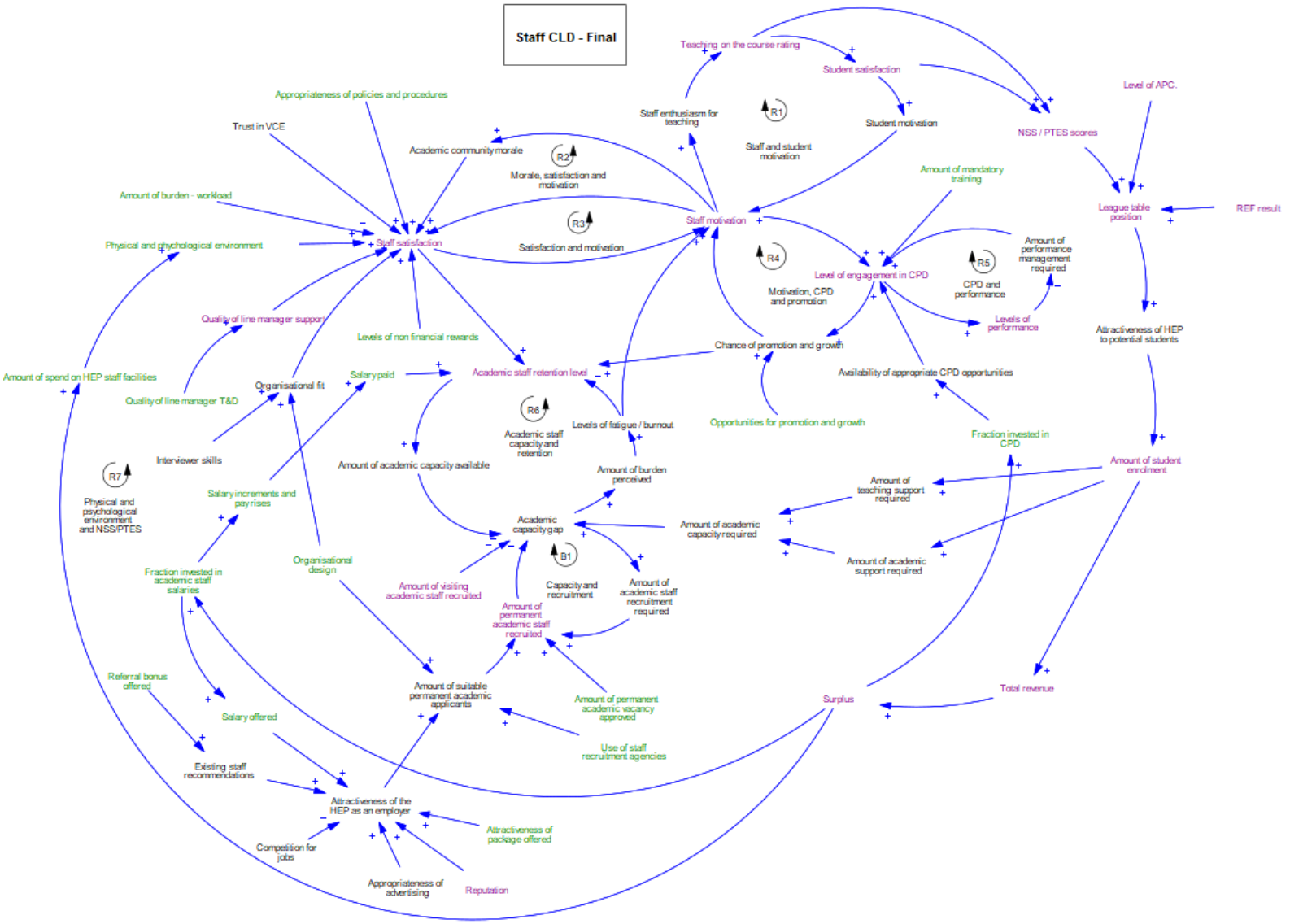
The seventh feedback loop (labelled R7 on the CLD) is named physical and psychological environment and NSS/PTES. This reinforcing feedback loop shows that the physical and psychological environment impacts staff satisfaction which impacts staff motivation and thus teaching on the course, which positively impacts the module rating and thus the NSS/PTES scores which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested in the form of HEP staff facilities spend.

The balancing loop (labelled B1 on the CLD) is named capacity and recruitment. This balancing loop shows that if the HEP is able to recruit, this academic capacity gap will reduce and thus staff will feel less burden and retention levels will increase impacting the amount of academic capacity available and thus reducing the academic capacity gap.

The CLD can be used to show where action is needed to influence a variable, if the HEP wished to improve staff satisfaction, then they need to review the levels of non-financial rewards, the organisational design, the quality of the line manager training and development, the physical and psychological environment, the amount of burden on staff workload and the appropriateness of the policies and procedures relating to staff.

To influence staff retention the HEP needs to consider the salary level (including salary increments and pay rises) and the amount of permanent academic vacancy that is approved. To successfully appoint suitable permanent academic staff, the HEP should review the use of recruitment agencies, the organisational design and the attractiveness of the package offered including salary. Finally, to influence staff motivation the HEP needs to consider the chances of promotion and growth.

Figure 9: Staff causal loop diagram



6.3.2 Learning and teaching causal loop diagram

The finished CLD for the learning and teaching sector (see Figure 10 below and Appendix 15) has two main areas of activity or components: the quality of the classroom activities and the quality of assessment and feedback processes. The first component relates to the quality of the classroom activities is positively impacted by staff qualifications and experience, the amount of time available to prep (includes the ability to offer flexible learning, addressing different learning styles etc.), staff enthusiasm for teaching, student attendance and engagement, and the learning environment (for example learning resources centre, classroom attributes, physical resources, environmental, technology, facilities, availability of resources) and is negatively impacted by the staff-student ratio. See Appendix 16 for a list of all of the variables in the learning and teaching CLD.

The quality of the classroom activities positively impacts the module rating, this variable is also positively impacted by the module organisation rating, the amount of research informed teaching included and the teaching on the course rating (which is impacted by appropriateness of module content in terms of levelness, currency and amount). The module organisation rating is an important variable that will directly impact NSS/PTES scores which in turn feed into the league table position obtained by the HEP and thus impacts future student enrolment and revenue. The module organisation rating is impacted by module leader capability (which is impacted by staff qualifications and experience and module leader training and development), the amount of time made available to lead the module and the level of module administration support provided.

Within the first component the decisions made that impact the quality of classroom activities and relate to staffing (which includes the staff-student ratio because this relates to the capacity available), facilities and administrative support are all made by the CMT. The decisions that are made by the SMT relate to workload allocated, the volume of research informed teaching and the module leader training and development.

The second component relates to the quality of the assessment and feedback processes which is an umbrella term that refers to the quality of the assessment set and also all of the administration of the assessment and impacts the NSS/PTES scores. This variable is positively impacted by the module leader capability, the amount of time made available to lead the module and the amount of support provided to the students regarding their assessment and feedback. It is negatively impacted by the marking load (which is impacted by the amount of students and the number of assessment pieces) and the amount of markers on the module (also impacted by the marking load). The quality of the assessment and feedback processes is a key variable in the level of attainment, progression and continuation (which will be examined further below).

The decisions that are made within the second component impact the quality of the assessment and feedback processes and are mostly made by the SMT. These decisions relate to the module leader workload allocated and training and development as well as the amount of assessment activity (this decision is made by the module leader themselves but in agreement with the head of department who is a member of the SMT).

There are six feedback loops in this CLD which are going to be described next. The first feedback loop (labelled R1 on the CLD) is named workload allocated to teaching, module organisation and league table. This reinforcing feedback loop shows that the amount of time available to lead the module will have a positive impact on the module organisation (as the academic has more time to

spend on module leadership), this positively impacts the module rating and thus the NSS/PTES scores which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested in the form of workload allocation.

The second feedback loop (labelled R2 on the CLD) is named workload allocated to teaching, quality of assessment and feedback, and league table. This reinforcing feedback loop shows that the workload allocated to teaching and in particular to the amount of time available to lead the module, will have a positive impact on the quality of the assessment and feedback processes and thus the NSS/PTES scores which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested in the form of workload allocation.

The third feedback loop (labelled R3 on the CLD) is named module leader capability, module organisation and league table. This reinforcing feedback loop shows that the module leader capability will have a positive impact on the module organisation which positively impacts the module rating and thus the NSS/PTES scores which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested in staff salaries thereby enabling the HEP to recruit more qualified and experienced staff who are likely to have more capability in the role as module leader.

The fourth feedback loop (labelled R4 on the CLD) is named module leader capability, quality of assessment and feedback, and league table. This reinforcing feedback loop shows that the module leader capability will have a positive impact on the quality of the assessment and feedback processes and thus the NSS/PTES scores which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested in staff salaries thereby enabling the HEP to recruit more qualified and experienced staff who are likely to have more capability in the role as module leader.

The fifth feedback loop (labelled R5 on the CLD) is named staff experience, module rating and league table. This reinforcing feedback loop shows that the quality of classroom activity will have a positive impact on the module rating and thus the NSS/PTES scores which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested in staff salaries thereby enabling the HEP to recruit more qualified and experience.

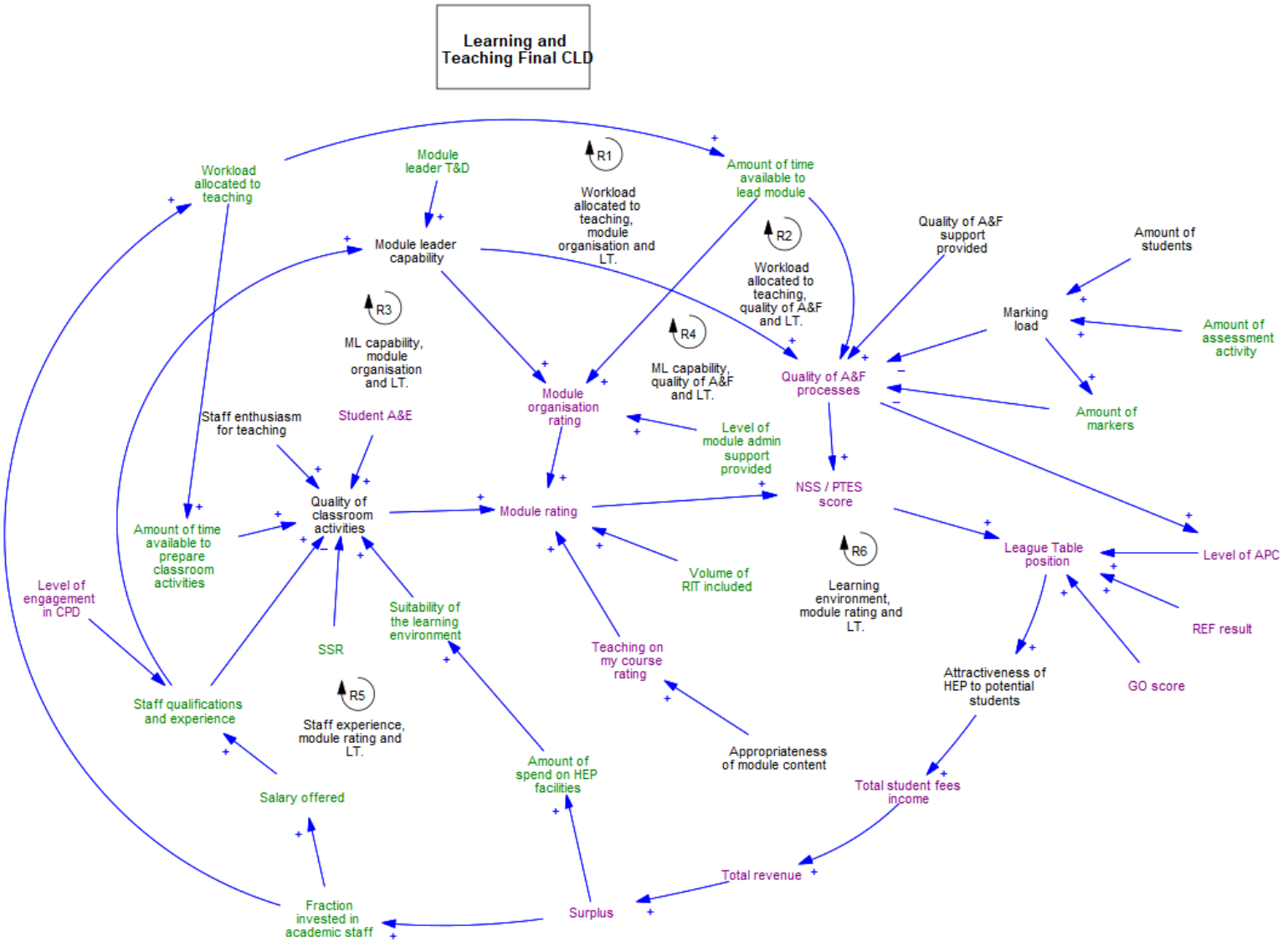
The sixth feedback loop (labelled R6 on the CLD) is named learning environment, module rating and league table. This reinforcing feedback loop shows that the learning environment will enhance the quality of classroom activity which has a positive impact on the module rating and thus the NSS/PTES scores results which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested into HEP facilities.

This CLD shows that the key PEF (the NSS/PTES scores) are impacted by the KPIs: module rating (which is impacted by the module organisation and teaching on the course ratings) and the quality of assessment and feedback processes. The policy levers that influence these KPIs and subsequently the PEF are: workload allocated to teaching, amount of time available to prepare the classroom activities, staff qualifications and experience (impacted by salary offered), the staff-student ratio, the

suitability of the learning environment, module leader training and development, amount of time available to lead the module, level of module administrative support provided, the amount of assessment activity and the amount of markers on the module.

Thus there are a considerable number of decisions that can be made to enhance the NSS/PTES scores, but whichever policy levers are used they all fundamentally depend upon financial investment to provide time and support.

Figure 10: Learning and teaching causal loop diagram



6.3.3 Student engagement causal loop diagram

There are two components in this CLD that explore the variables that impact student engagement in both the student community as well as in their academic studies (see Figure 11 below and Appendix 17). The student community is one of the key measures on the NSS/PTES, student attendance and engagement drives attainment, progression and continuation (APC) which is another key variable that impacts the league table position. See Appendix 18 for a list of all of the variables in the student engagement CLD.

The first component relates to the level of attendance and engagement and it can be seen that there are multiple variables that impact the level of attendance and engagement in classes, namely, student attributes, the ease of attending classes on campus, the assessment landscape (for example whether the student has another test that day), the appropriateness of the timetable, the existence of an attendance policy, the teaching on the course rating and sense of community will all have a positive impact. Only one variable was identified that might have a negative impact and that was the amount of online delivery that was offered.

The decisions that occur in this component are also made partly by the CMT (the amount of online delivery, attendance policy and the tariff). The decisions made by the SMT relate to the assessment landscape and the appropriateness of the timetable. At a school level the decisions that are being made are to encourage students to attend class and are often necessary to compensate for the decisions made by the centre.

The level of attendance and engagement in classes impacts the level of cohort engagement and the level of APC which is also impacted by the quality of the assessment and feedback processes, engagement in study support (which is influenced by the module team and the level of student support available) and the tariff required by the HEP.

The second component relates to the sense of student community and shows that the variable sense of community impacts the level of attendance and engagement in classes, the strength of cohort identity and feeds directly into the NSS/PTES scores. The variable is impacted by the level of cohort engagement. The level of cohort engagement has multiple variables impacting it namely, the level of attendance and engagement in classes, the use of student ambassadors, the amount of campus-based activities offered, the attractiveness of the campus, the programme leader team activities and the strength of cohort identity.

The strength of cohort identity is impacted by the sense of community, the cohesiveness of the programme, the timeliness of interventions and the size of the cohort (which is impacted by the target size of the cohort).

A lot of the decisions that are made to create a community for the students are made at a school level and these include the use of student ambassadors, the amount of campus based activities offered, the cohesiveness of the progarmme, the timeliness of the interventions and the impact of the PLT (see below for more details about the PLT responsibilities). However the decision as to the target number of students is set by the CMT as is the decision to invest in the facilities. Once again, the CMT decisions have a longer term impact and therefore longer delays before they have any impact.

There are seven feedback loops in this CLD which are going to be described next. The first feedback loop (labelled R1 on the CLD) is named community, attendance and engagement. This reinforcing feedback loop shows that high levels of attendance and engagement in classes drive up the levels of cohort engagement (this is because the students are present on the campus), and this increases the sense of community. The second feedback loop (labelled R2 on the CLD) is named cohort and community. This reinforcing feedback loop shows that a good sense of community will improve the cohort identity which in turn will increase the levels of cohort engagement.

The third feedback loop (labelled R3 on the CLD) is named campus, community and revenue. This reinforcing feedback loop shows that investment in the campus facilities to make it more attractive to students increases cohort engagement which impacts the sense of community and the subsequent NSS/PTES scores which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested.

In a similar way the fourth feedback loop (labelled R4 on the CLD) is named cohort activity, community and revenue. This reinforcing feedback loop shows that investment in cohort activities increases cohort engagement which again impacts the sense of community and the subsequent NSS/PTES scores which feed directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested.

The fifth feedback loop (labelled R5 on the CLD) is named study support, APC and revenue. This reinforcing feedback loop shows that investment in study support increases the level of APC which feeds directly into the league table position and impacts attractiveness to students therefore increasing enrolment, revenue and thereby the subsequent surplus that can be reinvested in this area.

However these loops are counterbalanced by two balancing loops present on the CLD. The first balancing feedback loop (labelled B1 on the CLD) is named community, A&E and APC. This balancing feedback loop shows that as the cohort size grows the cohort identity diminishes which impacts the cohort engagement, sense of community and thus the level of attendance and engagement and subsequently the APC, league table position and impacts attractiveness to students therefore decreasing the cohort size.

The second balancing feedback loop (labelled B2 on the CLD) is named community, NSS and cohort identity. This balancing loop shows that as the size of the cohort increases, the sense of community decreases and negatively impacts the NSS/PTES scores which feed directly into the league table position and will thus reduce the attractiveness to students therefore decreasing future cohort sizes.

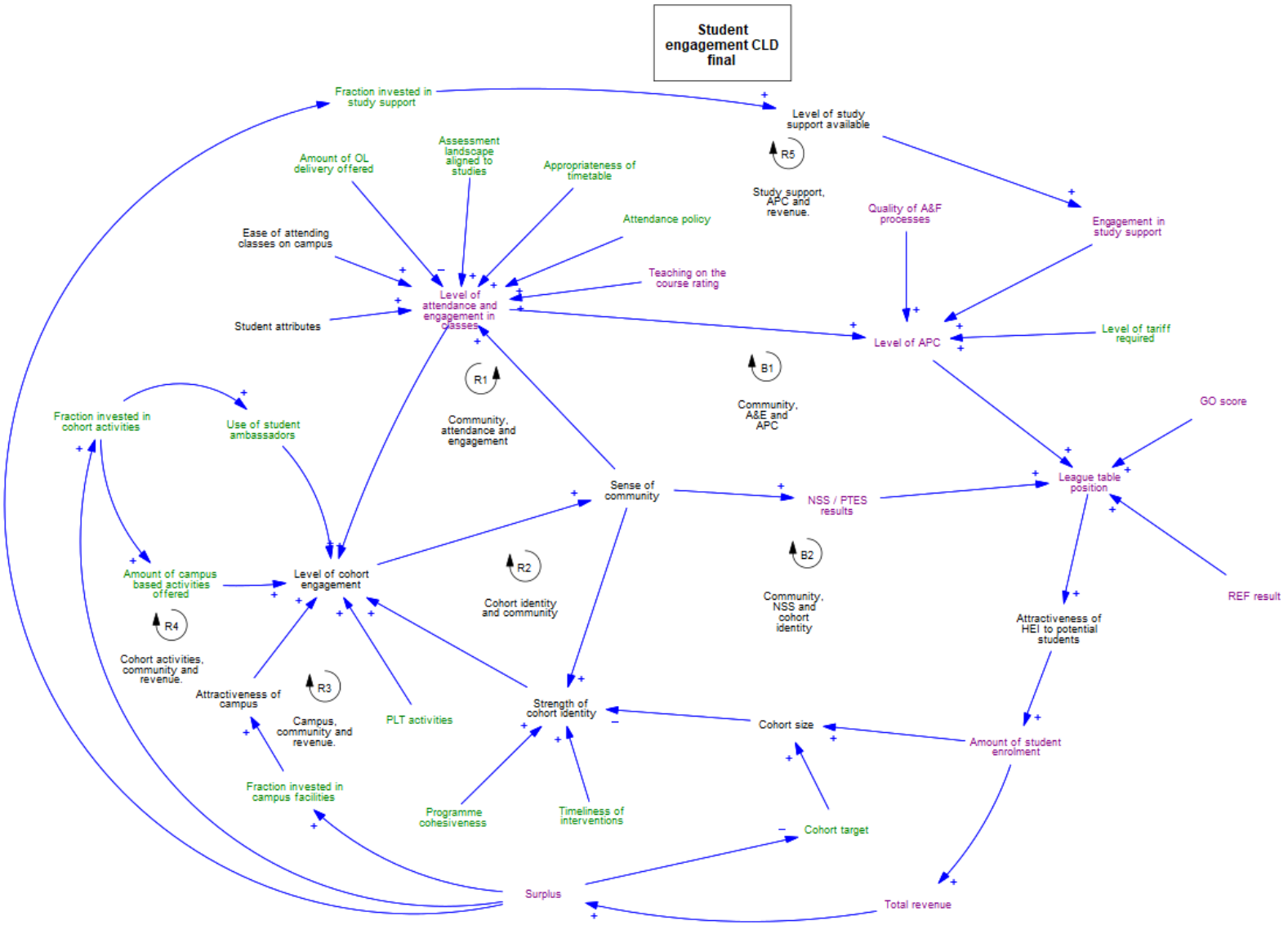
This CLD clearly shows the policy levers where decisions can be made to impact the KPIs and PEFs. There are two main areas that impact the NSS/PTES scores, and league table position addressed in this CLD, namely the student community and the level of APC.

The sense of community is impacted by the level of cohort engagement, investing in this area and providing student ambassadors and campus-based activities will increase this, as will investing in making the campus more attractive and providing appropriate programme leader teams activities. The level of cohort engagement will also improve if the cohort identity is strengthened which can be

actioned by ensuring programme cohesiveness, timely interventions and setting an appropriate cohort target.

If the HEP wants to improve the level of APC, then it should be addressing three areas, namely: the levels of attendance and engagement in classes, the quality of the assessment and feedback processes and the engagement in study support. The CLD shows that to enhance the levels of attendance and engagement in classes it would be necessary to review the assessment landscape, the appropriateness of the timetable, the existence of an attendance policy and the amount of OL delivery. To increase the engagement in study support then the amount that is invested in this area would need to be reviewed. The other lever that impacts the level of APC is the level of tariff required; thus this is another policy lever or decision area that the HEP can action if required.

Figure 11: Student engagement causal loop diagram



6.3.4 Employability causal loop diagram

The key focus of this CLD is the level of graduate employability (see Figure 12 below and Appendix 19), this is a key variable and one of the KPIs that feeds into the Graduate Outcomes Survey which impacts the league table position. The CLD explores the variables that drive graduate employability and identifies the levers that can be applied to improve graduate employability as well as the KPIs to track how well the HEP is doing in this area. See Appendix 20 for a list of all of the variables in the employability CLD.

The level of graduate employability is impacted by multiple variables namely: performance at interview, amount of students on placement, the level of employability in the curriculum, amount of engagement in extracurricular activities and amount of engagement in study abroad (both of which are impacted by the student's attributes), employment opportunities within the HEP, the vocational nature of the subject studied, the level of APC and the amount of value added to the student.

The level of employability in the curriculum is impacted by the influence of the employability champion, amount of experiential and case learning and the amount of employer and alumni engagement. The amount of employer and alumni engagement is impacted by the strength of the HEP's external networks, and the admin support available to support this activity, the variable itself impacts the amount of placements available and thus the number of students that are able to go on placement (which also affects the level of graduate employability). The last area of importance is that relating to the careers support available which impacts the amount of students on placement as well as performance at interview.

The majority of the decisions that relate to the level of graduate employability are made by the CMT, namely employment opportunities within the HEP, careers and administrative support. Within the school the SMT decide on the employability within the curriculum and how this is incorporated. Any decisions that relate to employability will have a delay; it can be several years before the graduates are in 'suitable' jobs that leads to good results in the Graduate Outcomes Survey and after impacts the league table and future student enrolment.

The are four feedback loops in this CLD. The first feedback loop (labelled R1 on the CLD) is named employability in the curriculum, employability and graduate outcomes. This reinforcing loop shows that the level of employability in the curriculum has a positive impact on graduate employability and therefore the Graduate Outcomes Survey and league table position, this will enhance the attractiveness of the HEP to potential students driving up enrolment and therefore revenue and surplus that can be reinvested to provide administrative support to continue to support and grow the amount of employer and alumni engagement that enhances the level of employability in the curriculum.

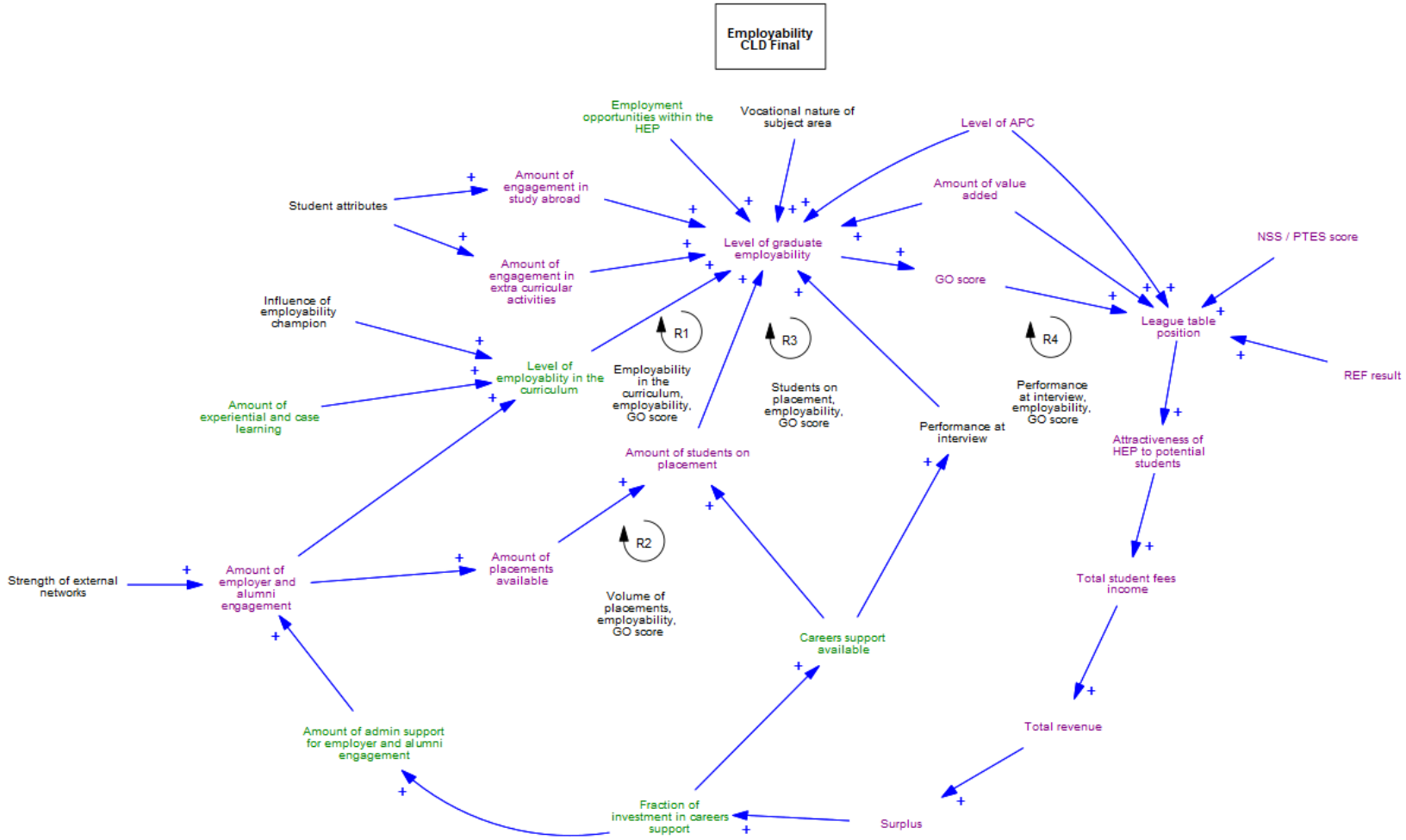
The second feedback loop (labelled R2 on the CLD) is named volume of placement, employability and graduate outcomes. This reinforcing loop shows that the amount of students on placement has a positive impact on graduate employability and therefore the Graduate Outcomes Survey and league table position, this will enhance the attractiveness of the HEP to potential students driving up enrolment and therefore revenue and surplus that can be reinvested to provide administrative support to continue to grow and support the amount of employer and alumni engagement that enhances the amount of placements available.

The third feedback loop (labelled R3 on the CLD) is named students on placement, employability and graduate outcomes. This reinforcing loop shows that the amount of students on placement has a positive impact on graduate employability and therefore the Graduate Outcomes Survey and league table position, this will enhance the attractiveness of the HEP to potential students driving up enrolment and therefore revenue and surplus that can be reinvested to provide the careers support to support the amount of students on placement.

The fourth feedback loop (labelled R4 on the CLD) is named performance at interview, employability and GO. This reinforcing loop shows that performance at interview has a positive impact on graduate employability and therefore the GOS and league table position, this will enhance the attractiveness of the HEP to potential students driving up enrolment and therefore revenue and surplus that can be reinvested to provide the careers support for those students preparing for interviews.

This CLD also shows that if there was an issue with the level of graduate employability the HEP could address this by taking action in the following areas: level of employability in the curriculum (by increasing the amount of experiential and case learning) and investing in careers support to prepare students to be successful at interview and also to support and grow the amount of employer and alumni engagement (which will also improve the level of employability in the curriculum but also the amount of placements).

Figure 12: Employability causal loop diagram



6.3.5 Programme leader team causal loop diagram

This is a key CLD as many participants noted the correlation between a good programme leader team (PLT) and high NSS/PTES scores (see Figure 13 below and Appendix 21). This may be because it is the PLT actions that students are referring to when they answer the NSS/PTES questions relating to organisation and management. The programme leader team is arguably the key to providing student satisfaction in general and this drives all responses (i.e. regardless of their experiences on the programme if the students 'like' the programme leader team they will respond favourable in the NSS/PTES). See Appendix 22 for a list of all of the variables in the programme leader team CLD.

A successful programme leader team will be able to influence students' performance (due to their relationship with the module team and their ability to identify appropriate student support as well as encouraging students to engage in study abroad which positively impacts their employability) and student satisfaction (by forming and strengthening cohort identity in addition to the impact a successful programme leader teams has generally on ensuring students satisfaction) and finally the programme leader team influence and support student recruitment activities.

The level of responsibility and decision-making accountability of the PLT varies according to which school within the HEP is being considered. The PLT within the school that is the case study of this research have delegated authority to make decisions, but it is the head of department (a member of the SMT) that has the accountability for any decisions made.

The decisions that are made within this CLD are PLT level of qualifications and experience which is impacted by staff recruitment policy and thus determined by the CMT, the amount of administrative and IT support for the PLT is also determined by the CMT. The other decisions, which are the hours allocated to and the training and development available for the PLT are determined by the school, but as with the module leader decisions mentioned above, any investment in this area is at the expense of investment that could be made in another area of activity within the school.

The two main variables in the CLD are programme leader team cohesiveness and programme leader team influence. Programme leader team cohesiveness is impacted by programme leader team members' engagement (which is impacted by the hours allocated to the role), strength of relationship with central function and the programme leader team capability (which is impacted by programme leader team level of qualifications and experience). Programme leader team influence is impacted by amount of admin and IT support for the programme leader team, training and development available to the programme leader team and programme leader team cohesiveness. Programme leader team influence impacts the strength of relationship with the module team, amount of engagement in study abroad, ability to identify appropriate study support (which impacts the amount of engagement in study support), student recruitment and admissions, strength of cohort identity and student satisfaction (which feeds directly into the NSS/PTES scores).

There are three feedback loops in this CLD. The first loop (labelled R1 in the CLD) is named investment, programme leader team cohesiveness and NSS. This reinforcing loop shows that the fraction invested in the hours allocated to the programme leader team members will impact the members' engagement and therefore cohesiveness and subsequently the influence the programme leader team have which will have a positive impact on student satisfaction and thus the NSS/PTES scores which will impact the league position making the HEP more attractive to potential students

thereby driving up the number of students enrolled increasing revenue and therefore making more surplus that can be invested back into the programme leader team.

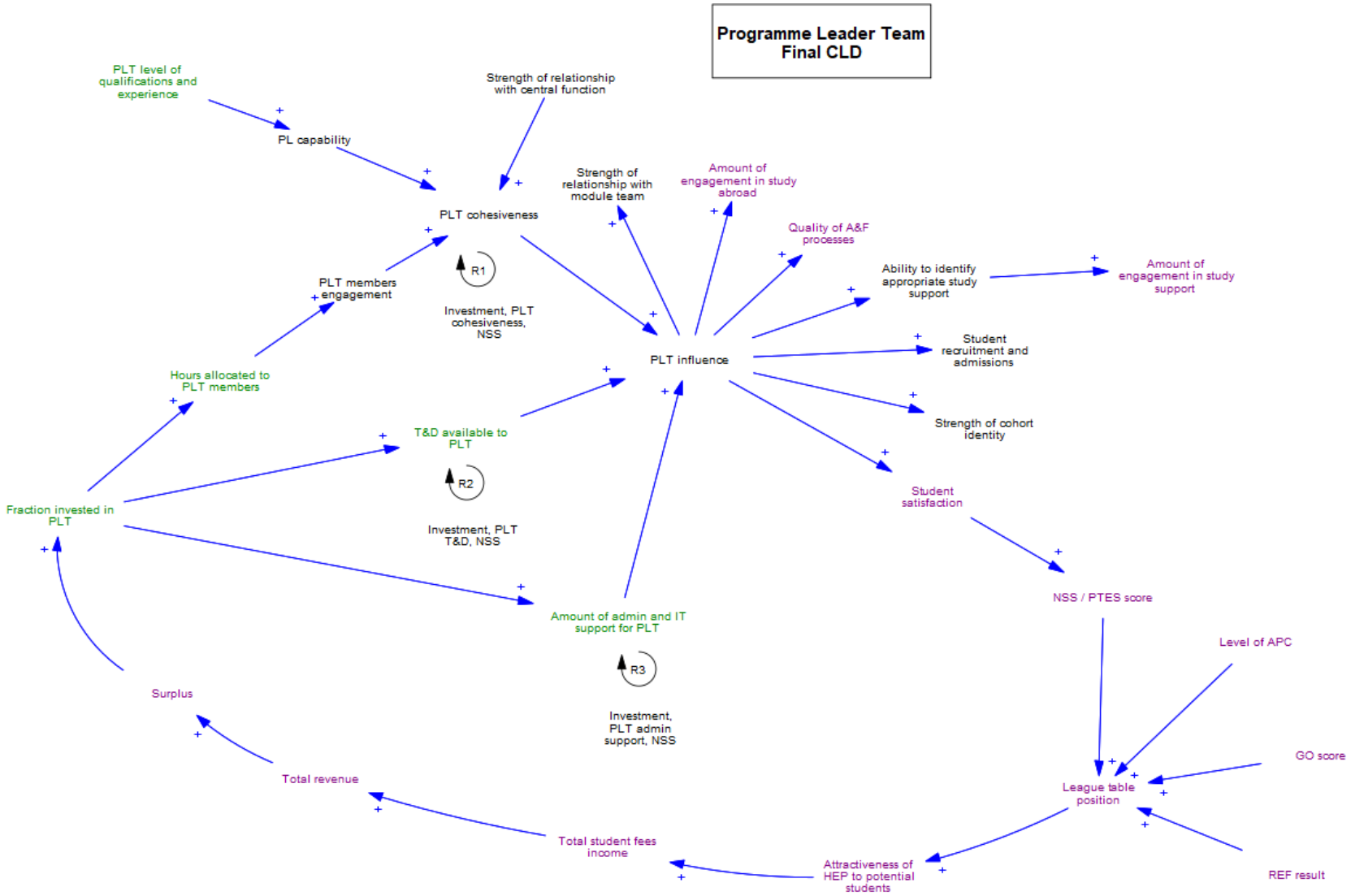
The second loop (labelled R2 in the CLD)) is named investment, programme leader team training and development and NSS. This reinforcing loop shows that the training and development available to the programme leader team will impact the influence the programme leader team have which will have a positive impact on student satisfaction and thus the NSS/PTES scores which will impact the league position making the HEP more attractive to potential students thereby driving up the number of students enrolled increasing revenue and therefore making more surplus that can be invested back into the programme leader team.

The third loop (labelled R3 in the CLD) is named investment, programme leader team admin support and NSS. This reinforcing loop shows that the fraction invested in the amount of admin and IT support for the programme leader team will impact the influence the programme leader team have which will have a positive impact on student satisfaction and thus the NSS/PTES scores which will impact the league position making the HEP more attractive to potential students thereby driving up the number of students enrolled increasing revenue and therefore making more surplus that can be invested back into the programme leader team.

If any issues with the programme leader team are identified (based upon feedback from the programme committees, the programme reps and the NSS/PTES) then there are several levers that can be used to improve this, the first is to review the programme leader teams qualifications and experience, and the second is to invest more in the programme leader team in the areas of hours allocated to the role, training and development available and/or the amount of admin and IT support for the programme leader team.

How does the HEP determine the fraction of investment to the programme leader team activities? If NSS/PTES scores suggest that there is an issue in this area the HEP can respond by investing financial resource into this area in order to enhance it, this may be academic time or bought in admin / professional support. However if NSS/PTES scores do not suggest that there is an issue in this area the resources invested are likely to remain the same as previous years.

Figure 13: Programme leader team causal loop diagram



6.3.6 Research causal loop diagram

The CLD that represents the research activity within the school (see Figure 14 below and Appendix 23) shows three main areas of activity or components: the first relates to research success (i.e. bids won, impact cases produced and publications), the second related to the research environment and the last relates to doctoral students. All three of these areas of activity feed into the REF results which impact the league tables, research reputation and the amount of QR funding received (this is also impacted by the amount of output from staff with significant responsibility for research and the amount of home doctoral students that enrol). See Appendix 24 for a list of all of the variables in the research CLD.

The first component considers research success which depends on both the quantity and quality of research output. The quantity of research output is impacted by research office support and academic staff research capacity. The quality of research output is impacted by research office support, the calibre of research staff, and external networks (which includes team working, collaborations and KEEP and KTP projects).

Academic staff research capacity is impacted by investment in research (specifically the amount of research allowance and amount of research capacity that is bought in), amount of research fellows (paid for by QR funding), proportion of time academic staff allocate to research (above their research allowance if they are in receipt of one) and research staff attrition.

The proportion of time academic staff are able to allocate to research will depend upon the calibre of the students (if they are teaching as well as being research active, supporting students will be another draw on their time) it will also depend on the amount of supervision required by doctoral students and finally, the level of mentoring support that they are required to provide.

The decisions that need to be made to achieve research success all relate to the amount of research capacity that is available. The amount of research capacity bought in, and the amount of research fellows is determined by the CMT but is also dependent on the amount of QR funding (thus there is a delay in receiving this). The amount of research allowances awarded is determined within the school by the SMT, as mentioned before time that is allocated to research is time that cannot be allocated to other activities that are occurring within the school.

The next component considers the quality of the research environment. This is impacted by the quality of the research office, the number of professors and readers, recruitment of early careers researchers, the amount of research mentors, the quality of the research leadership, the number of staff undertaking doctorates, opportunities for research promotions and the calibre of the research staff recruited. The quality of the research environment will impact research informed teaching, the research staff satisfaction and the REF results.

The decisions that are made that relate to the quality of the research environment include the number of professors and readers and the opportunities for research promotions which are both determined by the CMT. The recruitment of ECRs is a decision made by the SMT who have the capability to flex the personal specifications of any advertised jobs as they see fit depending on the business need at the time. All of these decisions have delays both in terms of recruitment but also with regard to the release of the REF results and the longer term impact of those results.

The third component in this CLD is that relating to doctoral students, including applications, enrolments, completions and publications. Doctoral student enrolment is impacted by the amount of doctoral student applications (impacted by the amount of doctoral scholarships offered, the fees charged and the doctoral student targets). The level of doctoral student enrolment impacts the amount of supervision required, the amount of UK students (which impacts QR funding), revenue from doctoral students and the amount of doctoral student completions. Doctoral student completions are also impacted by the calibre of doctoral students and the quality of doctoral supervision. The calibre of the doctoral students will also impact the amount of publications from doctorates which will feed into REF results.

The decisions that are made that relate to the amount of doctoral student enrolment include the doctoral student fees and student targets (set by the CMT), the amount of doctoral student scholarships and the hours allocated to doctoral supervisions (set by the SMT). There will be a delay in all of these policies.

There are nine feedback loops on this CLD, eight of which are reinforcing feedback loops and one of which is a balancing feedback loop. The first feedback loop (labelled R1 in the CLD) is named surplus, investment in research, REF and enrolment. This reinforcing feedback loop shows that the investment in research (this could be the amount of research allowance allocated or the amount of research capacity that is bought in) will increase academic staff research capacity and thus the quantity of research output meaning statistically research success will be higher and thus better REF results, which feed into the league tables, makes the HEP more attractive to potential students thereby increasing enrolment, revenue and providing more surplus which can be reinvested in research.

The second feedback loop (labelled R2 in the CLD) is named surplus, investment in research, REF and supervision. This reinforcing feedback loop shows that investment in research will increase academic staff research capacity and thus increases the amount of doctoral students that can be enrolled, increasing revenue and providing more surplus which can be reinvested in research.

The third feedback loop (labelled R3 in the CLD) is named QR funding, research fellows and REF. This reinforcing feedback loop shows that QR funding can be used to employ research fellows and thereby increase academic staff research capacity which can be used to support the production of research output which is likely to enhance research success and thus will lead to better REF results which will generate more QR funding.

The fourth feedback loop (R4 in the CLD) is named QR funding, scholarships and UK students. This reinforcing feedback loop shows that the use of QR funding to offer scholarships for doctoral students, depending on the amount and type of student, can generate more QR funding.

The fifth feedback loop (labelled R5 in the CLD) is named calibre of research staff, quality of output, REF and research reputation. This reinforcing feedback loop shows that the calibre of research staff will increase the quality of research output and therefore the research success which will improve REF results and enhance the research reputation, increasing the likelihood of success for the HEP in recruiting research staff of good calibre.

The sixth feedback loop (labelled R6 in the CLD) is named calibre of research staff, completions, REF and research reputation. This reinforcing feedback loop shows that the calibre of research staff will

increase the quality of doctoral supervision and therefore the amount of doctoral student completions which will improve REF results and enhance the research reputation, increasing the likelihood of success for the HEP in recruiting research staff of good calibre.

The seventh feedback loop (labelled R7 in the CLD) is named QR funding, scholarships, calibre and completions. This reinforcing feedback loop shows that the use of QR funding to offer scholarships for doctoral students is likely to improve the calibre of the students who are thus more likely to complete which will lead to better REF results which will generate more QR funding.

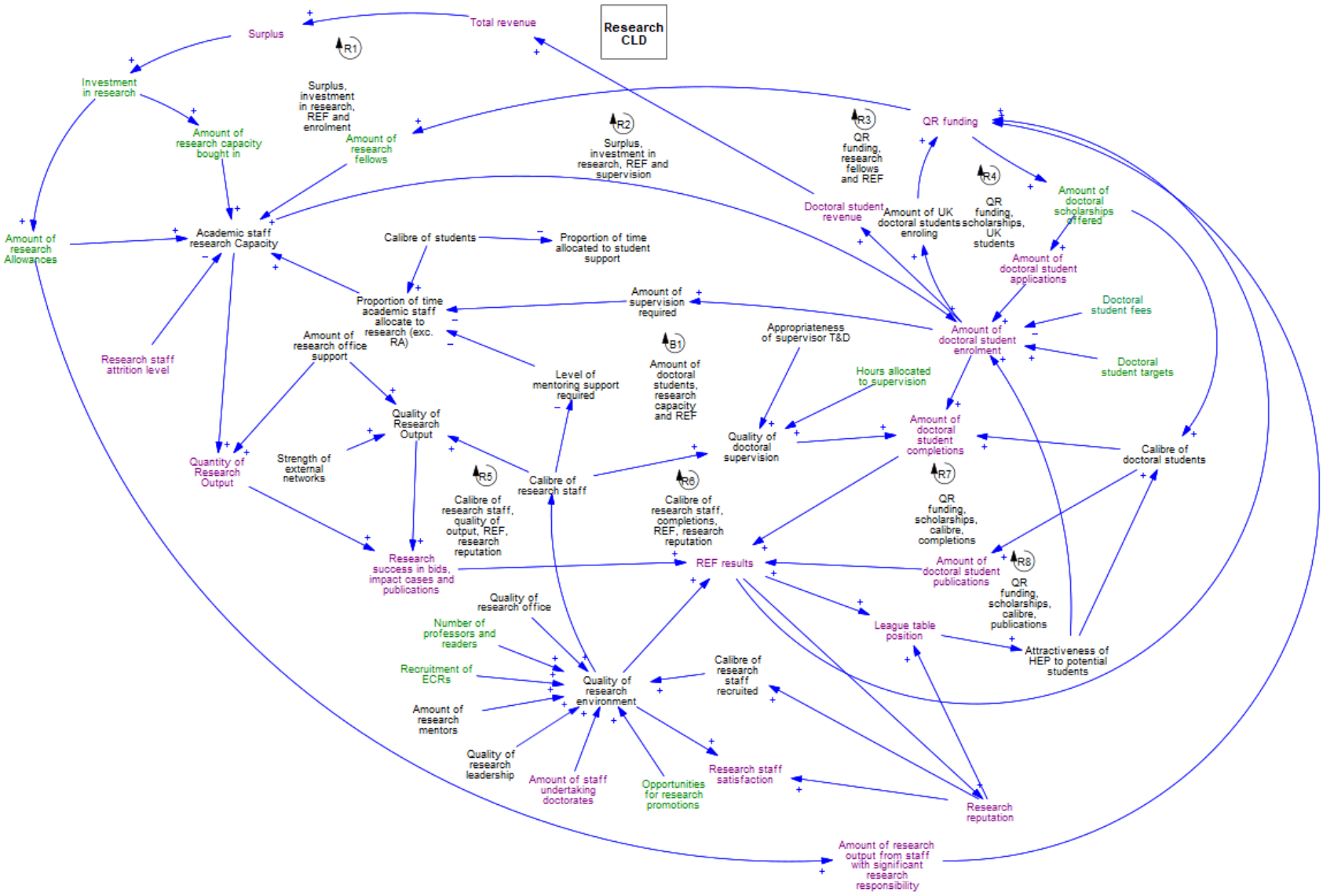
The eighth feedback loop (labelled R8 in the CLD) is QR funding, scholarships, calibre and publications. This reinforcing feedback loop shows that the use of QR funding to offer scholarships for doctoral students is likely to improve the calibre of the students who are thus more likely to publish which will lead to better REF results which will generate more QR funding.

The last feedback loop (labelled B1) is names number of doctoral students, research capacity and REF. This balancing feedback loop shows that as the amount of doctoral student enrolment increases the amount of supervision required will lead to a decrease in the proportion of time staff have available to do research which will therefore impact research capacity and thus the quantity of research output therefore decreasing REF results, as this feeds into the league tables this will make the HEP less attractive to potential students thereby decreasing enrolment and reducing the demand for supervision.

This CLD can also be used to decide where to act, if necessary, to improve the REF results. If the HEP wishes to grow academic staff research capacity it can invest in the amount of research fellows, increase research allowances or choose to buy in additional capacity. To impact the amount of doctoral student enrolments the HEP can review the amount of scholarships offered or change the fees or targets.

To improve doctoral completion rates the HEP can increase the hours allocated to supervisors to supervise students or ensure the calibre of academic staff undertaking supervision, the HEP can also look to increase the amount and/or calibre of doctoral student enrolments. To improve REF results the HEP can look at doctoral completions and publications as well as research success (by investigating the drivers behind the quantity and quality of the research output). The last major area of research activity is the research environment, this can be enhanced by considering the number of professors, readers and early careers researchers, ensuring that there are opportunities for promotion and building on research reputation.

Figure 14: Research causal loop diagram



6.3.7 Finance causal loop diagram

The finance CLD (see Figure 15 below and Appendix 25) shows the sources of income that contribute to the total revenue, the cots and the surplus. Some of the surplus is diverted to maintain financial sustainability, the remainder can be reinvested into areas to grow the business. See Appendix 26 for a list of all of the variables in the finance CLD. The main sources of revenue are from student fees and student accommodation, there is also REF income and other smaller sources of income from buses, sports, catering, conferences, Office for Students, income from collaborations, investment, business services and consultancy. The costs for the HEP are mainly staff costs (wages, pensions and continuing professional development), other costs are tax and interest, goods and services, travel and central overheads, and agency fees (which depend on the amount of agency activity).

Student fees income is from UG, PG and doctoral students' income but it is decreased by student debtors (these are mostly at PG and therefore increases as PG student enrolment numbers grow) and withdrawals at UG (these are mostly at UG and therefore likely to increase as UG student enrolment numbers increase). UG student fees income is based on student enrolment figures which depend on the target set by the HEP, the attractiveness of the HEP and the portfolio offered. PG student fees income is based on student enrolment figures which depend on the target set by the HEP (this will be in response to whether the UG target has been met), the attractiveness of the HEP and the portfolio offered but also will depend on the fees charged and the amount of activity at the student recruitment agencies. Student accommodation income is impacted by enrolment but also by the suitability of the accommodation.

All of the decisions within this CLD are made by the CMT. The total revenue is dependent upon student tariff, target and fees as well as the use of student recruitment agencies and the suitability of the student accommodation. Once the amount of surplus is calculated the CMT decide the amount that is to be allocated to ensuring financial sustainability and the spending on capital expenditure; then the CMT determine the amount of investment that can occur in the areas deemed to be of strategic importance (staffing – recruitment and facilities, enterprise, and research).

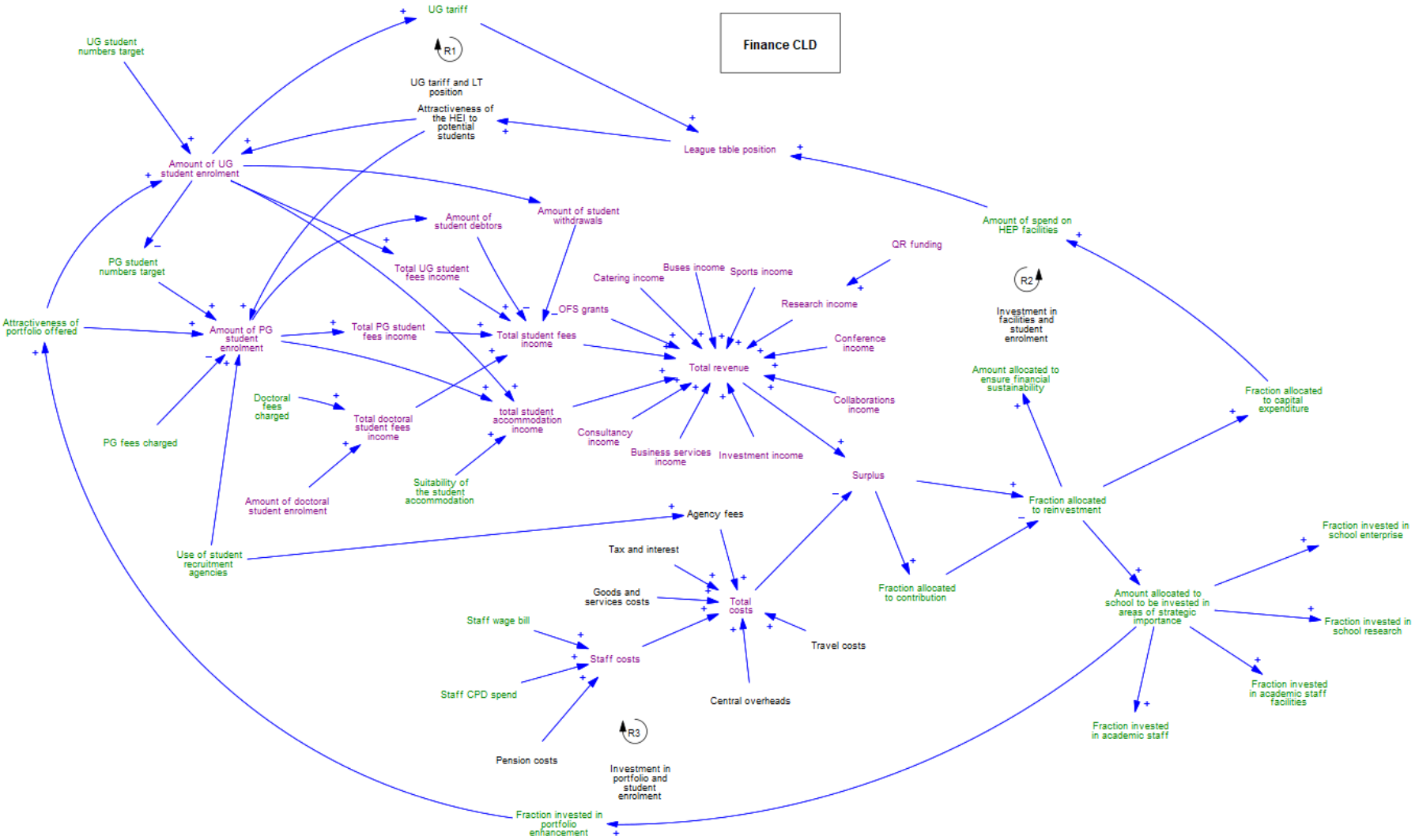
There are three feedback loops in this CLD. The first feedback loop (labelled R1) is named UG tariff and league table position. This reinforcing loop shows that student tariff positively impacts the league table position, which impacts the attractiveness of the HEP to potential students and thus UG enrolment which means that the HEP can maintain their tariff, conversely when the HEP drop the tariff (for example when targets are not met), the league table position will reduce which will negatively impact the attractiveness of the HEP to potential students and thus UG enrolment.

The second feedback loop (labelled R2) is named investment in facilities and student enrolment. This reinforcing loop shows that investing in the HEP facilities has a positive impact on the league table position, this impacts the attractiveness of the HEP to potential students and thus enhances UG and PG enrolment which increases income (through fees and accommodation) and revenue and thus the available surplus to reinvest in the facilities.

The third feedback loop (labelled R3) is named investment in portfolio and student enrolment. This reinforcing loop shows that that investing in portfolio enhancement impacts the attractiveness of the portfolio offered and thereby enhances UG and PG enrolment which increases income (through fees and accommodation) and revenue and thus the available surplus to reinvest in this area.

In summary this CLD shows that for the HEP to increase surplus they need to increase revenue or reduce costs. To increase income the HEP can maintain a suitable UG tariff which has a positive impact on the league table position, set appropriate student targets (and at a PG level use agencies to help achieve the target), ensure that the portfolio offering is appropriate and review their fees at PG and doctoral level. To save costs the HEP can look at reducing the staff bill as this is the largest amount of spend.

Figure 15: Finance causal loop diagram



6.4 Chapter conclusion

This chapter has explained the process behind the data collection and analysis undertaken in order to create the CLDs. These CLDs were then validated by a sample of participants across the HEP and the CLDs were subsequently finalised. When asked what were the variables and relationships that were necessary to perform in the PEFs, the participants proposed that the main resources required were staff and investment and that the key decision-making areas were learning and teaching, student engagement, programme leader team, employability and research.

The decisions or policies are either made externally to the school, by the CMT, or internally by the SMT. The CMT decisions relate to investment in staffing and facilities as well as all of the financial performance measures. And these decisions are medium to long-term. The SMT decisions are related to resource allocation and operations within the school with a focus on the delivery of student experience, teaching and learning in the main. These decisions are short to medium term and are often a response to a CMT initiative. The delays have also been identified, these are either related to information (a delay in the PEF results) and therefore decision makers may not know the impact of their decisions and policies for several years. The other major delay relates to staff recruitment, which impacts staff motivation and student satisfaction.

The next chapter will discuss how these individual CLDs were amalgamated into one CLD that represents all of the decision-making activity that occurs across the school to ensure PEF attainment. This school CLD will provide a holistic view of the system and the connections and interactions between the different performance indicators and drivers, this will increase awareness of the decisions that underpin performance and thus enable the formulation of a performance measurement system and the development of improvement strategies.

Chapter 7 Stakeholder workshops

7.1 Chapter introduction

This research aims to produce a performance measurement system to support decision-making. This will be achieved through the adoption of a framework that will enable the users to explore the impact of their decision-making on the performance evaluation frameworks (PEFs). To be able to support the school management team in attaining the school's strategic objectives as well as the best possible results in the PEFs it is first necessary for the team to possess a holistic view of the decision-making occurring in the school to ensure that no one core activity is being weakened in preference to another.

In the previous chapter, each of the key areas of activity within the school, that underpinned the performance that lead to PEF attainment, was mapped into a causal loop diagram (CLD). This chapter will discuss how these individual causal loop diagrams were amalgamated into one causal loop diagram that represents all of the decision-making activity that occurs across the school. This school causal loop diagram will provide a holistic view of the system, showing how the variables, policy levers and key performance indicators (KPIs) underpinning performance, all connect and interact together.

Once this school causal loop diagram was developed it was presented at two workshops, one with the school management team and a second with the central management team. This chapter will discuss the production and subsequent reception of the school causal loop diagram.

7.2 Creation of the school causal loop diagram

It was shown in chapter 3, that in the presence of multiple competing priorities, to achieve the desired performance outputs, it is necessary to determine how to best deploy resource and ensure the selection and application of the most effective processes. This activity can be supported by the application of a framework that enables the decision makers to understand how their decision-making supports or detracts from the attainment of the strategic objectives.

The first stage in the creation of this framework is the production of a school causal loop diagram. To develop the school causal loop diagram it was first necessary to understand the areas of decision-making that occurred across the school. In chapter 6 it was shown how, following a series of interviews, the individual causal loop diagrams were created and validated. These individual causal loop diagrams displayed all of the activities including decisions about resource management and processes, the KPIs and input variables, that were necessary to achieve the PEFs. These CLDs related to the areas of learning and teaching, student experience, programme leader team, employability, research, staff, and finance. The next stage was to amalgamate these individual causal loop diagrams in order to construct a causal loop diagram that represented the entire school.

The construction of the school causal loop diagram was a complicated and time-consuming process as there are many variables in the individual causal loop diagrams to be considered and amalgamated. The first stage was to list all of the variables occurring in each individual causal loop diagram to ascertain which variables appeared in more than one causal loop diagram as these would be used to connect the causal loop diagrams into the school causal loop diagram (see Appendix 27).

The next stage was the production of an overview framework for the school causal loop diagram (see Appendix 28). This overview framework shows that the staff component impacts the learning and teaching, programme leader team, employability and research components by providing the workload capacity in each of these areas. The programme leader team component impacts the student engagement component through the variable programme leader team influence. The research, employability, student engagement, and learning and teaching components all impact finance as they all result in a PEF and thus impact the league table position which impacts student enrolment and therefore income. Finally, the finance component impacts all of the components by providing the funding for all of the activities and resource required to produce the outputs that result in the PEF attainment.

Once this overview had been determined, the next stage was to decide which variables, levers and KPIs from the individual causal loop diagrams would form each of these components. This was determined by reviewing each individual causal loop diagram to select which variables were most relevant to the decision-making occurring in the school and would thus be incorporated in the school causal loop diagram. For each causal loop diagram a new, reduced causal loop diagram was produced that would be used in the creation of the school causal loop diagram (see Appendices 29 – 42).

This school causal loop diagram (see Appendix 43) is very complex with many interconnected variables and multiple feedback loops present. A list of all of the variables within the school causal loop diagram stating which CLD they come from and what type of variable they are can be seen in Appendix 44. To be able to understand the school causal loop diagram, it is helpful to consider the components within it. The first component is informed by the learning and teaching causal loop diagram and can be seen in the top right of the causal loop diagram, this area represents the decisions made relating to learning and teaching which impact the NSS/PTES scores (see Appendix 45). In this component the NSS/PTES scores are impacted by the module rating and the quality of assessment and feedback processes. The relevant feedback loops in this component are:

1) capacity available affects workload allocated to module leadership which enhances the module rating (reinforcing)
2) capacity available affects workload allocated to module leadership which enhances the quality of the assessment and feedback processes (reinforcing)
3) capacity available affects workload allocated to learning, teaching and assessment (LTA) which enhances the quality of classroom activities (reinforcing)
4) staff capability affects module leader capability which enhances the module content and thus the module rating (reinforcing)
5) staff capability affects module leader capability which enhances the module organisation and thus the module rating (reinforcing)
6) staff capability affects teaching team capability which enhances the quality of classroom activities (reinforcing)
7) staff capability affects module leader capability which enhances the quality of the assessment and feedback processes (reinforcing)
8) staff enthusiasm will enhance the quality of the classroom activities and module rating (reinforcing)
9) the level of admin support enhances the module rating (reinforcing)

Within this component the decisions that are made are amount of administrative support for LTA (made by the CMT), amount of time allocated to teach module and amount of time allocated to lead module and the SSR (these decisions are all made by the SMT).

The second component is informed by the programme leader team and student engagement causal loop diagrams and can be seen in the middle right of the school causal loop diagram. This area represents the decisions made relating to the programme leader team and student engagement which impact the NSS/PTES scores and the level of attainment, progression and continuation (APC) (see Appendix 45). In this component the NSS/PTES scores are impacted by student satisfaction and sense of community; the level of attainment, progression and continuation is impacted by the amount of engagement in study support and the level of attendance and engagement in class. The relevant feedback loops in this component are:

1) PLT capability affects PLT influence on the quality of the assessment and feedback processes (reinforcing)
2) PLT capability affects PLT influence on the student satisfaction (reinforcing)
3) PLT capability affects PLT influence on the amount of engagement in study support (reinforcing)
4) PLT capability affects PLT influence on the amount of cohort activities (reinforcing)
5) PLT capability affects PLT influence on the student recruitment and admissions (reinforcing)
6) PLT capability affects PLT influence on the amount of engagement in extracurricular activities (reinforcing)
7) amount of workload allocated to PLT affects PLT influence on the quality of the assessment and feedback processes (reinforcing)
8) amount of workload allocated to PLT affects PLT influence on the student satisfaction (reinforcing)
9) amount of workload allocated to PLT affects PLT influence on the amount of engagement in study support (reinforcing)
10) amount of workload allocated to PLT affects PLT influence on the amount of cohort activities (reinforcing)
11) amount of workload allocated to PLT affects PLT influence on the student recruitment and admissions (reinforcing)
12) amount of workload allocated to PLT affects PLT influence on the amount of engagement in extracurricular activities (reinforcing)
13) amount of admin support for PLT affects PLT influence on the quality of the assessment and feedback processes (reinforcing)
14) amount of admin support for PLT affects PLT influence on the student satisfaction (reinforcing)
15) amount of admin support for PLT affects PLT influence on the amount of engagement in study support (reinforcing)
16) amount of admin support for PLT affects PLT influence on the amount of cohort activities (reinforcing)
17) amount of admin support for PLT affects PLT influence on the student recruitment and admissions (reinforcing)
18) amount of admin support for PLT affects PLT influence on the amount of engagement in extracurricular activities (reinforcing)

19) level of cohort engagement impacts the sense of community which impacts level of A&E (reinforcing)
20) cohort size impacts the sense of community which impacts NSS/PTES (balancing)
21) cohort size impacts the sense of community which impacts level of A&E and thus the level of APC (balancing)

The decisions that are made in this component are the amount of study support available, the delivery plan, the amount of workload allocated to the PLT, and amount of cohort activity are all determined by the SMT. The remaining decision to be made, the amount of administrative support for the PLT is determined by the CMT.

The third component is informed by the employability causal loop diagram and can be seen in the bottom right of the causal loop diagram, this area represents the decisions made relating to employability which impact the Graduate Outcomes Survey (see Appendix 46). In this component the Graduate Outcomes Survey is impacted by the level of graduate employability. The relevant feedback loops in this component are:

1) staff capability affects employability champion capability which impacts the number of students employed in a graduate level position and thus the level of graduate employability (reinforcing)
2) staff capability affects employability champion capability which impacts the level of employability in the curriculum and thus the level of graduate employability (reinforcing)
3) amount of workload allocated to employability affects employability champion capability which impacts the number of students employed in a graduate level position and thus the level of graduate employability (reinforcing)
4) amount of workload allocated to employability affects employability champion capability which impacts the level of employability in the curriculum and thus the level of graduate employability (reinforcing)
5) amount of admin support affects the amount of employer and alumni engagement which impacts the level of employability in the curriculum and thus the level of graduate employability (reinforcing)
6) amount of admin support affects the amount of employer and alumni engagement which impacts the amount of placements available and thus the level of graduate employability (reinforcing)
7) strength of external networks affect the amount of employer and alumni engagement which impacts the level of employability in the curriculum and thus the level of graduate employability (reinforcing)
8) strength of external networks affect the amount of employer and alumni engagement which impacts the amount of placements available and thus the level of graduate employability (reinforcing)

The decisions that are made in this component are the amount of workload allocated to employability, the level of employability in the curriculum which are both made by the SMT). The final decision to be made in this area is the amount of administrative support for employers and alumni engagement is both made by the CMT and the SMT. This is one of the examples whereby a resource is available centrally, but the school wishes to maintain ownership and control and thus deploys some the school budget to employ their own resource in this area.

The fourth component is informed by the research causal loop diagram and can be seen in the bottom left of the causal loop diagram; this area represents the decisions made relating to research which impacts the REF result (see Appendix 47). In this component the REF result is impacted by doctoral student completions and publications, research success in bids, impact cases and publications, and the quality of the research environment. The relevant feedback loops in this component are:

1) capacity available affects amount of workload allocated to research which impacts workload allocated to research allowances, academic staff research capacity and research success (reinforcing)
2) capacity available affects amount of workload allocated to doctoral supervision which impacts quality of doctoral supervision and amount of doctoral student completions and publications (reinforcing)
3) the amount of QR funding affects the amount of research fellows which impacts academic staff research capacity and research success (reinforcing)
4) the amount of QR funding affects the amount of doctoral scholarships offered which impacts amount of doctoral student applications and therefore doctoral student completions and publications (reinforcing)
5) the amount of QR funding affects the amount of doctoral scholarships offered which impacts the calibre of doctoral student applications and therefore doctoral student completions and publications (reinforcing)
6) amount of budget allocated to research support impacts the amount of research capacity bought in and thus academic staff research capacity and research success (reinforcing)
7) staff capability affects academic staff research capability which impacts amount of doctoral student applications and therefore doctoral student completions and publications (reinforcing)
8) staff capability affects academic staff research capability which impacts quality of doctoral supervision and amount of doctoral student completions and publications (reinforcing)
9) staff capability affects academic staff research capability which impacts research success (reinforcing)
10) the quality of the research environment affects academic staff research capability which impacts amount of doctoral student applications and therefore doctoral student completions and publications (reinforcing)
11) the quality of the research environment affects academic staff research capability which impacts quality of doctoral supervision and amount of doctoral student completions and publications (reinforcing)
12) the quality of the research environment impacts the REF which impacts the number of ECRs recruited (reinforcing)
13) the quality of the research environment impacts the REF which impacts the number of professors and readers recruited (reinforcing)

There are many decisions that are made in this component and in addition to this approximately half are determined by the CMT and half by the SMT, which could lead to conflicting results in this PEF. The amount of research capacity bought in and the amount of research fellows (are decided by the CMT but also dependent on the amount of QR funding); the number of professors and readers, the opportunities for research promotion and growth and the amount of doctoral student fees are all

determined set by the CMT. Whereas the amount of workload allocated to research allowances, the recruitment of early careers researchers, the amount of doctoral student scholarships and the hours allocated to doctoral supervisions are all set by the SMT.

The fifth component to be reviewed is in the top left of the causal loop diagram, this area represents the decisions made relating to staff which impacts all of the other areas discussed above. This component shows the main areas of activity as staff capability, the amount of academic capacity available, staff satisfaction, staff motivation and staff recruitment and retention. The staff capability and the amount of academic capacity available have been considered in the feedback loops described above and are the main resource (along with budget) that underpin PEF performance. The relevant feedback loops in this component are thus:

1) staff satisfaction impacts staff motivation (reinforcing)
2) staff motivation impacts engagement in CPD and thus the chance of promotion (reinforcing)
3) academic staff capacity impacts staff retention (reinforcing)
4) academic capacity gap impacts staff recruitment (balancing)

The decisions in this component that are made by the CMT are salary offered, staff increments and pay rises, and amount of permanent vacancy approved, the decisions in this component that are made by the SMT are opportunities for promotion and growth, and levels of non-financial awards.

The last component to be reviewed is in the bottom right of the causal loop diagram, this area relates to the finance variables at the bottom right of the causal loop diagram. All of the PEFs feed into the league table position and this impacts the amount of UG and PG applications. The UG and PG enrolment, together with doctoral student enrolment, impact the total student fee income. This source of income (less school contribution) impacts the total school budget available that is used to fund admin support (learning and teaching, programme leader team and employer and alumni engagement), amount of study support available, the amount of investment in CPD, the amount of vacancy approved, and the amount of budget allocated to research. The amount of total student enrolment also impacts the amount of academic capacity required which impacts the academic capacity gap.

Within the last component the decisions are all made by the CMT, namely, level of UG student tariff, amount of PG fees, level of international office activity, and most importantly and impactful on the school is the amount of contribution back to central HEP functions.

The decisions that are made that impact each PEF will be considered next. The decisions that impact the NSS/PTES are all related to learning, teaching and assessment and the PLT. The decisions that impact the Graduate Outcomes Survey all relate to the decisions made about employability. Finally the decisions that impact the REF all relate to the research capacity, research environment and doctoral students.

All decisions involve a trade off as there is only a limited amount of resource, so any decision to enhance workload allowances to improve student community, for example, will reduce the capacity available for staff to engage in research. Therefore any decisions that are made to 'spend' resource to enhance the NSS/PTS are likely to have an impact on the REF results. Some of the PEFs have

crossovers and therefore investing in the PLT will not only impact student community and therefore the NSS/PTS but the PLT also impact student employability and thus the Graduate Outcomes Survey.

SMT decisions about operationalising the resources (based on the budget available) with a focus on the delivery of T&L in the main and therefore with less of a delay as SMT decisions are acted upon quickly especially if put in place to address an issue however although school level decisions are more impactful in the ST the impact on the NSS/PTES will not be known until the end of the year, and the subsequent impact on student enrolment could take even longer.

School level decisions to use resource are often made to support central resource, for example module leader T&D is offered locally in addition to that offered by the centre. But the SMT often make decisions in response to a CMT decision, for example increasing student targets is likely to impact the delivery plan adopted and the SSR. However all of the decisions made by the SMT will eventually track back to the CMT particularly when it uses school budget which is determined by the CMT.

The next sections will discuss the workshops that were held with the SMT and the CMT to consider the causality map.

7.3 Workshop with the school management team (2023)

In chapter 3 engaging stakeholders was said to support strategic decision-making and aid group mental model alignment and consensus by creating a shared understanding of the complex system within which the group operate by providing a mechanism (in this research a school causal loop diagram) for managers to exchange information and ideas which can provide important insights (Andersen et al., 1997; Béraud, 2010; Rouwette, 2011; Wilkerson et al., 2020). In this research this was achieved by organising a school workshop with members of the school management team.

The participants (listed in Appendix 48) were selected as those most responsible for the decision-making in the areas that had been identified in the interviews as the most impactful on PEF performance; those areas being: learning and teaching, student experience, programme leader team, employability, research and staff.

During this workshop the researcher presented the school causal loop diagram that represented the main areas of decision-making that need to be addressed at a school level to succeed in the attainment of the HEP's goals and ensure good performance in the NSS/PTES, GOS and REF. The purpose of the workshop was to introduce the decision makers to the school causal loop diagram so that they could appreciate the complexity, and the interaction of the decisions made in their area of activity on other areas of activities in the school and ultimately the PEFs, as well as explore the impact of the decisions made to achieve the desired performance outputs.

Participation in this workshop aimed members of the school management team to develop an understanding of the school causal loop diagram which would lead to a shared understanding of the system across the management team and, hopefully, improved decision-making. At the start of the workshop the facilitator informed the participants of the research process that had been undertaken to assure them of the validity of the research output. Of the seven participants selected to attend

the school workshop, five had already participated in either the data collection phase and/or the CLD validation meetings.

The facilitator also provided a short introduction to system dynamics, feedback loops and CLDs so that the participants would appreciate the methodology underpinning the research. Participants were told that they would be questioned about the decisions made and policy levers applied, that related to the component of the school causal loop diagram that most aligned with their area of responsibility and they were asked to relate all of their answers to PEF attainment. Once those participants had contributed, other participants were invited to share their thoughts regarding the decisions and policies within the component being discussed (the workshop notes are in Appendix 49).

In addition to the participants, three other people were present, this included the researcher (who undertook the role of facilitator), the supervisor (who undertook the role of observer) and a note taker. The aim of the workshop was to collate answers about the decisions made, but to also capture the participants' reactions and any evidence of a change in their decision-making processes as they first considered their own area in a silo and then were asked to review their decisions and policies when the whole system was taken into consideration, the participants were also encouraged to reflect on the interactions between the different PEFs during this activity.

7.3.1 Learning and teaching component

The first component of the school causal loop diagram that was considered was that relating to learning and teaching. The participants that are responsible for the decision-making and policies applied in this area are SP2, SP3 and SP5. SP3 began by discussing how the response to the NSS was created and immediately started to focus on the module level. While this is not unreasonable, as a programme is basically a collection of modules, it was surprising given the emphasis placed on the importance of the programme leader team during the data collection phase. It is also an unusual place to start a discussion about NSS when there are no modular level questions in that PEF.

One of the main levers across the school causal loop diagram is workload allocation and thus participants were asked how workload allocations were determined. SP3 suggested that more time given to module leaders would result in a more 'successful' module however SP7 said that extra time would not necessarily drive up the module rating but that the real issue was capability (the causal loop diagram has both variables included as impacting module rating score).

The hours allocated for module leadership and teaching activities are currently calculated via a workload model that was created many years ago. The hours allocated depend only on the module credits and the number of students. A bigger module will therefore attract more hours but would not take any other factors into account (for example module level, complexity of subject, student attributes, assessment instrument used).

If a workload manager (these are the managers responsible for the application of the workload model) wanted to allocate more hours for module leadership and teaching activities, they would either need to find a workaround (for example allocate hours to the module leader to redevelop the module) or utilise some additional resource that is available in the school (for example using skills tutors or teaching fellows).

Where there is a lack of capacity within a department (typically caused by staff turnover or a failure to recruit), the shortfall is made up by the use of visiting lecturers. SP6 expressed concern over the use of visiting lecturers to lead modules though, as they felt that the visiting lecturers were not given sufficient workload to undertake this activity. Despite being the major resource used in the school, SP1 admitted that there was no consideration of workforce planning within the planning round discussions (this is the time of year that school budgets are approved).

SP3 said that they, the decision makers, operated as islands and made whatever decisions were deemed necessary at the time. Several participants suggested that when there was an issue in one area of the school (for example learning and teaching) 'everything was chucked' at that issue and that this might include redeploying staff from other activities if necessary.

SP6 discussed the staff recruitment strategy with regard to the recruitment of visiting lecturers, the assumption is that visiting lecturers are recruited to support module delivery, and they did not need to be able to evidence any specific competencies just capability. SP7 said that when recruiting permanent staff there was a move towards assessing where a new member of staff could fit in and add value to other parts of the school's portfolio, in addition to recruiting staff that only engaged in teaching delivery.

It was noted that the huge growth of postgraduate (PG) student numbers had impacted both new and established staff. One of the impacts of this growth was on the staff-student ratio, and SP3 suggested that this was driven by estates and capacity and not pedagogy.

SP7 noted that despite the changing student profile, the job description/person specification used during recruitment was still the standard one and that it was not nuanced to take into account the school requirements. They went on to say that there is a movement within the school to improve the recruitment process. SP3 noted that the job description no longer made it necessary to possess a doctorate and that despite this change in the school recruitment policy the NSS/PTES scores had improved.

7.3.2 Programme leader team component

The discussion then focused on the programme leader team component in the school causal loop diagram, where it was again noted that the workload constrained the amount of hours allocated to programme leader teams members and SP2 noted that, as with module level interventions, additional hours and support had been added as and when considered necessary. SP3 proposed that this seemed to be a frequently used 'solution' when the workload constrained the capacity. Where there were indicators that a programme was not providing a good student experience then there would be a service recovery whereby additional resource would be directed to support the programme leader teams. SP3 said that if there was an issue with the performance of a programme leader then a deputy programme leader could be added to the team.

The discussion then moved to the issue of staff continuing and professional development as this was identified as the other variable that impacted staff capability. SP7 said that there was no clarity on the amount of staff development budget that was available, and thus heads (who predominantly approved continuing and professional development requests) were unable to plan a strategy for this. SP7 went on to say that there was also no evaluation of the effectiveness of any training and development that was undertaken.

7.3.3 Employability component

The next component that was considered related to the Graduate Outcomes Survey. SP4 said that the programme leader's had targets around employability but that any decisions made focused on measures and not targets, however SP1 said that there were no targets!

7.3.4 Research component

The last component to be discussed related to research. SP1 discussed research allowances and said that it was basically whatever had been allocated in the previous year plus a bit more. It was also noted that because of the way HESA reports the data, anyone with a significant responsibility for research (i.e. 20% or more of their workload is allocated to research) must be returned to the REF. SP1 said that this had led to some 'playing' with the way the allowances were recorded in workloads. The participant went on to say that the previous pro vice chancellor for research was keen to performance manage any researchers that were under delivering but in reality, the school had never engaged in this.

In opposition to the view shared by SP3 before, SP1 had the view that doctorly qualified and research trained staff would possess both more, and a broader variety of, skills to contribute towards module leadership and delivery. Regarding doctoral supervision and the allocation of workload for this supervision, this worked well if the students were able to generate research output. SP1 went on to say that, however, as an institution, we were more likely to get 'less able' students which would take up more time and require more supervision without producing research that supported their supervisors' research output.

SP7 asked what evaluation was ever made following resource investment, where was the return on investment? The last comment made in this first part of the workshop was made by SP4 who asked whether anyone had considered the cost of staff undertaking doctorates and the subsequent payback.

7.3.5 The school causal loop diagram

After a short break the workshop reconvened to move onto the second part of the workshop which was the discussion of the entire school causal loop diagram. The first comment was from SP3 who said that learning, teaching and assessment (LTA) activities always took priority because the students needed to be taught. Other participants then contributed, SP5 said the issue was that we were 'running around doing projects' that were not related to LTA activities, instead we were expected to deliver on pet projects that came from the central management team. SP2 said that delivering quality and high volume were mutually exclusive. SP6 said that the priority was to make money to which SP4 added that the engine was the teaching activities to provide financial sustainability.

SP7 said that we were driven by the Office for Students, Graduate Outcomes Survey and REF. SP6 asked how we could be expected to deliver on all of the objectives? SP4 said that it would depend on how we defined operations, SP7 added to this and said that the reality was we would always be tasked with delivering on quality because of the NSS/PTES. SP3 continued with this theme saying that we had a contract with the students to deliver and that we promised to make them employable. The participants started to think about those factors that were external to our delivery and said that

however much resource and effort we put into making our students employable, there were still external variables present that we could not mitigate against that would impact a student's employability.

The participants went on to comment on the complexity present in the system and questioned how we would decide our priorities given the targets that were set by the central management team. SP5 commented that we were trying to be an 'everything for everybody' institution and this affected the way that we did things. SP6 added that if we could determine the main priority or vision that would help us and that having a clear plan or strategy would provide a direction that would make decision-making easier.

SP7 said that we were always influenced by the higher education provider's strategy which was focused on income generation and that led everything. As a school, though, we were led by a sector framework which meant that we could not control the outcomes that we were being measured on. SP4 agreed and said that as 'quasi' public sector we had a pre-determined framework. SP2 and SP5 noted that as the Office for Students was our regulator, and they give us our awarding powers, it was thus necessary that their requirements drove our decision-making.

Regarding the decisions about the allocation of budget, SP3 suggested that a manager would need to 'fight' to justify their expenditure in an area and that there would be an expectation that they would deliver on the measures in that area. SP1 said that we had not yet reached the point where we wanted more than we could afford but if that became the case, then we would need to review the workload allowances.

SP7 asked again whether we considered the impact of our spending and whether we evaluated investment in terms of value for money and measuring return on investment. SP1 said that there was no appetite for this by central management team and the focus instead was on spending and budgets. SP1 concluded the discussion by saying that the institution had made a strategic decision to focus on recruiting large numbers of international PG students to ensure financial sustainability, and that this decision had had the biggest impact on our performance measures.

7.4 School management team workshop discussion

During the discussion there was a consensus that the workload model was not fit for purpose given the scope of activity that was required across the school (module delivery, programme leadership, support for the multiple other activities the school undertakes, and undertaking research). This is a reactive recovery model of allocating capacity, and not a proactive model that aims to achieve a desired outcome. There was also some concern that there was no consideration made regarding the productivity of the resource deployed or effectiveness of the decisions made.

There was a majority view that the initiatives that the central management team directed the school to act upon, were seemingly out of nowhere and depended on the 'flavour of the day'. As well as ongoing initiatives, new unforeseen strategies (normally to ensure financial sustainability) were also imposed upon the school. The presence of these initiatives and strategies, especially given the constraints and targets also imposed by the central management team, made it a lot harder for the school to deliver effectively.

There was thus some concern about meeting the requirements of the central management team regarding certain activities. There was a sense that the school was unable to deliver some of the initiatives, given the constraint of the capacity available and the commitment to delivering modules to a huge PG cohort. Despite this, participants said that they would find a solution. These 'solutions' usually meant finding a way to add additional resource or reviewing the underlying processes to make them more efficient.

There was a consensus that the main objectives for the school going forward are attaining the B3 conditions and improving the NSS. SP6 suggested that the school needed a clear plan or vision and that would help shape the decision-making that occurred, making it more strategic.

The adoption of a systems thinking approach is partly to help participants understand the complex system in which they operate. At the end of the workshop many of the participants commented that this experience had helped them to see the connectivity between the components of the school CLD and the areas of decision-making. SP3 noted that they had not previously appreciated how much the workload model constrained their decision-making.

Another outcome from adopting a systems thinking approach is to enhance communications between the participants. SP7 said that the use of this school causality map brought a narrative to the table that could enable the team to have an informed discussion about strategic priorities and where to focus, as well as a better understanding of what was attainable. SP4 said it was refreshing to see the whole picture, as one tended to focus on their own role and responsibility and did not necessarily ask how it impacted upon other areas.

The participants were generally very engaged in the workshop but, as one may expect, some more so than others. The facilitator is a member of the school management team and hence there was some collegiality and support, which made the majority of the participants more inclined to engage.

Participants showed an interest in the process and wanted to be reassured of the robustness and thus questions were asked about the assumptions that had been made when constructing the causal loop diagrams. The facilitator reminded them that the data used had been obtained during the two rounds of interviews that had been held with members of the school (including five of the participants present in the workshop). The causal loop diagrams had then been validated during a further round of interviews with participants from both the school and members of the central management team.

There was a consensus that although many decisions and policies were made, there was no evaluation or consideration of what was cost effective. During the workshop several metrics and measures were mentioned but there seemed to be a lack of target setting and decision-making was not aimed towards the attainment of a specific goal. There was also some confusion over who had targets and whether these were in fact targets or measures.

The adoption of a systems thinking approach should enable the participants to make informed decisions, but the participants suggested that decisions were 'made on the hoof' and were dependent upon the agenda at the time for example when one of the school's goals was achieving AACSB (Association to advance collegiate schools of business), all new staff being recruited had to have, or be near completion, of a doctorate. Other decision-making occurred on an ad hoc basis

according to whichever area was deemed the most in need and usually because the central management team had told the school that there was a particular issue in that area.

When these policies and initiatives came from the central management team, the constraints that occurred due to the application of a restrictive workload model, meant that decisions and policies were often 'fixes' and 'workarounds' and not strategic. Participants noted that these initiatives and directives (many regarding teaching and assessment) were very difficult to achieve given the capacity available and the pressure that is already being put on staff.

During the workshop it became evident that several participants experienced a 'critical learning incident' as they started to appreciate the volume of activity that the school was trying to engage and succeed in (Thompson et al., 2016). However due to the competitive nature of the school management team it was unlikely that many would obviously display a critical learning incident and hence the facilitator sent a follow-up email to attempt to establish whether this had occurred. This was not a concern as Thompson et al (2016) do say that the absence of a critical learning incident does not imply an absence of learning by the participant.

Following the school workshop, a second workshop was held with the central management team (the participant list is in Appendix 50 and the notes are in Appendix 51). The purpose of this workshop was to question members of the central management team about the decisions that they made that constrained activity at the school and impacted the school's attainment in the PEFs. The central management team were also questioned about the tracking and monitoring of the PEFs and what corrective actions were made if necessary.

7.5 Workshop with the central management team (2023)

At the start of the workshop the facilitator gave a brief introduction to the components of the school causal loop diagram. This was followed by a series of questions, the first of which asked how the workload allocated to activities was determined. VP4 started the discussion and said that it was good to see the programme leader team at the centre of the causal loop diagram they then went on to discuss the distribution of workload to programme leader teams. They said that the issue in the schools across the higher education provider was not with the amount of workload allocated to the programme leader teams, but the perceived disparity in the amount of workload allocated but that this should be addressed through the adoption of a common workload allocation framework.

VP3 continued the discussion and added that historically research allocation across the higher education provider had not been that consistent but, since REF 2021, this situation had improved as it had become necessary to develop a code of practice involving the research time allocated to staff. This was that all staff with a significant responsibility for research received a base allowance of 0.2 FTE, which should equate to one day a week depending on their timetable. When VP3 was asked whether it was possible to guarantee a whole day free for research activity, the participant said ideally the timetable would allow for it but that a member staff would get at least two 1/2 day blocks free for research.

The participant continued and said that smaller research allowances were available for those staff at the start of their research journey. Those staff who had received a research promotion i.e. associate professor (research) or readership receive a 0.3 research allocation. The professorial research

allowance, however, is dependent on the school as their research allowance is driven by their successful acquisition of research funding which can be used to support their research.

The central management team were then asked whether there would be a review of workload allowances if the PEF results are not as desired. Again VP4 answered this question and focussed on the NSS/PTES scores saying that the programme leader team were pivotal to NSS/PTES and that student voice and community were key to influencing NSS/PTES. They continued saying that the data from the surveys was analysed and used to indicate which areas were 'good or bad'. Following this a team would meet with the deans to discuss the changes needed which could include a review of the resource, although any changes made were dependent on the dean.

VP4 said that when programmes work well that it was about 90% due to relationships between the programme leader team and their students and only 10% due to other factors. These factors included the student timetable and communications and thus the participant said that they also worked with the head of HR about staff turnover and recruitment times, the head of estates and the head of the learning resource centre.

The next question moved onto what actions the central management team took with regard to ensuring staff satisfaction, motivation, and retention. VP4 again started the discussion and said that the HEP has high staff retention and low ill health. VP1 added that the central management team were however plagued by negative staff survey results about the central management team and that VP6 was working on that.

When discussing staff motivation VP6 said that staff motivation had changed post-COVID due to the work environment and that staff were also more dependent on finances. They went on to say that while the people strand of the HEP strategy had been focused on equality, diversity and inclusivity, the next area to be considered would be lived experience, working at the higher education provider and the HEP as a modern employer. VP1 added that motivation was different for different people, for some it was about CPD opportunities, for others it was for example the Christmas bonus which was very well received.

When asked about the impact of salary, VP1 said that broadly speaking the salary was regulated centrally and grades were benchmarked across the sector. This was especially important in non-academic departments, for example marketing and finance, where there was a need to undertake market rate analysis to be able to recruit staff. They added that although there was an industry dispute over salary, the higher education provider was relatively unaffected by the strikes and the marking boycott.

The central management team were more interested in reviewing the whole package offered as they felt that staff were less concerned about salary and more concerned about salary add on, the cost of living in the county and annual leave. They added that they thought that the staff that worked at the higher education provider were motivated by things other than pay, instead they were more interested in their employment rights, having a voice, being listened to, finding their work interesting and that they felt that the higher education provider was a good place to work.

They thought that staff recruitment was affected by the marketplace more than the attractiveness of the HEP. VP6 continued that recruitment was bouncing back and VP1 added that recruitment application numbers per post were increasing, having dipped to 8 were now at 30. VP6 then said

that staff turnover was on average at 10% but higher in some areas than others. This was especially true in the areas where staff could work from home for a company based in London and be able to command a higher salary. VP2 questioned whether this trend would remain as industry was slowly moving back to staff being in the office again. The last comment relating to staff was made by VP6 who said that staff satisfaction was negatively correlated with the length of service particularly if one had been in service for more than 15 years, and that there were some very demotivated staff.

The next question asked how student targets numbers were set for each programme. VP1 immediately discussed the massive influx of international students which they had tasked the Deans to accept because of the associated finances but said that resources had now caught up. However they went on to say that, where they had struggled to recruit, it was due to issues about salary especially in computer science where academics were like 'hens' teeth'. VP4 added that the central management team did think about staffing when they considered growth and especially international PG growth as it had grown enormously. When considering the large increase in PG student enrolment, VP2 said that it was necessary to vary the size of the teaching group accordingly and that the staff-student ratio may be 20 to 1, 30 to 1 or 40 to 1. To which VP6 added that students were satisfied, as evidenced by the PTES results, despite the increased staff-student ratios in.

VP4 said, of course there had been a lag in staff recruitment, but that it had been necessary to leverage the window of opportunity to ensure financial security. VP4 went onto say that despite any potential lag in recruitment, that it was 'curious how well we had advanced in the PTES and that it was higher than expected and that obviously staff and students were building positive and strong relationships. VP2 added that staff were getting it done, somehow. They went on to add that having a large PG community could mean that the students saw the HEP as being successful. Having a large number of students to deliver to was actually 'a good problem to have'. The last comment related to student targets, specifically to the UG student numbers and the need to support those staff responsible for the delivery to UG students to keep 'their morale up'.

The next, and last, question related to the Board of Governors KPIs (see Appendix 52) and whether it was possible to deliver on all of them at the same time. VP1 said that the institution had no option but to do so as it was a complex organisation competing against other complex organisations. VP4 added that there was room for all of the KPIs but only in so far that staff could see the relevance of them. They said that the institution needed a range of KPIs to reflect the HEP's ambitions across the whole portfolio. They continued by saying that it was necessary for the KPIs to be easily communicated for example for the NSS to be in the top 25%.

The facilitator asked whether philosophically did we want teaching and research integrated or separated? The central management team discussed this but concluded that very few HEP's did one or the other. VP1 said that HEPs needed to be careful that they did not sell students a lie and that students attended a prestigious higher education provider because they expected to absorb some of that reflected glory. VP3 added that as an HEP we had a significant proportion of academic staff that were not research active, and thus this meant that 'they could be busy with learning and teaching development'. They went on to say that it is all about success, that 70 HEPs are currently in deficit but as an institution we had a £60 million surplus which provides security.

VP2 added another point about resource, saying that before adding more resource it was necessary to consider affordability. VP3 added that where staff received an allowance for research that it was

necessary for them to consider how best to achieve their research outputs within that envelope of research. VP2 added that it was necessary for staff to decide how best to allocate their time.

Continuing the theme of whether we should be a teaching only HEP, VP6 said that we have a broad base of staff who were increasingly pracademic, adding how would they know what they wanted to do or be if they did not have a workload that was spread across learning, teaching and research? In opposition to this view though, VP1 suggested that the Ph.D. had evolved to become the training or currency in required to engage in research activity.

VP4 said that it was necessary to have a balance between teaching and research because we are an alliance higher education provider, hence we were committed to delivering professional and technical education. To do this we had to have space for a range of academic workloads including those academics who had been recruited because of their professional experience. They added that the HEP encouraged their learning and reflective practice and that although there should be a space for research it was not necessarily important that everyone did everything equally. The participant finished by saying that we did not have to be experts in everything equally, that we needed a mix to ensure students were technically competent in the professional qualifications.

7.6 Central management team workshop discussion

At the start of the workshop VP4 led discussions and was very focused on the programme leader team and said that they were pivotal to the success in the NSS/PTES. VP4 suggested that a persistently poor programme was normally due to staff capability and confidence and that it was easy to say with more time they would do better. The participant was pleased to see staff-student relationships in the causal loop diagram. However, throughout the discussion learning and teaching was hardly mentioned and there was no mention of pedagogy or employability and enterprise at all.

It was proposed that to improve the NSS/PTES the focus should be on community, student voice and staff-student ratios. It was suggested that across the schools these staff-student ratios were inconsistent, and that it was necessary to build programme teams that talk to each other. It was considered particularly important to consider the staff-student ratio in those schools that relied on the use of group work as part of their assessment, as the use of groupwork continued to cause student discontentment.

There seemed to be a belief that the adoption of a common workload framework across the whole HEP would lead to equity and transparency. But it was evident from the school workshop that workload managers find ways to allocate more resource if they deemed it necessary. Although the concept of the workload was discussed there was no consideration of whether the actual amount of hours allocated to activities was sufficient or not. The belief seemed to be that workload was never going to be agreed and that the best aim was equity, which they hoped could be achieved through the introduction of a new workload model across the entire higher education provider.

The central management team did not discuss the many other areas of activity that academics could engage in, as a member of the University Alliance, it was surprising that activities relating to employability and enterprise were not mentioned. There was also no mention made of those staff with other administrative workload allowances (i.e. those staff supporting other strategic areas in addition to programme leader team which includes admissions, collaborative activities, employability

and enterprise, and academic quality). The only other workload allocations that the central management team mentioned was in a general comment that the staff that were not research active could focus on learning and teaching instead.

The timetable constraints allow for all staff to have at least one day free from classroom delivery to provide the space to undertake their module and general administration. However, if research was a strategic imperative, it would not be unreasonable to expect a member of staff with a minimum research allowance of 0.2 to have an additional day free of teaching. It was also surprising the way research allocation worked with professors, while it makes sense that there is an expectation that they find their own funding but how does this expectation impact on the time that they are expected to spend providing research leadership and mentoring?

The central management team gave conflicting responses when discussing the lag in recruitment, it was obvious that this was a sensitive area, although they initiated the discussion on this. Some of the members accepted there had been a lag in staff recruitment, but others said no, but maybe! Either way it was agreed that despite any potential lag in recruitment, staff had delivered because they were professionals that went above and beyond to ensure student experience and this, together with the fact that the PG students 'get the game', meant that PTES results were actually fantastic. They also suggested that international PG students' expectations may be lower than we think, with students being quite content to be mass educated in seminars of 50-60 students.

When asked the question about student targets, the facilitator believed that the central management team took this as a criticism of overselling certain PG programmes leading to a mass influx of international students. At this time the higher education provider also experienced a lag in securing sufficient resource to ensure the appropriate capacity was in place to deliver the programmes. Having said previously that salary did not affect academic staff recruitment, members of the central management team now suggested that the salary offered had maybe been a factor behind the slow staff recruitment experienced during the fast growth in PG numbers.

The facilitator was interested to hear that there was some market rate analysis, and possibly some benchmarking, of salaries but that this tended to occur for the administrative positions and not in subject areas that found it harder to recruit due to the fact that those academic staff qualified in more vocational fields (typically accounting and computer science) could command higher salaries in industry. The central management team did not see this as an issue and reasoned that the type of people that choose to work in academia were less financially motivated.

The narrative adopted by the central management team was one of buoyancy, where they felt that students saw us as a successful international student institution which possessed the air of 'you are in a successful place' and thus confirmed to the students that they had made the right choice in attending our institution. Those staff engaged with supporting international PG students had worked hard and there was an energy and sense of success.

They agreed that the next area that needed improving was that of UG student enrolment. The central management team said that they felt that those staff engaged with UG were experiencing an issue with their morale and that it was showing up in the NSS as students were questioning if this was the place to come to study at. The central management team said that the real value of them as a management team and the job of the school management team was to build morale and self-belief.

The last observation is that it was evident that participants tended to focus on their own areas of responsibility even at this level. VP5 did not contribute as they were on teams and not in the room and thus was unable to view the school causal loop diagram which was presented as a hard version.

7.7 Chapter conclusion

The school CLD clearly shows the size and complexity of the school's operations, there is a large amount of activity and decision-making that needs to occur to produce the necessary outputs. Both the school management team and the central management team agreed to the workshops which implies that the management are interested in this research. The members of the school management team workshop were generally very engaged, sharing their experiences and frustrations with the current system. The central management team were also engaged but their contributions were more one sided. The next chapter will present a discussion of the findings which will include a discussion about these workshops with regards to the participant learning achieved.

Chapter 8 Discussion of findings

8.1 Introduction

This chapter will discuss the research findings in relation to the underpinning literature and the conceptual framework. The aim of the research is to produce a performance measurement system that can support the decision-making activity to successfully achieve the desired performance outcomes. To achieve this aim the following research questions were developed:

RQ1: What are the KPIs that translate the strategy of the HEP into performance indicators to measure attainment and act as proxies for the desired performance to be achieved in the PEFs?

RQ2: How can an HEP be represented as a dynamically complex system? How is this complexity captured in the system's causality map of the HEP?

RQ3: How can the system dynamics methodology be employed to create an environment to facilitate learning?

RQ4: Can a framework, that demonstrates the interdependencies between the KPIs and shows how the underlying perspectives that create performance are interlinked, be created to support decision-making?

The research questions are concerned with the processes adopted and the outcomes attained. The processes adopted refer to the application of the system dynamics methodology to create an environment to facilitate learning. The outcomes referred to are a causality map that provides a representation of the HEP as a complex system, as well as a framework that supports decision-making and includes the policy levers necessary to achieve the outcomes and the KPIs that measure these outcomes and can be used as proxies for the PEFs

This chapter has three sections, each will consider the literature, the conceptual framework and the corresponding research question(s). The first section will discuss the participants' awareness of the concept of the HEP as a dynamically complex system and the implications of this. The second section will reflect on the causality map produced. The third section will review the impact of the application of the system dynamics methodology to create an environment to facilitate learning as a result of participating in the research. This is a case study of a school within an HEP, and it is the school that is the HEP that is referred to throughout this chapter.

8.2 Did the participants appreciate that the higher education provider is a dynamically complex system, and did they understand the impact of this on their decision-making?

8.2.1 Section introduction

This section will address the first part of RQ2 by reviewing the participants' responses to determine how well they evidenced their appreciation of the HEP as a dynamically complex system. Additionally, if they were able to evidence an appreciation of the HEP as a dynamically complex system, did they also understand the impact that this had on their decision-making. In chapter 4 it

was proposed that the higher education provider is a dynamically complex system and that any decisions made are likely to be policy resistant and lead to counter-intuitive results. The proposition that the higher education provider is a dynamically complex system is due to the presence of many interconnected components, multiple feedback loops, non-linear causality relationships and major time delays (Ghaffarzadegan et al., 2017; McGee and Edson, 2014; Sterman, 2000).

8.2.2 Participant appreciation of the characteristics of the higher education provider as a dynamically complex system

The presence of many interconnected components and multiple feedback loops is the first feature of a dynamically complex system to be considered. During the interviews in the data collection phase many variables and cause-and-effect relationships were mentioned. Many examples of feedback were also provided and therefore it was evident that participants had experienced the presence of feedback. However, during the interviews, only one participant demonstrated that they appreciated that the phenomena that they were experiencing was due to the presence of feedback. This is possibly because of the nature of the example provided (the relationship between class size, student community and the impact on the NSS/PTES and therefore future enrolment) and their role (senior manager with a focus on student experience).

The second feature of a dynamically complex system is the presence of non-linear relationships and during the interviews two examples were proposed. The first example provided was noted by two participants who both said that the amount of student support required was non-linear as a minority of students took up the majority of the time. The second example of a non-linear relationship was suggested by four participants who all related the amount of time it took to prepare a teaching session as being dependent upon the amount of experience a member of staff possessed, with those staff with more experience taking considerably less time to prepare a teaching session. There were surprisingly few examples provided of the non-linear relationships present given their inherent nature in higher education (Oyo et al., 2008).

The last feature of a dynamically complex system is the presence of time delays. Unlike the first two characteristics, many more participants provided examples of time delays, specifically those relating to delays in investment in research, staff recruitment and information delays in performance outcomes (Oyo et al., 2008; Zaini et al., 2017). The reason that this characteristic was more easily identified is likely to be because of the direct impact it has on a participant's ability to undertake their work.

Most of the participants acknowledged the existence of these characteristics and many provided examples, but few appreciated that their existence was due to the complexity present in the HEP. Those closest to the delivery of the outputs were more likely to understand why they were experiencing the feedback, non-linearity and time delays. This is probably because the presence of these characteristics impacted those participants more in their day-to-day operations than those in more senior positions. The more senior staff, those on the school and central management teams with responsible for determining the vision and the strategy, did not provide any examples of the characteristics of complexity.

In addition to the range of examples provided, it was the ability to be able to demonstrate how the complexity was captured in a series of causal loop diagrams that can be considered to be the most

important evidence that the HEP is a dynamically complex system. Interestingly, the researcher was unable to identify any prior research that considered the participants' ability to provide examples of the characteristics present in a dynamically complex system or understand the impact that these had on any decision-making.

8.2.3 Participant appreciation of the impact of the presence of dynamic complexity on the higher education provider

The dynamic complexity in the system, as evidenced by the presence of feedback loops, non-linear relationships, and time delays, leads to bounded rationality which results in decisions and policies being made that are likely to be policy resistance and lead to unintended consequences (Ghaffarzadegan et al., 2017; Kennedy, 1998a; Morecroft, 2015).

One of the consequences of bounded rationality is the adoption of short-term thinking which was mentioned by several participants together with a lack of forward planning, this was specifically discussed in relation to research activity. One participant said that the school had a short-term research policy that focuses on the next REF only and not on building research capacity, another participant suggested that the school needed long-term investment if it wanted to be successful in the REF.

This short-term thinking did not only occur in regard to the decisions made about research, one participant said that while a drop in tariff would enable the HEP to meet their student enrolment targets this was a short-term approach because of the long-term impact this policy would have on the HEP's reputation. Another example of short-termism was provided by a participant who suggested that the use of visiting lecturers to buffer gaps in permanent staff recruitment would lead to an erosion of core permanent staff. The reason for these decisions was proposed by one participant as being due to the fact that the HEP had a core objective of financial sustainability which led to a failure to reinvest to build staff capacity.

Another issue that was mentioned by multiple participants related to the presence of the silos in the school, one participant said that decisions in the school were made in silos and suggested that while there were many decisions relating to teaching there was no thought about research. Another participant agreed and said that the school only focused on the NSS/ PTES and TEF and not the REF. One participant also noted the silos that existed between teaching active and research active staff.

It was suggested by two participants that the school operated as a silo within the wider HEP, such that there was a complete mismatch because the overarching HEP strategy was decoupled from the operations occurring. Kim and Rehg (2018) also had participants in their study who commented on the silo structure that was present in their HEP.

These examples of short-term thinking and the presence of silos provided by the participants demonstrated that the interviews presented an opportunity for the participants to explore and share their thoughts about the complexity present and the impact of this complexity. From these examples it is possible to see that some participants were aware of the dynamic complexity present and the issues that arose from this.

With regard to policy resistant decisions, one participant in the school workshop provided an example when they suggested that the workload managers could find work arounds to allocate more resource than the amount proposed by the workload model, if it was required.

Examples of the unintended consequences were also provided by participants in the interviews, the first was mentioned by four participants who all noted that the impact of changing classroom delivery from on campus to online as a means to reduce resource requirements, had actually resulted in increased non-attendance which meant that more resource was required to support those students in their assessment.

Another participant noted that in an attempt to manage the unexpected growth in the postgraduate cohort, larger class sizes were introduced, however this had led to less engagement which resulted in more incidents of academic misconduct which increased resource requirements in another area. Thus, while larger enrolment brings more income the associated costs can increase disproportionately as more resource is required to manage academic misconduct and provide additional support. Kennedy (1998a) also noted that as class size increased, student performance decreased.

A similar unintended consequence was experienced when the student tariff was reduced, while student and thus income targets are met, staff needed more time to support those students which will lead to either increased cost or higher levels of staff fatigue and burnout.

This section has explored how the HEP can be represented and understood to be a dynamic complex system. The section has also considered the characteristics of a dynamically complex system and the impacts of this and provided evidence as to how this was experienced by the participants. The next section will review how this complexity was captured in a system's causality map of the higher education provider.

8.3 Capturing the complexity of the higher education provider in a causality map

The section will consider how well the complexity identified above was captured in a causal loop diagram of the HEP's decision-making activities that led to the outputs produced. This will be achieved by comparing the variables and relationships in the HEP causal loop diagram to those proposed in the literature as well as in the conceptual framework.

The aim of the causal loop diagram, or causality map, produced was to represent the complexity present in the HEP such that it could be used to support decision-making as it provided a visualisation of the variables, policy levers and the resulting KPIs that impact PEF performance. Kim and Rehg (2018) proposed that the use of maps, such as this, provided an organised way to visualise and understand the complexity present in the system. The prior research that is most aligned to the aims of this research was produced by Kennedy (1998a) whose model was concerned with managing quality, and Merkulov et al (2015) whose model also considered the impacts on ranking but with a focus on postgraduate education (see Appendix 53 for a comparison of the causal loop diagram produced to existing literature).

The main components in the causal loop diagram produced are teaching and learning, student engagement, programme leader team, employability, research, staff, and finance. Kennedy (1998a)

proposed a model with similar components, namely student performance, quality of administration, engagement, budget, research, staff, and funding. The model proposed by Oyo et al (2008) also included similar components which were quality of teaching, perceived quality of students, qualitative research, staff, and funding.

This section has considered the main components of the HEP causal loop diagram. The causal loop diagram includes the levers and the KPIs that both underpin and track the desired performance to be achieved in the PEFs. The next section will consider the levers and the KPIs that specifically lead to PEF success.

8.3.1 The levers and key performance indicators that drive and monitor PEF attainment

To achieve success in the NSS/PTES, the main policy levers are the amount of workload allocated to staff, the staff to student ratio (this was also observed by Merkulov et al., 2015), the amount of administrative support allocated to this area, and the amount of cohort activities. One of the relationships in this component considered the impact of student enrolment on the quality of classroom activity, which was also observed by Oyo et al. (2008) and Zaini et al. (2017).

The KPIs that act as a proxy for the NSS/PTES scores are quality of assessment and feedback processes, module rating, student satisfaction and sense of community. This research proposed that student satisfaction is impacted by the programme leader team. This is in opposition to the relationship proposed by Ismail et al. (2017) who said that student satisfaction is impacted by quality of teaching, quality of learning, percentage of trained students, and cost per student. The quality of teaching might appear to be a more appropriate variable that impacts student experience but as the context of this research takes place in the UK, where HEPs have become increasingly focused on the PEFs, including the NSS/PTES, the role of the programme leader has become central to student satisfaction.

To achieve success in the Graduate Outcomes Survey the main policy levers are the amount of administrative support allocated to this area, the amount of workload allocated to staff in this area of delivery, the level of employability in the curriculum, the amount of study support available, and the delivery plan adopted. The main KPI that acts as a proxy for the GOS tracks the level of graduate employability which is measured by the number of students employed in a graduate position and the amount of students on placement.

Finally, to achieve success in the REF the first policy lever is the amount of research capacity (which is impacted by the amount of research capacity bought in, the amount of research fellows, and the amount of workload allocated to research allowance). The amount of research allocation or faculty resource was also observed as a policy lever in research attainment by Kennedy (1998a), Oyo et al. (2008) and Merkulov et al. (2015).

The other policy levers are the number of early careers researchers, readers and professors recruited, opportunities for promotion and growth, the amount of doctoral fees, and the amount of doctoral scholarships offered. The KPIs that act as a proxy for the REF are research success, the quality of the research environment, and amount of doctoral student completions and publications.

8.3.2 The main resources that underpin PEF attainment

The causal loop diagram also includes components for staffing and finance. These are two key areas in the production of the outputs that are measured by the KPIs and subsequently the PEFs. The key variables in the staff component relate to the amount of academic capacity required and the ability to meet this. The larger the gap between academic capacity required and academic capacity available, the higher the levels of fatigue and burnout which impact both staff retention and staff motivation. Staff retention impacts the academic capacity available, staff motivation impacts staff retention and module rating and therefore the NSS/PTES scores.

There is a reinforcing feedback loop related to staff which shows that the impact of failing to recruit sufficient academic staff increases the gap in academic capacity and levels of fatigue and burnout, this impacts staff motivation and subsequently staff retention which increases the gap in academic capacity. This loop was also included in the work produced by both Kim and Rehg (2018) and Pavlov and Katsamakas (2020).

There is also a balancing feedback loop which shows that the NSS/PTES scores impact student enrolment which impacts the academic capacity required and thus the academic capacity gap. This gap impacts the level of fatigue and burnout, which impacts staff motivation and subsequently teaching on the course, module rating and the NSS/PTES scores. Zaini et al. (2017) also observed this balancing relationship between student enrolment, faculty workload and the impact this has on student satisfaction and subsequent reputation and enrolment, as did Barlas and Diker (2000).

Oyo et al. (2008) reported that in their HEP the amount of academic capacity required is also driven by the amount of student enrolment, they warned that over enrolment would compromise teaching, tutors' evaluation of student performance and student research project supervision.

The finance component includes the variables student enrolment, income, contribution and budget. The feedback loop shows that as the league table position increases so does student enrolment and therefore income from student fees, this can be reinvested to ensure future success in the PEFs and therefore lead to the attainment of a higher position in the league table. Merkulov et al. (2015) suggested a similar loop, whereby the higher the HEP's ranking, the more likely that the HEP would be successful in general (for example receiving research projects, ensuring placements and graduate employability) all of which feed into the PEFs and would thus continue to increase the HEP's league table position.

The aim of the causality map was to present the higher education provider as a dynamically complex system and this map could then be utilised by the decision makers in the HEP. The concept being that by being able to recognise the complexity that is present and becoming aware of the impacts of this on the decisions that they made, the decision-making that is occurring would be enhanced. The next section will consider whether engagement in the production of, and exposure to, the causality map led to any learning occurring.

The impact of the interventions to improve PEF attainment will be subject to information delays, as it will not be possible to know their impact until the PEF results are released. Another major delay in the system occurs when recruiting staff. The main issue with the presence of delays is that they can lead decision makers to continue to make interventions while awaiting the results of the first set of

interventions. This process of making constant minor adjustments will make it difficult to identify which initiatives actually had an impact on PEF attainment.

8.4 The use of the system dynamics methodology to create an environment to facilitate learning

This chapter has reviewed the participants' perception of how the HEP is a dynamically complex system operating in the presence of feedback loops, non-linearity and time delays and why this dynamic complexity needs to be considered during decision-making. In chapter 3 the adoption of a system dynamics methodology to support decision-making, reduce the incidences of policy resistance and unintended consequences as well as enhance learning, was suggested. This section will consider whether the use of the system dynamics methodology created an environment to facilitate learning for those participants that engaged in the tacit knowledge elicitation interviews, validation meetings and/or the group workshops.

There were two levels of interaction undertaken with the participants, the first level of interaction was at an individual level and occurred during the data collection interviews to elicit tacit knowledge and access mental models and again during the individual validation meetings that were held to confirm the causal loop diagrams. The second level of interaction was at a group level and occurred during the workshops which were held with both the school management team and the central management team.

8.4.1 The levels of engagement experienced with the participants during the individual interactions

The first observation is that all of the participants that contributed to the tacit knowledge elicitation interviews that were undertaken to collect the necessary data, were willing to provide their time and were happy to be recorded. They all said that they thought that this was an interesting piece of research, and many seemed grateful to have a platform to express their views.

The participants at the validation meetings were also willing to provide their time and were happy to be recorded. Participants were asked to comment on the causal loop diagram that represented their area of decision-making responsibility. These meetings were generally more interactive than the data collection interviews, this may be due to the participants having more familiarity with the subject as well as the use of the causal loop diagrams, with many participants being highly engaged in their discussion. All participants were helpful and only minor suggestions were made regarding any changes that were considered necessary to improve the causal loop diagrams.

In regard to whether an environment that could facilitate learning was achieved, it was observed that three levels of participant engagement were experienced during the interviews and validation meetings. In the first level of engagement, the participants were very didactic and therefore it is likely that they did not experience any change to their mental model. These participants, although helpful with suggestions about the causal loop diagrams, were more interested in what knowledge they could impart, and presented no evidence of learning or changes to their mental model. Their contributions were very siloed to their area of decision-making and many gave the impression that while they were willing to participate, they did not actually think the research was going to be something that the school or HEP would be able to implement.

In the second level of engagement experienced, the participants displayed a medium level of engagement, these participants were more enthusiastic in their contributions and even implied that they could see the value of the research, however there was no evidence that demonstrated that a critical learning incident had occurred with these participants (Thompson et al., 2016).

In the third level of engagement that was experienced, the participants were highly engaged and also very positive about the potential of the research to foster change in the HEP. These participants actively engaged in the causal loop diagram, and it was evident that they were reflecting on their knowledge and mental model during the conversation. What is interesting is that these participants were either HR practitioners, learning and teaching experts and/or researchers in the field of system dynamics.

8.4.2 The levels of engagement experienced with the participants during the group interactions

The second level of interaction occurred at a group level during the two group workshops that were held. The purpose of each group workshop was to present the causality map (the causal loop diagram of the HEP) first to the school management team and then, to the central management team, for discussion. The workshops aimed to achieve two things, the first aim was to foster participant learning and the second aim was to gain acceptance of the causality map.

Firstly, the workshop aimed to provide the participants with an opportunity to interact with the map to be able to formulate their views about their knowledge and understanding of the system (Lane in Morecroft and Sterman, 1994). This process was adopted such that the individual would experience learning and thus mental model refinement could occur at both the individual and group level (Andersen et al., 1997).

This would lead to the second aim such that engagement in the workshop and exposure to the causality map would enhance the credibility of the research produced (Qudrat-Ullah and Seong, 2010). This was desirable to increase the chances of implementation of the research to achieve a change to the system (Andersen et al., 1997; Vennix, 1999). The ambition being that this would promote model ownership and that the school management team would utilise the causality map in future strategic planning activities (Zaini et al., 2017).

The causality map was used as a socially constructed artefact to help the school and central management teams understand the complexity present in the system in which the decision-making that drives performance is being undertaken (Zagonel 2002). If participants could interact with the map and develop an appreciation of the scope of the system and begin to understand the complexity, then it would have succeeded as a mechanism to support decision-making and should help participants overcome any cognitive limitations (Barlas, 2007; Dangerfield, 1999; Oliva, 2003).

In the first group workshop held with the school management team, the amount that each participant engaged in the causality map varied. Two participants spoke about their area but did not engage with the causal loop diagram much, three were engaged in the discussion more generally but did not refer to the map. However, two participants were very engaged with the map, and it was possible to witness learning occurring for these participants (Thompson et al., 2016). One participant at the group workshops actually said ‘aha’, which was good evidence of a critical learning

incident, this participant had already contributed to both rounds of interviews and the validation meeting prior to their attendance at the workshop (Thompson et al., 2016).

Rouwette et al. (2002) note that models of real life do not tend to deliver insight when they are too big to understand. The HEP causality map has a lot of content and therefore it is possible that participants at the workshops who were being exposed to this for the first time found it more difficult to engage in than those who had been part of the validation meetings. Lane (in Morecroft and Sterman, 1994) noted that ownership is fostered through early engagement and frequent exposure to the map.

To establish participant satisfaction and acceptance of the work, the facilitator asked the participants for their feedback both at the end of the workshop as well as in a follow up e-mail to which all participants responded (Scott, 2014). Participants said that the session had been 'impressive', 'interesting', 'very insightful' and 'informative'. This was surprisingly positive compared to the varying levels of engagement experienced during the workshop and suggests that the participants needed an opportunity to reflect upon the map.

The second workshop was held with the central management team, similar to the experience of the school management team workshop, the amount that each participant engaged in the causality map varied. Some participants spoke very generally in answer to the questions but did not engage with the map at all, others showed some interest in the map as well as being very helpful in their answers. Zaini et al. (2017) also noticed a variation in the level of participant involvement in their research project, they attributed this to the participants' exposure to system dynamics and their experience.

One participant, though, was highly engaged and said that it was good to see the programme leader team so pivotal to the NSS/PTES scores that were attained and agreed that student voice and community were key to influencing the NSS/PTES scores. The participant followed up the session by inviting some of her colleagues to liaise with the researcher to discuss the research findings further and present them to the wider staff body.

The workshop had been allocated a 1-hour time slot originally but at the start of the session the facilitator was informed that the slot had been reduced to 30 minutes. In the end the session actually ran for 45 minutes and when asked for feedback, one participant fed back that the central management team had enjoyed the session.

There were very few changes to the causal loop diagrams suggested during the validation meetings. This implies that the data collection exercise was successful, the data analysis was robust, and that the causal loop diagrams that were created represented a good understanding of the feedback present in the system. Despite being confident that the data was both captured and analysed appropriately, this map was a representation of the participants who engaged in that stage of the research. Although most of the members of the school management team workshop (5/7) had engaged in the data collection stage, none of the CMT workshop participants had. Therefore it is possible that the workshop participants were unable to view this map as being representative of their mental models (Lane in Morecroft and Sterman, 1994).

8.4.3 The likelihood of implementation

When asked whether they had adapted, or would consider adapting, their decision-making processes after seeing the causality map, the responses ranged from one participant saying a categorical 'no' (because they felt that they already considered the big picture in their decision-making) through to another participant being a definite 'yes' (they were very engaged with the methodology and had taken a copy of the component of the causality map most aligned to their area of decision-making to use in their team planning meetings).

The person who had said no to adapting their decision-making processes, based on their exposure to the causality map, was the most senior manager present at the workshop. Lane and Rouwette (2023) suggested that sometimes resistance to a model is because the participant considers their managerial intuition to already be sufficient.

The other participants said that they thought that having attended the session that their decision-making would improve because the causality map had demonstrated to them the need to consider the impact of the decisions that they made. When asked to elaborate, one participant said that they would think about the impact of the workload on delivering the school's objectives and another suggested that they would be more mindful of the impact of their decision-making.

During the session participants had suggested how the causality map could be best used in future school management team meetings. This included the use of the map as a framework for discussions about any decisions to be made, they said that having this picture of the interactions between the school's activities was helpful in enabling them to see the impact of their decisions on the performance metrics. It was also suggested that because the causality map demonstrated the areas impacted by the decisions and policies, it could therefore highlight any potential risks in PEF performance.

One participant suggested that using the causality map as a framework for discussions about decision-making could be extremely helpful in reducing the silos of thinking. It was proposed that the key portfolios owners (those persons most responsible for the decision-making in each area of the causal loop diagram) needed to be less siloed and to work horizontally across the school/HEP rather than vertically in their own domains. Zaini et al. (2017) suggested the utilisation of models such as this as a vehicle for communication about delicate issues that required effective collaboration.

One participant suggested that there was not enough reporting and analysis undertaken at a school level regarding the allocation of resources and the impact of those allocation decisions on outcomes, and that it was thus a 'best practice' game. The HEP causality map could be used to help prioritise the resources and capabilities the school has to be able to align them to whichever PEF the school chose to prioritise. It was proposed that other sessions, similar to this, might be useful to build into the calendar of management activities as a 'check in' to track how the school management team's decision-making impacted the attainment of the school's objectives.

From the feedback received at the workshop and the follow up emails, it can be concluded that some of the participants' mental models appeared to have changed. However when it comes to change of practice, the participants fall into three groups: those who would like to change their personal

practice, those who would like to see the school management team work differently and those who will not do anything differently!

Other reasons for a lack of adoption of the causality map and acceptance of its potential to enhance their decision-making, is a lack of ownership (which is likely if participants had not been engaged throughout the process of creating the map), rejection of the researcher as an expert (again this is feasible as this is doctoral research and not a commissioned project), or reluctance to accept the methodology or that the output actually could address the problem (one participant did actually question the presumed causality) (Lane in Morecroft and Sterman, 1994).

The BSC literature suggests that non adoption of such a PMS may be due to a lack of knowledge or awareness or a resistance to adopting business practices (Beard, 2009; Taylor and Baines, 2012). It was also noted that the application of the BSC requires a long-term commitment and a change to the HEP's culture (Papenhausen and Einstein, 2006; Taylor and Baines, 2012). In the HEP there is a lack of performance measurement, it is not part of the culture and that is evidenced by the responses above.

8.5 Reflecting on the conceptual framework

The conceptual framework, shown in figure 8 in chapter 4, proposes that operating in a dynamically complex system leads to the adoption of bounded rationality. When decision makers adopt this bounded rationality, they are relying on simplistic mental models which leads to ineffective decision-making. This research has evidenced that the higher education provider is a dynamically complex system however it has not been able to evidence that the decision-making that is taking place is ineffective.

The school management team responded well to the causality map, but the team would have benefited from more time spent discussing and reflecting upon the map. It is possible that if they had better understood the process before the workshops were arranged, that they might have allocated more time to the exercise. Had they allocated sufficient time to run 2 or 3 workshops, the potential for learning and implementation would have undoubtedly been enhanced.

The response of the central management team to the causality map as a vehicle for change, was less positive which could be due to a lack of familiarity with the map. One of the deliverables that is achieved when adopting a system dynamics methodology is learning through engaging in the process, if all members of that team had been able to engage in multiple interventions this may have increased their confidence and understanding of the map (Lane in Morecroft and Sterman, 1994).

Sterman (2000) says that the existence of the causality map that represented the virtual world is not sufficient on its own to overcome any flaws in mental models and group processes, and it is only effective if people engage in reflective thinking. The amount of time in the group workshops was quite limited (particularly with the central management team)and therefore there may have not been sufficient time to allow for reflection. If there had been a series of workshops some reflection time could have been included and thus it might have been possible to assess the individual and group learning that had occurred.

8.6 Chapter conclusion

This chapter has discussed how the research produced compared to the prior literature and the conceptual framework. The chapter was divided into 4 sections with each section addressing a key area that aligned to the research questions.

The first section in the chapter addressed RQ2 by evaluating the evidence from the interviews, the validation meetings and the workshops to ascertain whether the participants had appreciated that the higher education provider could be considered to be a dynamically complex system and the impact of this. The section showed that the higher education provider was a dynamically complex system but the participants, although able to provide examples of the characteristics, had not been aware of this fact. The participants were also not explicitly aware of the impact of the presence of dynamic complexity on the higher education provider.

The second section in the chapter addressed RQ1 and RQ2 by reviewing the causal loop diagram that had been created to capture and demonstrate the complexity present in this dynamically complex system. A review of the causal loop diagram identified the main KPIs, levers and variables that led to PEF attainment. It was shown that there was some affinity with prior research, where there were differences, this was due to the models having different aims, context and/or levels of aggregation. While the prior models also focused on KPIs, they all identified funding as the main lever, this research has attempted to break this variable down into the specific areas that need investment, i.e. where the funding would be best deployed to enhance PEF attainment.

The third section in the chapter considered RQ3 by undertaking an evaluation of the learning that had occurred for the participants due to their engagement in the system dynamics methodology, as well as the chance of implementation. The evidence from the workshop suggested that learning and adoption of the model is more probable if the participants are engaged in multiple interactions throughout the process.

The aim of each workshop was to influence the thinking, and thus as a consequence, the actions of the school and the central management teams and to move the participants from silo thinking and reductionism to the adoption of a holistic view of the HEP in future decision-making. The workshops were seeking to achieve an alignment of the group participants' mental models and a consensus as to the content and use of the HEP causality map, but it was not evident that this did occur (Andersen et al., 1997).

The last section of the chapter considered how the process of the research aligned to that suggested in the conceptual framework. It was proposed that while most of the conceptual framework held true, the element that advocated the use of group model building techniques to produce the causality map, should also include an alternative option. This would be necessary if, like in this research, access to the necessary participants as a group proved difficult and it became necessary to produce the causality map in advance of any group interactions.

This chapter has discussed the research questions, while also considering the prior research that has been undertaken as well as reviewing the conceptual framework. From this discussion it is clear that the process adopted to enable the creation of a causality map for the higher education provider has addressed the research questions, in the main. However, RQ4 asks whether a framework can be produced to support decision-making? The findings from this discussion would suggest that the

current output, the causality map, is too complex for the decision makers to utilise for this purpose. Instead it is proposed that the causality map is adapted and condensed to enable the production of a strategy map specifically to support this activity and this will be presented in the next chapter.

Chapter 9 Creation of a framework to support decision-making

The chapter above has shown that the higher education provider is a dynamically complex system where the outcomes of the decisions that are made often produce ineffective results or unanticipated consequences (Barnabè, 2004). This research thus proposes the application of the system dynamics methodology, in combination with the balanced scorecard approach, to underpin the creation of a performance measurement system that could be used to support and enhance decision-making.

9.1 Chapter introduction

This chapter will discuss how a strategy map to support the school and central management teams' decision-making process can be developed, it will go on to critique this strategy map against the conceptual strategy map that was proposed in chapter 4. It will therefore address the following research questions:

RQ1: What are the KPIs that translate the strategy of the higher education provider into performance indicators to measure attainment and act as proxies for the desired performance to be achieved in the PEFs?

RQ4: Can a framework, that demonstrates the interdependencies between the KPIs and shows how the underlying perspectives that create performance are interlinked, be created to support decision-making?

9.2 Creating a strategy map

In chapter 2 it was shown that decision-making is difficult unless there is a clearly articulated strategy accompanied by a performance measurement system. In the higher education provider a performance measurement system would be used to track and monitor the impact of the decisions made on PEF attainment using the KPIs. In chapter 4 it was also proposed that the balanced scorecard was an appropriate framework that could be used as the foundation to create a performance measurement system to be implemented in the higher education provider.

In chapter 3 it was shown that it was difficult to ensure that the decisions made were necessarily the best ones, given the presence of dynamic complexity. Chapter 4 went on to suggest that the system dynamics methodology should be integrated with the balanced scorecard methodology to enable the production of a strategy map that could be used to support management decision-making (Barnabè, 2011).

The research has adopted a robust process that culminated in the production of a causal loop diagram of the higher education provider which was presented at the school and central management team workshops. This causal loop diagram is extremely informative, but it is also very detailed and as such is not an appropriate instrument to be used as a framework for a performance measurement system. A successful performance measurement system would need to incorporate the different strands of operations strategy with two to three objectives per strand, together with the relevant associated KPIs.

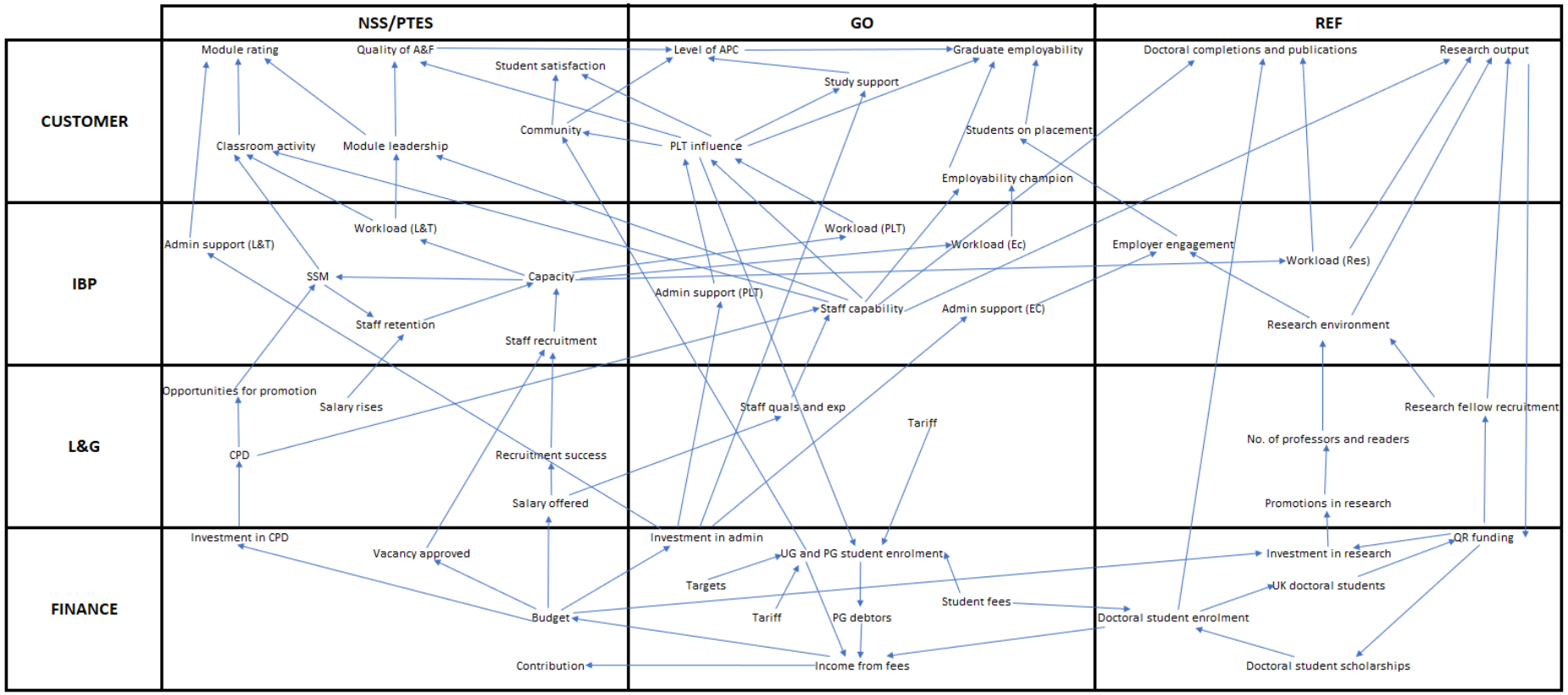
The causal loop diagram includes the decision-making activity that is necessary to succeed in the PEFs, and it also includes the KPIs that can be adopted to monitor and track performance towards PEF attainment. The HEP causal loop diagram will thus be used as the foundation for the creation of a strategy map that will be used as the framework for a performance measurement system that clarifies the HEP's objectives and shows the policies and the KPIs that need to be in place to achieve and track these objectives.

9.2.1 Process adopted to create the strategy map

The strategy map was based on the proposed conceptual strategy map shown in Figure 6 in chapter 4. The conceptual strategy map provided the overall structure such that the PEFs are listed along the top of the matrix and the perspectives down the side. In the intersection of each PEF and perspective, the KPIs were included, these were taken from the HEP causal loop diagram (see Appendix 54 for a list of the strategy map components). The underlying policy levers that drive the output were also taken from the causal loop diagram and added to the strategy map, lastly arrows indicating the direction of impact between each of the variables were added.

The resulting strategy map is shown in Figure 16 below.

Figure 16: Strategy map



9.2.2 Comparison of the proposed conceptual strategy map with the strategy map produced – within the perspectives

This section will compare the conceptual strategy map (shown in Figure 6) to the strategy map produced above (Figure 16) and comment on the similarities and differences (see Appendix 55 for a list of the KPIs included in each of the strategy maps). In the strategy map there are 12 components, each one represents the intersection between a perspective and a PEF and shows the KPIs and their drivers.

The perspectives that were included in the strategy map were suggested by the literature as being financial, customer/stakeholder, internal business processes and innovation, and learning and growth (Al-Zwyalif, 2012; Baporika, 2015; Voelpel et al., 2006). The research undertaken concurs with these findings. The BSC literature also states that the inclusion of the stakeholder expectations is paramount (Cullen et al., 2003; Sayed, 2012). Again the research undertaken concurs with this and includes KPIs that relate to both staff and students.

The BSC literature stresses the importance of the KPIs having a focus on the HEP's long-term strategy, simple yet meaningful, focused on outcomes and, ideally, a maximum of 30 (Bailey et al., 1999, Brown, 2012, Eftimov et al., 2016; Papenhausen and Einstein, 2006). However the strategy map has 54, which is the minimum amount that could reasonably be incorporated to ensure the PEF attainment.

The following sections will review each perspective in turn.

9.2.2.1 The customer perspective

Within the customer perspective, the conceptual strategy map proposed that teaching quality impacts student satisfaction, in the strategy map classroom activity (which is the variable that was suggested in the interviews and represents one element of teaching quality) is shown to impact the module rating and it is this KPI that impacts the NSS/PTES scores and not student satisfaction. The conceptual strategy map also proposed that the number of students employed impacts student satisfaction, this relationship was not suggested during the interviews and thus has not been replicated in the strategy map.

The conceptual strategy map also proposed that teaching quality impacts the percentage of students employed, in the strategy map a new variable, the quality of assessment and feedback (another element of the original variable teaching quality which arose during the interviews) impacts the level of attainment, progression and continuation and subsequently graduate employability.

The last variable to impact the percentage of students employed is student tariff, during the data collection this was mentioned, but the consensus was that it was the responsibility of the higher education provider to ensure that the design of the delivery and support provided considered this. Thus, although student tariff is an important variable, it was not considered to be one of the variables that impacts the percentage of students employed. The student tariff also impacts student enrolment in the conceptual strategy map, and this relationship is replicated in the strategy map, however it is now in the finance perspective.

Lastly, within the customer perspective in the conceptual strategy map it is proposed that teaching quality is impacted by research output, there is no relationship between research and classroom activity included in the strategy map. This is representative of the recurring theme during the interviews of the (perceived) disconnect between research and teaching within the higher education provider.

9.2.2.2 The internal business processes perspective

In the conceptual strategy map, the internal business processes perspective includes the variable staff recruitment which impacts staff satisfaction and motivation. In the strategy map, a similar relationship is included whereby staff recruitment impacts capacity, but it is capacity that impacts staff satisfaction and motivation (by reducing burden). The conceptual strategy map also proposed that staff satisfaction and motivation impacts the research environment, but this relationship was not suggested in the interviews. The conceptual strategy map showed academic/student support as impacting staff satisfaction and motivation but again this is not in the strategy map, instead in the strategy map it is admin support that impacts student delivery (via module rating, programme leader team influence and employer engagement) and is not related to staff satisfaction.

The internal business processes perspective in the strategy map contains more variables than the internal business processes perspective in the conceptual strategy map. These additional variables relate to staff capacity, capability, retention, and workload and the reason for this is likely to be because the majority of staff that were interviewed are all student facing and/or research active and during the interviews many shared their thoughts about the pressure and burden that they were experiencing.

9.2.2.3 The learning and growth perspective

The next perspective, learning and growth, shows staff development and training as impacting learning and teaching initiatives. There are no variables relating to learning and teaching initiatives in the strategy map, any data that was provided that related to this were collated into a variable that was named continuing professional development, and this incorporated all staff development and training.

9.2.2.4 The finance perspective

The last perspective, the finance perspective shows that revenue impacts investment in staff, this has been expanded in the strategy map such that budget (not revenue) impacts vacancy approved, salary rises, and salary offered. In the conceptual strategy map revenue is also shown to impact investment in research, in the strategy map this has been represented as budget impacting investment in research. And finally, in the conceptual strategy map research funding impacts investment in research which in the strategy map is represented as QR funding impacting investment in research.

9.2.3 Comparison of the proposed conceptual strategy map and the strategy map produced – across the perspectives

Having compared and considered the variables that represent the KPIs and drivers within each perspective, the relationships between the variables across the perspectives will now be reviewed.

At the bottom of the conceptual strategy map, the variable investment in staff, in the financial perspective, impacts the staff development and training variable in the learning and growth perspective. This relationship is replicated in the strategy map however investment in staff has been renamed investment in continuing professional development (changed from staff development and training as this was the term used by the participants).

The variable investment in staff also impacts staff recruitment and academic/student support in the internal business processes perspective. Again these relationships are replicated in the strategy map however additional variables have been added as investment in staff has been expanded to include vacancy approved and it is this variable that impacts staff recruitment. Investment in admin impacts the administrative support provided in three areas, learning and teaching, programme leader team, and employability, as well as the amount of study support provided.

The final variable in the financial perspective that impacts a variable in another perspective is investment in research which impacts the research environment in the internal business processes perspective. In the strategy map this has been expanded so now investment in research impacts promotions in research and thus the number of professors and readers and this impacts the research environment.

The next perspective to review is learning and growth, in the conceptual strategy map the variable staff development and training in this perspective impacts the variable staff satisfaction and motivation in the internal business processes perspective. In the strategy map staff development and training (now named continuing professional development) impacts opportunities for promotion and therefore staff satisfaction and motivation. The other learning and growth perspective variable that impacts a variable in another perspective is the relationship between learning and teaching initiatives and teaching quality in the customer perspective. This is not present on the strategy map, during the interviews the only variables that were suggested as impacting classroom activity were staff satisfaction and motivation, workload and staff capability.

The conceptual strategy map proposed four relationships between variables in the internal business processes perspective and those in the customer perspective. The first is the relationship between staff recruitment and teaching quality and in the strategy map this is represented as the relationship between staff capability (which is partly impacted by staff recruitment) and classroom activity. The second relationship is between staff satisfaction and motivation and teaching quality, in the strategy map this is represented as the relationship between staff satisfaction and motivation and classroom activity. The third relationship is that between research environment and research output which is directly replicated in the strategy map. The final relationship is between academic/student support and student satisfaction, in the strategy map this has been adapted so that it is now the administrative support that impacts the programme leader team influence which subsequently impacts student satisfaction.

The final set of relationships between perspectives are between variables in the customer perspective and the internal business processes and finance perspectives. In the customer perspective, student satisfaction impacts staff satisfaction in the internal business processes perspective, this was not included in the strategy map as it was not mentioned in the interviews. The other two relationships are between the customer perspective and the finance perspective, the first is that student enrolment impacts revenue, in the strategy map this is represented as UG, PG and doctoral student enrolment impacting income from fees. The last relationship proposed in the

conceptual strategy map is between research output and research funding and in the strategy map this is represented as research output impacting QR funding.

The conceptual strategy map (shown in Figure 6) is much simpler with less KPIs than the final strategy map, the key differences between the strategy map and the conceptual strategy map are due to the fact that the data gathered during the interviews is richer than the descriptions provided by the literature used to create the conceptual strategy map.

9.3 Adoption of the strategy map

The purpose of the strategy map is to guide the school and central management teams' decision-making but in order for this to be effective there needs to be an agreed strategy in place. This strategy should be top level for example for the HEP to be in the top quartile for NSS/PTES scores performance, this strategy can then be articulated into the key KPIs and the drivers for those KPIs will become the focus of the management team decision-making activity.

The strategy map shows that to succeed in the NSS/PTES it is necessary to achieve on module rating, quality of assessment and feedback and student satisfaction. The drivers for module rating are admin support, classroom activity and module leadership and the strategy map also shows the decisions that need to be made to achieve in those areas, which are investment in admin, staff satisfaction and motivation, workload and staff capability. The drivers for quality of assessment and feedback are module leadership and programme leader team influence, and the map again shows the decisions that need to be made to achieve in those areas those being admin support, workload and staff capability. The drivers for student satisfaction are community and programme leader team influence, and the map shows the decisions that need to be made to achieve in those areas are student enrolment, admin support, workload and staff capability.

The strategy map next shows that to achieve in the Graduate Outcomes Survey it is necessary to achieve in level of attainment, progression and continuation and graduate employability. The drivers for the level of attainment, progression and continuation are community and study support and the map shows the decisions necessary to achieve in those areas are student enrolment, admin support, workload, staff capability and investment in admin. The drivers for graduate employability are programme leader team influence, employability champion and students on placement and the decisions that need to be made to achieve in those areas are admin support, workload, staff capability and employer engagement.

The last PEF is the REF, and the strategy map shows that to achieve in this it is necessary to produce doctoral completions and publications and research output. The drivers for doctoral completions and publications are staff capability, doctoral student enrolment and workload and the map shows the decisions necessary to achieve in those areas are doctoral student scholarships and capacity. The drivers for research output are staff capability, workload, research environment and research fellow recruitment and the decisions that need to be made to achieve in those areas are continuing professional development, staff qualifications and experience, capacity, number of professors and readers and QR funding.

This strategy map forms the key component of a performance measurement system as it identifies the key decisions and policy levers necessary to attain success in the PEFS as well as the KPIs that measure the output from the decisions that are made. These KPIs can thus be used to track and

monitor performance and make any necessary adjustments. This can be used in all of the schools across the higher education provider to improve practice and also by the central management team when they are determining future strategy.

9.4 Chapter conclusion

This chapter has considered the production and adoption of a strategy map to guide and support the management teams in their decision-making. The strategy map displays the KPIs and the underlying policy levers that drive PEF attainment and thus are pertinent to the decision-making activity. The chapter proposed the strategy map and discussed and compared it to the original conceptual strategy map, concluding that the final strategy map was more detailed and capable of being utilised in management team meetings to guide decision-making. The strategy map is a modified version of the causality map that used balanced scorecard principles as the framework, 44% of the original variables were incorporated and thus while this is a simplified version of the causality map, the strategy map maintains a good level of detail. The next chapter presented is the final conclusion.

Chapter 10 Conclusion

10.1 Chapter introduction

This chapter will discuss the significance of this research before presenting a summary of the research findings and how they address the research questions. The chapter will continue by stating the contributions to both theory and practice. Finally, the chapter will discuss the limitations of this research, present the recommendations, and discuss opportunities for further research.

10.2 Significance of the research

This section will consider why this research topic is important.

10.2.1 Crisis in Higher Education

Nearly 25 years ago Barlas and Diker (2000) reported on the long-term dynamic and persistent problems in higher education which they said were: an unbalanced growth in the student body, infrastructures that failed to keep pace with the growth in enrolment, increased staff-student ratios, concerns about the quality of instruction, heavy competition for limited funding available for research and heavy competition for limited student demand. Over twenty years later higher education providers find themselves faced with the same issues, but now with declining student numbers and more pressure on students to access alternative forms of education such as further education and apprenticeships.

Successive governments have introduced more performance measures, many of which are proxies for existing measures (for example the TEF and B conditions) all of which require the higher education provider to measure and report on certain KPIs. In addition to this, the student fees for home UG students has been fixed since 2017, the demand for traditional higher education is in decline and the competition for providers has increased, all of which has led to a need for higher education providers to ensure that the processes adopted, and the allocation of their resources are efficient and effective.

In this pressured environment, to ensure that operations are efficient and effective, some form of performance measurement is required. Understanding the drivers behind the attainment of goals and the impact of any spending and investment made, can help higher education providers review and realign their processes and resources to ensure success and longevity. Higher education is now highly commercialised but many higher education providers continue to act as though they are part of the public sector, and this is confounded by the fact that many are registered charities. This dichotomy creates confusion in both management behaviour and staff acceptance of performance measurement.

10.2.2 The higher education provider as a dynamically complex system

In 2011 the white paper “Higher Education: Students at the Heart of the System” identified higher education as a system (Department for Business, Innovation and Skills, 2011). Not only is higher education a system, but the higher education providers within the system are themselves dynamically complex systems. This is because of the presence of interconnected components, time

delays, feedback and non-linear relationships. The presence of this dynamic complexity is such that the decision makers are reliant on simplistic mental models that are not representative or appreciative of the complexity present, this leads to policy resistance with decisions having unintended consequences. It was thus proposed that the adoption of a system dynamics methodology could support decision-making in the higher education provider by highlighting the consequences and possible impacts of any decisions made on the system.

10.2.3 Performance measurement and decision-making

In chapter 2 it was shown that the government introduced the concept of KPIs as a mechanism to determine funding and introduce some form of control over the higher education providers. This increasing performance measurement exacted by the government was part of an ongoing move towards efficiency and effectiveness. The PEFs, which feed into the league tables, impact the higher education provider's reputation and marketability as they provide the information by which stakeholders view and judge them. The information provided by the PEFs and the league tables can also be used by the higher education providers to inform their policy and decision-making, it can enable benchmarking against other higher education providers and inform their plans to ensure ongoing performance in these PEFs.

The higher education providers responded by creating corporate structures to determine the vision, strategy and goals which could be used to determine their targets including the desired level of attainment in the PEFs. The higher education provider's goals should be informed by the PEFs, their governors and other external influences (for example initiatives such as widening participation). Once the goals are determined, the strategy can be defined, and this will then influence the school level plans which should inform where investment and spending occur. The last stage is the development of the operational level plans, these will determine how the resources are allocated and what processes are adopted.

Chapter 2 also justified the need for some form of performance measurement system and suggested that without a performance measurement system in place it was not possible to progress towards the desired goals, a performance measurement system is also needed to enable the higher education providers to identify, and subsequently take, any necessary corrective actions to ensure that the desired PEF attainment is achieved (Walters and Rainbird, 2006).

All of the stages of strategic management and planning require the higher education providers to engage in decision-making activities, but it was shown in chapter 2 that decision-making in higher education providers is challenging and complicated. In chapter 3 this was explained to be due to the fact that the higher education provider is a dynamically complex system subject to policy resistance and unintended consequences. To overcome this and improve decision-making activity, the use of system dynamics, along with a balanced scorecard framework, was proposed to support the creation of a performance measurement system. The resulting framework can be used to assist in strategic planning, monitoring and tracking of performance as well as support individual and organisational learning.

10.2.4 Addressing the gaps in the literature

Chapter 2 evidenced a lack of literature regarding the application of the balanced scorecard framework in higher education providers and chapter 3 showed that although there is some

literature that combines the application of system dynamics with the development of a balanced scorecard framework, this is very limited, and most were applied to higher education providers outside of the UK. This research is novel in that there is no other study to have yet been undertaken at the scale proposed here.

10.3 Summary of the research project

This section will provide a summary overview of the research aims, philosophy, methodology, and the development of the conceptual framework.

10.3.1 Research aims and objectives

The aim of this research was to produce a framework to support the necessary decision-making that occurs at all levels in the management teams across the higher education provider. In addition to supporting and enhancing the decision-making activity, this framework was also proposed to support both individual and organisational learning.

10.3.2 Research philosophy and methodology

Once it was decided that a system dynamics methodology was a suitable approach for addressing the research aim and questions, the philosophical and methodological considerations became clearer to the researcher. The position adopted by the researcher is that of critical realism, this is a paradigm that aligns well with the system dynamics methodology as it accepts the theory that, despite the best intentions of any decision-making activity, the system can, and often will, produce unexpected and unintended results.

The research strategy took the form of a case study as the research was undertaken within the context of one school within a large higher education provider. This decision was made because of the access available but also because the selection of one school provided a suitable boundary for the system dynamics modelling exercise. This is standard practice within system dynamics research and is also the practice adopted by most of the researchers in the prior studies that had been reviewed.

This was a qualitative system dynamics study and thus the input of participants was particularly key. The participant knowledge was elicited through a series of interviews and meetings. The first round of interviews was used to identify the key themes that would support the creation of an initial set of causal loop diagrams. The second round of interviews provided considerably more data which was analysed using techniques inspired by the grounded theory approach. Once the initial causal loop diagrams were constructed a series of validation meetings were held and these causal loop diagrams were confirmed.

The individual causal loop diagrams were then merged to create one large and complex causal loop diagram, this causality map represented the decision-making that was undertaken across the school that would lead to attainment in the PEFs. The map was presented at two workshops, one with the school management team and another with the central management team. The purpose of these workshops was to facilitate participant learning and gain acceptance of the causality map.

10.3.3 Conceptual framework

Before the interviews were undertaken a conceptual framework was created which was based upon the application of the system dynamics methodology incorporating a balanced scorecard framework. The first stage in the development of the conceptual framework was to create a conceptual balanced scorecard. This showed the perspectives (customer, internal business processes, learning and growth, and finance) mapped against the objectives for each of the PEFs. The next stage was to identify the KPIs that would represent the PEF objectives for each of the components of the balanced scorecard.

This information was used to create a conceptual strategy map that would inform the creation of the framework that would support and enhance decision-making within the higher education provider. The conceptual strategy map was then analysed to create a smaller framework that represented the complexity present in the HEP by providing a top-level view of the decision-making activity that was necessary and showed how decisions made in any one area would impact the decision-making that occurred in any other area(s). This framework was expanded to incorporate the effects of bounded rationality and showed how the application of the system dynamics methodology, including the use of stakeholder engagement to facilitate learning and thus lead to improved decision-making

10.4 Summary of the findings

The following section will consider each research question in turn and discuss how the research undertaken has addressed that question.

RQ1: What are the KPIs that translate the strategy of the HEP into performance indicators to measure attainment and act as proxies for the desired performance to be achieved in the PEFs?

The research adopted a system dynamics methodology to address the research questions. Two rounds of individual interviews were conducted, and the tacit knowledge elicited from these interviews provided the data that was analysed to produce the causal loop diagrams. From this data it was possible to determine the KPIs that acted as proxies for the PEFs, hence addressing RQ1.

RQ2: How can an HEP be represented as a dynamically complex system? How is this complexity captured in the system's causality map of the HEP?

The data was also analysed to provide examples of the presence of dynamic complexity, this is discussed in more detail in chapter 8. The participants provided a range of examples that evidenced that the higher education provider could be considered to be a dynamically complex system. The ability to use the data to construct a series of causal loop diagrams that each represented a key area of decision-making that would lead to successful PEF results, however, is the most important evidence to address the first part of RQ2.

Following the production and validation of these individual causal loop diagrams, it was possible to create a causal loop diagram that represented the entire school (which is the higher education provider that is being researched). This causal loop diagram addresses the second part of RQ2 as it demonstrates the complexity present in the higher education provider. The details of how the causal loop diagram was constructed were presented in chapter 7.

RQ3: How can the system dynamics methodology be employed to create an environment to facilitate learning?

In order to ascertain whether the application of the system dynamics methodology did create an environment for learning, the interactions that occurred with the participants will be reviewed. In the first level of interaction the opportunities for learning were provided at an individual level during the two rounds of interviews undertaken for tacit knowledge elicitation, as well as during a third round of individual interactions held for the validation meetings. It is difficult to prove whether any learning actually occurred, however there were some incidences where the researcher observed individuals making connections and starting to appreciate the complexity in the decision-making process. In chapter 8 the level of engagement was reviewed instead, and it was noted that some of the participants had been highly engaged in the research which might suggest that they are more likely to have obtained some learning through this process.

The second level of interaction was in the group workshops, the participants' feedback about their engagement in the workshops was positive and at the end of the school workshop many of the participants commented that the experience had helped them to see the connectivity between the variables and the areas of decision-making. However, once again, it was difficult to ascertain whether any learning had occurred and one of the areas for future research would be to interview all of the workshop participants to gather their thoughts about the impact of the process on their mental models.

The actual answer to the question of, how system dynamics techniques can be best employed to ensure that individual and group learning is achieved, can only be ascertained by regular interaction and discussion with the participants. Those participants who engaged more than once in the process (for example members of the school management team who had already been interviewed as part of the individual tacit knowledge elicitation exercise) demonstrated a greater understanding of the causality map and one participant evidenced a critical learning incident. It was also observed that those participants that had already had access to a causal loop diagram, as part of a validation meeting, were more engaged in this discussion that was offering them an opportunity to elaborate and expand on their mental model.

The discussions held at each workshop were insightful but the feedback from the participants, particularly at the school management team workshop, led the researcher to rethink whether this causality map was, in fact, the best instrument to address RQ4.

RQ4: Can a framework, that demonstrates the interdependencies between the KPIs and shows how the underlying perspectives that create performance are interlinked, be created to support decision-making?

The two group workshops showed that the concept of causality was well received and that the proposed drivers, KPIs and the relationships between them were acceptable. However, the findings from the workshop discussions suggested that the causality map was too complex to use as a framework that could support decision-making. Instead it was proposed that the causality map was adapted and condensed into a strategy map that was designed specifically to support management decision-making. The strategy map was created by using the conceptual strategy map as a starting point, further details from the causality map (the causal loop diagram) were then added in until each section of the strategy map was completed. This strategy map showed the interdependencies

between the KPIs and how the underlying perspectives that result in PEF attainment are interlinked and thus addressed RQ4.

10.5 Theoretical contributions

This research has adopted a systems thinking approach and has specifically utilised CLDs to underpin the production of a causality map that identifies the essential components and their dynamic relationships to support PEF attainment. The theoretical underpinnings are that the HEP is a DCS and thus the adoption of the systems thinking methodology, including the application of causal mapping, will address the issues that arise from this, including that of bounded rationality. To ensure an output that can be implemented by the SMT the strategy map has incorporated the BSC principles. Based on these theoretical underpinnings this research proposes the following contributions to theory:.

The key concepts that arise from the BSC literature are the proposed perspectives, which this research agrees are the most appropriate. The second key BSC concept relates to the inclusion of the stakeholder expectations, this research agrees and thus staff and students have been included in the strategy map.

The third key BSC concept relates to the reasons why the BSC might not be adopted in an HEP and this research suggests an extension to this by noting that the Board of Governors is a very powerful entity in the HEP and therefore determines the performance management process for the HEP which includes the KPIs. This leads to the last key concept that says that the maximum number of KPIs to be incorporated should be no more than 30, this research proposes 50 in the strategy map and that is the minimum number to be included that represent the full range of activities undertaken in the HEP to address the PEF attainment. This finding thus extends the proposed theory however what it may suggest is that the HEP has a very broad diverse strategy.

This research has extended the body of knowledge that relates to the presence of bounded rationality in educational decision-making. In addition to the findings correlating with the theory, multiple examples of the existence and impact of bounded rationality have been provided whereas the majority of the literature that has been incorporated in this work has failed to provide any examples.

The adoption of a systems thinking approach should help the user understand the complex system in which they operate and enhance communication by bringing stakeholders together. There is evidence of both of these occurring in the SMT and thus this research has extended the body of knowledge that relates to the adoption of a systems thinking perspective in educational decision-making.

However there was no evidence that the outcome from the application of this systems thinking approach had enabled the participants to make informed decisions and understand the implications of any policy proposed. It would only be possible to establish the contribution of the adoption of the systems thinking perspective to this research after the proposed framework had been adopted.

10.6 Practical contributions

This research proposes five contributions to practice which are discussed below.

10.6.1 The creation of an environment that can facilitate individual and organisational learning.

Many of the participants at the school management team workshop suggested that a final framework, that had been informed by the causality map, could be used during their regular meetings and that this would provide a structure for the decision-making that needed to occur. The framework would also remind the management teams of the vast range of activity that is occurring across the school and the volume of requirement made on the limited resource. During the school management team workshop it became evident that there was an awareness of the KPIs that had been defined by the HEP, but the participants did not think that these KPIs were used. This framework would provide a start of a conversation about performance measurement which could become the foundation of a performance measurement system.

10.6.2 Contribution to the practice in the higher education provider

At the central management team workshop the Pro VC (learning, teaching and student experience) identified that the programme leader team component could be a useful part of the ongoing training and development provided to the programme leaders. The causal loop diagram that was created that modelled the programme leader team activities was presented at the programme leader forum and the researcher has been asked to contribute to the ongoing programme leader training. The feedback received from the participants at the forum was very positive and included that this was great work, very interesting, and a fascinating reveal of the programme leader role that demonstrated how the role fitted with the wider HEP activity.

The research causal loop diagram was presented to the Associate Dean (research) and a list of the drivers that were identified in the causal loop diagram were used to inform the research strategy for the higher education provider for the next 5 years.

10.6.3 Supporting future success

The strategy map can be used during staff induction, and in ongoing training and development events, to support staff in their understanding of how and where they contribute to the HEP's goals. Enabling staff to be able to view how, and where, their input is making an impact on the system and show how they drive PEF attainment could be an important factor in staff satisfaction, motivation and retention.

It was difficult to evidence whether this research has been successful in influencing the existing management teams or had led to any change the mental models of the participants. However, this framework could be used in ongoing training events including those that are held with future managers in the HEP, this could include the production of causal loop diagrams to enhance the participants' mental models.

10.6.4 Identification of the key areas that drive success

This research has identified the key variables that will drive success in the PEFs, namely staff capability (which is driven by investment in continuing professional development and the salary offered), the amount of workload allocated to an activity, the amount of administrative support allocated to an activity, staff recruitment, fees charged, the student target and cohort size, and finally staff enthusiasm.

The HEP is very large with a vast portfolio of activities which includes other activities that have not been considered in this research such as international partnerships. Any resource deployment will naturally redirect resources from one area of activity to another, and therefore strategic decisions that relate to the overarching HEP vision need to be made assuming unlimited resource if the aim is to achieve on all PEFs. The key pivotal decision relates to the amount of contribution that the school has to pay back to the centre, because the remaining school budget is what is utilised to ensure future success for the school in the PEFs.

Fundamentally it all comes down to investment in staff to ensure the appropriate level of capacity and capability. The trade-off currently is where that staff time is utilised. Where investment is curtailed to ensure financial sustainability the HEP is unlikely to have sufficient budget to resource and achieve all of its goals. Therefore the key decisions for the CMT relate to finance and the key decisions for the SMT relate to the deployment of resource.

10.7 Recommendations

This research proposes the use of the system dynamics methodology to underpin the creation of a performance measurement system that could be used to support decision-making. The following recommendations are all thus related to this proposal.

10.7.1 Undertake a process review

One of the key findings from both the school and central management team workshops was the need for a workload model that was aligned to the HEP's strategy, and particularly to PEF attainment. It was noted that the existing model was not fit for purpose given the scope of activity that was required across the school (namely module delivery, programme leadership, employability and research as well as other activities that provide additional income). A new workload model is due to be rolled out in 2025, however it is not yet clear whether this has been designed on the principle of putting PEF success at the forefront of decision-making which is necessary to ensure success.

10.7.2 Align strategy, targets and key performance indicators

The second recommendation is for there to be more clarity regarding the HEP's strategy and in addition to a strategy the higher education provider also needs a clear set of targets regarding how well it wishes to perform in the PEFs. These targets need to be realistic, specific and attainable. All operational decisions relating to resource allocation and process adoption should be aligned to the attainment of these targets and a set of appropriate KPIs need to be developed which can be reported against at regular intervals. This process aims to remove, or at least reduce, the amount of fire-fighting and back filling of capacity that occurs.

10.7.3 School management team adoption of the framework

The research proposes that the management teams adopt a structured and rational approach to decision-making, supported by the utilisation of this framework. The framework provides a focus on how each decision that is made supports attainment in each PEF. Ongoing use of the framework will remind decision makers of the multiple and conflicting goals present. In addition to the framework, the causality map should also be referred to as it provides insights to, and is helpful in explaining, the underlying dynamic structure.

10.7.4 Create a narrative across the higher education provider

The framework, i.e. the strategy map, can also be used in ongoing conversations with staff about the KPIs and PEFs. This would allow staff the opportunity to explore how they contribute to the higher education provider's goals and the PEFs, this could help improve relationships between staff and the management teams.

10.8 Limitations of the thesis

There are two limitations to the study, the first was the impact of Covid-19 which affected the data collection and meant that instead of face-to-face interviews, some interviews were held over teams. While these participants were still engaged and forthcoming in their input, it would be unusual if the participants were as open and honest in their responses as might be expected from a traditional interview setting.

The second limitation relates to the research aim, to produce a performance measurement system that can support the decision-making activity to successfully achieve the desired performance outcomes. If this performance measurement system is going to be effective and achieve the research aim, the higher education provider will need to accept the recommendations presented above. Despite the perceived usefulness of the framework, the reality is that the implementation of any new initiative takes time and requires organisational wide commitment, and it may be that some members of the management teams do not have the appetite for this.

Higher education providers should all possess a vision but, due to the nature of the sector, HEPs tend to possess multiple, and often conflicting, goals. Higher education providers also have to ensure their financial security and sustainability, and this agenda will also impact the decision-making that occurs regarding the resource allocation and processes to be adopted. In addition to the internal vision and goals, there may be external requirements to ensure new initiatives are met (for example the creation of apprenticeship programmes). The presence of these initiatives will make it harder for the higher education provider to adhere to the framework in the manner proposed and thus it is likely that there will always be some element of reactive firefighting required.

10.9 Proposals for further research

There are three proposals for further research that could be undertaken which are discussed below.

10.9.1 Ascertain learning gain

The first recommendation would be to interview all of the participants again to ask them whether they had noticed any difference to their practice since being involved in this research project. This would include comparing their answers to those provided in the initial interaction. Participants could also be asked to review and comment upon the causality and strategy maps. This would also enable the researcher an understanding of whether any learning had occurred.

10.9.2 Repeat process and compare results across the higher education provider

The process of this research could be recreated in different schools in the higher education provider. It would thus be possible to compare the resulting causality and strategy maps. Each school could be written up as a case study and it would be possible to identify how and where each school contributed to the higher education provider's vision. The research could also be recreated in business schools in other higher education providers if it was possible to gain access.

10.9.3 Create a quantitative system dynamics model

Systems thinking is an approach to problem-solving, but it is also a process for mapping problem situations which is often the precursor to creating quantitative system dynamics models. The third recommendation is thus to produce of a series of quantitative system dynamics models based on the research findings such that the individual causal loop diagrams and the causality map could be modelled in a software package such as Vensim. A dynamic balanced scorecard could also be created based on the strategy map.

10.10 Chapter conclusion

The overall aim of this research was to produce a performance measurement system that could support the decision-making activity necessary to achieve the desired performance outcomes. The system dynamics methodology was adopted alongside a balanced scorecard approach to enable the production of a strategy map, to be used to support and enhance decision-making. This strategy map clearly displays the KPIs, and policy levers and provides the framework for a performance measurement system. The performance measurement system would include the use of the framework in staff training and development events and the adoption of the framework in senior and central management team meetings.

Chapter 11 Personal growth and reflection

Engaging in this whole process has made a practical contribution to my personal growth. During the process of the DBA, I have gained first-hand experience of mental model enhancement and also believe my own professional practice has improved greatly due to this experience. I have also improved their knowledge and skills of qualitative system dynamics, and I am keen to offer training sessions and away days with teams of participants that would run as facilitated workshops with the aim of creating causal loop diagrams to aid understanding of a particular issue and work towards a solution.

Regarding my position in the research study, firstly I believe that no research can ever be truly objective, even in scientific research experiments the researcher is making decisions about the research design. As a researcher with a statistics and management science background I feel comfortable in this space and using the terminology that goes with this territory, but I recognise that the work is subjective independent of the vocabulary adopted.

I am also aware that as a senior manager in an HEP I was probably afforded better access to the participants as well as the senior and central management teams. All interview participants that were approached engaged in the process (bar one). In the workshops the participants were generally very engaged but obviously some more so than others.

In additional to the more formal methods of data collection I must note that as an academic myself I am part of the system under investigation and therefore party to conversations, meetings and general communications in the system that undoubtedly influenced my research. It is highly likely that when undertaking the data analysis certain themes stood out as I had an affinity to them in my role (for example any mention of workload and my ears would prick up).

In summary I have thoroughly enjoyed this experience, if I were to do it again, I would have made myself work harder at the start and adhered to my project plan more closely.

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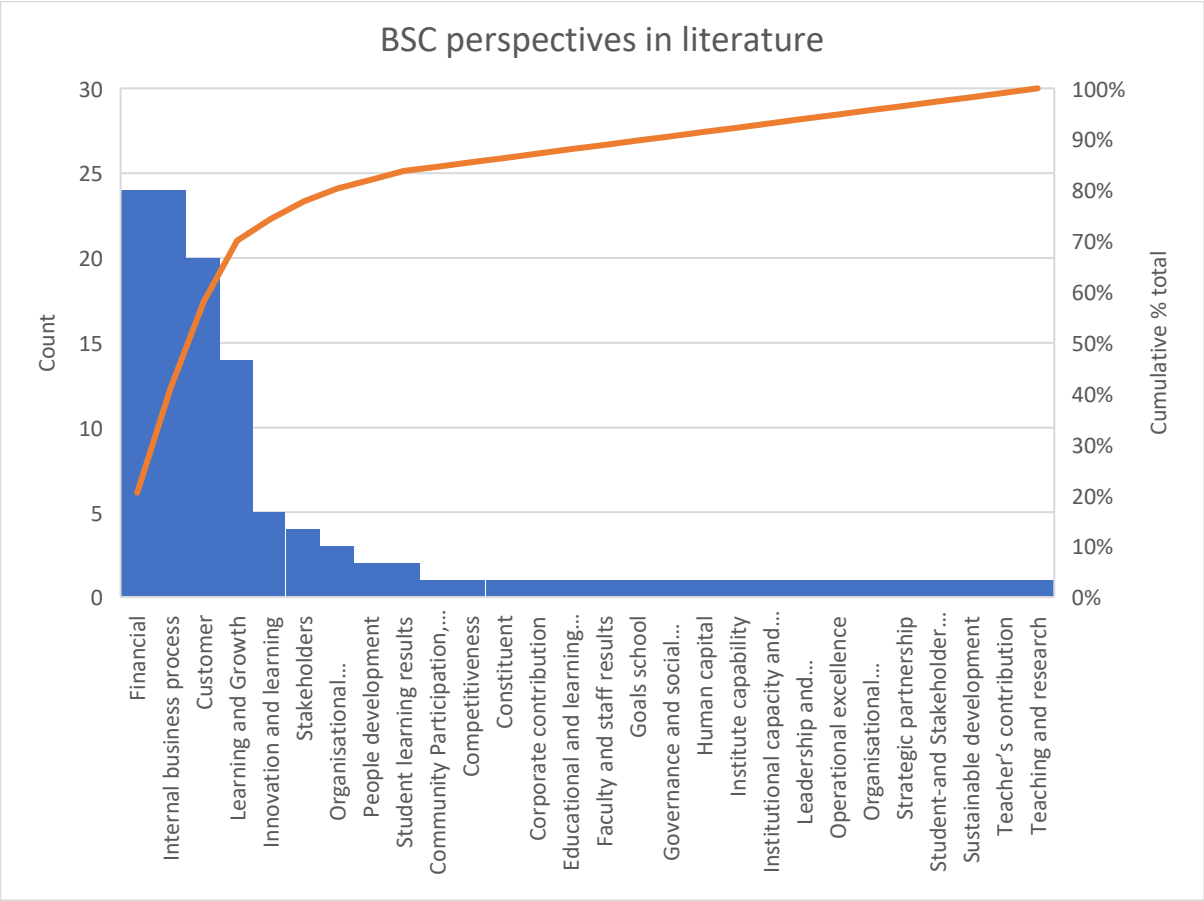
Appendices

Appendix 1: Proposed perspective headings from the literature

Perspective	Count	%
Financial	24	21%
Internal business process	24	21%
Customer	20	17%
Learning and Growth	14	12%
Innovation and learning	5	4%
Stakeholders	4	3%
Organisational development	3	3%
People development	2	2%
Student learning results	2	2%
Community Participation, environment development and stakeholders	1	1%
Competitiveness	1	1%
Constituent	1	1%
Corporate contribution	1	1%
Educational and learning excellence	1	1%
Faculty and staff results	1	1%
Goals' for the school	1	1%
Governance and social Responsibility results	1	1%
Human capital	1	1%
Institute capability	1	1%
Institutional capacity and quality management	1	1%
Leadership and governance results	1	1%
Operational excellence	1	1%
Organisational effectiveness	1	1%
Strategic partnership	1	1%
Student-and Stakeholder –focused results	1	1%
Sustainable development	1	1%
Teacher's contribution	1	1%
Teaching and research	1	1%


BSC perspectives in literature
Count
Cumulative % total
30
25
20
15
10
5
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Financial
Internal business process
Customer
Learning and Growth
Innovation and learning
Stakeholders
Organisational...
People development
Student learning results
Community Participation,...
Competitiveness
Constituent
Corporate contribution
Educational and learning...
Faculty and staff results
Goals school
Governance and social...
Human capital
Institute capability
Institutional capacity and...
Leadership and...
Operational excellence
Organisational...
Strategic partnership
Student-and Stakeholder...
Sustainable development
Teacher's contribution
Teaching and research

Appendix 2: Interview participants identified by balanced scorecard perspective and key performance indicator

Perspectives	**KPIs and participants**				
Customer	Teaching quality – ADLT ADAQ Heads of group Academics Students	Student satisfaction – ADSE ADAQ Programme leaders Students	Student employment – ADSE Careers tutor	Student enrolment – Admissions tutor Marketing	Research output – ADR Professors Readers Research active staff
Internal Business Processes	Staff recruitment – Dean Deputy Dean Heads of group HR Business partner Academics	Staff satisfaction and motivation – Dean Deputy Dean Heads of group HR Business partner Academics	Academic and student support – ADLT ADSE Deputy Dean Heads of group Academics Students	Research environment – ADR Professors Readers Research active staff	
Learning and Growth	Learning and teaching initiatives – ADLT ADAQ Heads of group Academics	Staff development and training – Deputy Dean ADLT Heads of group HR Business partner Academics			
Finance	Investment in staff – Dean Deputy Dean Heads of group HR Business partner Academics	Revenue – Dean Deputy Dean Heads of group Finance Manager	Investment in research – ADR Professors Readers Research active staff	Research funding – ADR Professors Readers Research active staff	

Appendix 3: First round interviews participants

- Visiting lecturers (2)
- Lecturing staff with high level of teaching on their workload (1)
- Lecturing staff with high level of research on their workload (1)
- Professor (1)
- Reader (1)
- School senior manager with management responsibilities for admissions (1)
- School senior managers with management responsibilities for staffing (2)
- School senior managers with management responsibilities for strategic areas of the portfolio (2)
- Senior manager in the school with management responsibilities for research (1)
- HEP senior manager with management responsibilities for staffing (1)

Appendix 4: First round interview sample transcript

R1P1 – FT SL high teaching load (FTSLHTL)

In HE more than 35 years

All post ’92 unis

Teaching focussed positions

Students more focused – want a qualification to get a better job

Try to use practical / real examples

Long time since I practiced – might be getting it wrong

Students want to be told the answers

Preparing a new module from scratch need to think about structure, DMD, schedule, time, order assessment, supporting assessment

Can take up to a couple of days

Preparing a new lecture depends on existing material about probably one day per lecture approx

Time invested if there is repeated delivery

When repeating lectures revision needed but reduces to about an hour to check through and then 5 minutes before the lecture to prep

There are economies of scale

L6 and L7 specialisms take longer – more subject expertise needed, new modules need lots of personal study to upskill myself

Basic subject knowledge I know

Newer (less experienced) people need longer

Changing student body, changed marking to be more generous

Particularly PG who lack the intellectual preparation

Take them in – responsible to get them through

Teach them differently, feed them helpful revision material

Not sure what employers think – surely they want students who can think?

Can students think?

I try to write in accessible English and always have done

The task is to get the assessment correct so that it is doable but stretches the good ones

It's a challenge to assess all levels appropriately

Personal experience balances out the extra time needed

Workload important to have some standardisation

Danger of being overloaded

Workload circulated across group – transparent

Less PL duties more teaching

Semesters unbalanced

Only so much I could do

As I get older, no longer have the stamina and the brain not as fast, can't recall as much

Use quiet time / summer to manage / smooth workload

Cancel social life in semester A

Peaks / troughs

Then stop from end of April until September

If teaching in three semesters would need to do block teaching to allow time for CPD / AL / research

Or maybe team teaching – I do 50/50

Semester A goes into semester B without a break and sometimes no break at Xmas either

Self-management to ensure can manage your time, own workload

Impacts personal life

Academic year more concentrated than it used to be, didn't feel so pressurised before and it was non semesterised

Students don't want to prep for tuts

They prepare for assessment but not tuts

Short-term view as affects exams

Wish I knew what affects engagement

Not enough time to do much with learner analytics

Wonder whether subject area impacts attendance and engagement (?) – fear of numbers

Job not as satisfying

Partly age, mostly change in the students as they are working (at uni work)

The fees are part of this

A lot of students work because they don't want the debt but FT study means they can't really do FT work

I don't provide as much support as I would like to – wish they would pester me more, rarely busy in office hours

Attendance is pants, sem A 18 probably the first time ever I noticed such poor attendance L5 always been an issue but now it's L4 and L7 too

About 40% attendance

Varying

Leads to low attainment and failure rates which impact the credibility of the graduating students

They are not work ready, pass them but what's the impact on employability?

Some prog year leader (clusters after results in A B and resits)

Some staff mentoring

Fairly phlegmatic

Teaching 80% of workload?

Oct / Nov teaching 18/19 hours per week, squashed out PL work

Needed a new VLE but it is laggy and clunky

Marking online went well for 40 students (wouldn't want to do for 200)

I provided better feedback (if they bothered to read it) – quite easy to annotate

Essential to have had the admin support

Busy sem A, nice when it stopped on the 7/2

Use quiet time to prep / reflect / review

Staff will do more / less of this

Dealing with emails – all the gumpf

Deleting, flagging for future reference and then forgetting it (unless chased)

About 1 hour per day on emails (varies)

Given 0.5 days a week for that and everything

New fangled peer review – negotiating that

More urgent things get in the way (teaching, marking)

Student satisfaction – responses low, blood out of a stone

Made the L5 students do it as ML (5/12 did) filled at end of class

Emails chasing are not helpful

If pressure them to complete have rude comments!

If I don't like something I'd tell you / not return

Students feel they have better things to do

Paper based had a higher response but when is there the time in a 50 minute lecture to spend 30 minutes on that?

Not enough time to do this anymore this way

If not engaged in teaching material why engage in MFQ?

Then there is a range of comments without enough background to action / make adjustments

H vs O adjustment?

At UG no idea which is which

With PG assume all international

At PG spend more time explaining the expectations of HE in the UK not rote learning, need application

Lack of concept for example thinking for yourself in Chinese students

Cultural impact

And the challenge of language

They can't concentrate for long enough because its hard work

International staff have it harder

I admire the students they travel halfway across the world and study in English

They don't have the sufficient educational background

The calibre of the masters students is concerning

On the register there are too many students 25-28 which doesn't suit the way I work

I like big group or smaller groups

But then only 10-12 in front of me – manageable small group

What else should I be doing to support non attenders?

Makes for unsatisfying teaching

Those that do attend often lovely, not necessarily the brightest but they are trying

Those who would have failed if I hadn't been nice and patient

Yes it affects my motivation

There are a lot of opportunities for them to engage in value adding transformation, not sure how if they don't engage

Not enough data to understand the MMF

(too summarised, or not enough responses, or skewed by one unhappy person)

Wonder what happens to the swipe in data? Little feedback about students from PL

Not sure what the data is used for – may help?

I undertake staff training on a need to know basis

Appendix 5: First round interview main themes identified

No.	Participant role and CLD themes identified	Areas / perspectives of interview discussed
1	Full time Senior lecturer with a high teaching load •Staff experience and module delivery •Student ability and module delivery on SSMR	Teaching and Learning: •the support operations and mechanisms in place to support teaching •what the staff are doing to be able to deliver the teaching
2	School Senior Manager with responsibility for L&T •Variables that impact module delivery •Student ability and APC •Variables that impact performance and SSMR	Teaching and Learning, Student •the support operations and mechanisms in place to support teaching •what the staff are doing to be able to deliver the teaching
3	Full time Senior lecturer with a research allowance and teaching •Research environment and SSMR •Research environment and research performance	Teaching and Learning, Research •the support operations and mechanisms in place to support research output •what the staff are doing to be able to be research productive •the support operations and mechanisms in place to support teaching •what the staff are doing to be able to deliver the teaching
4	Professor •Variables that impact research environment •Research environment and research performance	Research •the policies that create the structure, framework and environment in which the research at UH is undertaken •the support operations and mechanisms in place to support research output •what staff are doing / need to do to be able to be research productive
5	School Senior Manager with responsibility for staff (visiting) and staff development •Variables that impact SSMR •Variables that impact student satisfaction	Staff •the policies that create the structure, framework and environment in which staffing at UH is undertaken •the support operations and mechanisms in place to support recruitment and training •how staff are managed to be able to perform efficiently and effectively
6	School Senior Manager with responsibility for student recruitment •Variables that impact student applications •Student attributes and APC	Student •student recruitment considering the policies that create the structure, framework and environment in which admission at UH is undertaken •the support operations and mechanisms in place to support student recruitment

7	School Senior Manager with responsibility for staff (permanent) and workload •Variables that impact staff recruitment and SSMR •Variables that impact research output	Staff •the policies that create the structure, framework and environment in which staffing at UH is undertaken •the support operations and mechanisms in place to support recruitment and training •how staff are managed to be able to perform efficiently and effectively
8	School Senior Manager with responsibility for student experience •Variables that impact student applications •Student attributes and APC	Student •the support operations and mechanisms in place to support student recruitment and success
9	Visiting lecturer with teaching (less experienced) •Variables that impact APC	Teaching and Learning •the policies that create the structure, framework and environment in which the teaching at UH is undertaken •the support operations and mechanisms in place to support teaching •what the staff are doing to be able to deliver the teaching
10	Visiting lecturer with teaching (lots of experience) •Variables that impact SSMR •Variables that impact APC	Teaching and Learning •the policies that create the structure, framework and environment in which the teaching at UH is undertaken •the support operations and mechanisms in place to support teaching •what the staff are doing to be able to deliver the teaching
11	Reader •Variables that impact research environment •Variables that impact SSMR •Variables that impact APC	Research •the policies that create the structure, framework and environment in which the research at UH is undertaken •the support operations and mechanisms in place to support research output •what staff are doing / need to do to be able to be research productive
12	HEP Senior Manager with responsibility for staff •Variables that impact staff recruitment and SSMR	Staff •the HR strategy for the university •what strategic objectives are you trying to achieve through the HR strategy •how attractive UH is as a place of employment •the recruitment policy, policies and procedures
13	School Dean as Acting ADR •Variables that impact research quality •Variables that impact research environment	Research •feedback on initial findings •advice on access to HEP senior management

Appendix 6: First round interview pairs of variables and the direction of their relationship

Participant	Theme	Variable	Influence	Variable
P1	Staff	Staff experience	-	Prep time
P1	Staff	Experience of module	-	Prep time
P1	Staff	Student academic / ability level	-	Staff time on support and delivery
P1	Staff	High workload (fair / balance?)	-	SSMR
P1	Staff	Academic loading / cycle	-	SSMR
P1	Staff	Staff ability	+	Ability to use tech to support students
P1	Staff	Ease of use of tech to deliver / support	+	SSMR
P1	Staff	SSR	-	SSMR
P1	Staff	Module size	-	SSMR
P1	Staff	Academic support	+	SSMR
P1	Staff	Ease of use of systems and processes	+	SSMR
P1	Staff	Student ability	+	SSMR
P1	Staff	Attendance	+	SSMR
P1	Student	Ability of students	+	Support required
P1	Student	Ability of students	+	SSMR
P1	Student	Student engagement	+	Student C and R, low attainment, high failure
P1	Student	Student employment hours	-	Student engagement
P1	Student	Student C and R, low attainment, high failure	+	HEI reputation
P2	Staff	Staff experience	-	Time of prep and delivery
P2	LTI	Academic support (technical)	-	Time of prep and delivery
P2	LTI	Time available	+	Amount of materials and support given
P2	LTI	Staff experience	+	Amount of materials and support given
P2	LTI	Open to change	+	SSMR
P2	LTI	Time available	+	Ability to adapt teaching
P2	Staff	Ability to adapt to new systems	+	SSMR

P2	LTI	Staff engagement in LTI	+	SSMR
P2	Staff	Relevance of training	+	Staff engagement in LTI
P2	Staff	Time for T&D	+	Staff engagement in LTI
P2	Staff	Performance of staff	+	Staff engagement in LTI
P2	Staff	Years of business practice	+	Real life examples provided
P2	Staff	Tariff	-	Staff effort to get results
P2	Staff	Marking load per tutor	-	Assessment feedback provided
P2	Staff	Staff skills especially tech	+	Appropriateness of delivery
P2	Staff	Performance management of staff	+	SSMR
P2	Staff	Demands on staff	-	SSMR
P2	Student	Real life examples provided	+	SSERCE
P2	Student	Student engagement	+	Student classification
P2	Student	Interview skill and student confidence	+	Student employability rate
P2	Student	Tariff	+	Student engagement
P2	Student	Tariff	+	Student performance
P2	Student	Tariff	+	Student motivation
P2	Student	Engagement in academic skills support	+	Grades
P2	Student	SSR	-	Student engagement
P2	Student	Student possessing correct skills	+	Student employability rate
P3	Research	School research reputation	+	SSMR
P3	Research	School research reputation	+	Internal research funding
P3	Research	Research allowance	+	SSMR
P3	Research	Research allowance	+	Research output
P3	Research	Income from student enrolment	-	Research output
P3	Research	Research environment	+	SSMR
P3	Research	Hire ECRS	+	Research environment
P3	Research	Research allowance	+	Research environment
P3	Research	Research experience	+	Research output
P3	Research	Research environment	+	Research output
P3	Research	Research network	+	Research output

P3	Research	Sabbatical opportunity	+	Research output
P3	Staff	Time spent teaching	-	Research output
P3	Staff	Academic support (research assistants)	+	Research output
P3	Staff	Workload	-	Research output
P3	Staff	Distribution of workload	+	Research output
P3	Staff	Student voice	+	SSMR
P3	Staff	Opportunities for promotion	+	SSMR
P3	Staff	Research output	+	Opportunities for promotion
P3	Staff	Time in meeting	-	Time for teaching
P3	Staff	Sabbatical opportunity	-	Team morale
P4	Research	Research culture	+	Research success
P4	Research	Co-ordination between researchers / teachers	+	Research environment
P4	Research	Researchers favoured	-	SSMR
P4	Research	ECRs teaching	-	Research output
P4	Research	Perceived value of research	+	Research funding received
P4	Research	Cost of the research undertaken	+	Research funding received
P4	Research	Nature / subject area of research	+	Respect of outputs
P4	Research	Exposure to research networks	+	Research success
P4	Research	Appraisals wrt research	+	Research SSMR
P4	Research	Research environment	+	Research culture
P4	Research	Ease of applying for RA	+	Research SSMR
P4	Research	Ease of applying for RA	+	Research environment
P4	Research	Research recruitment strategy	+	Research environment
P4	Research	Number of professors / senior researchers	+	Research environment
P4	Research	Amount of ECRs with RA	+	Research environment
P4	Research	Support for research (for example research office)	+	Research environment
P4	Research	Support for research (for example research office)	+	Research output
P4	Research	Retention of ECRs	+	Amount of RAs awarded

P4	Research	Amount of RAs awarded	+	Research output
P4	Research	Operational pressures	-	RIT output
P4	Research	Focus on student income	-	Research environment
P4	Research	Desire to success in research	+	Research output
P4	Research	Research environment	+	Doctoral student numbers
P4	Research	Performance related to outcomes	-	Research environment
P4	Research	Amount teaching is blocked	+	Research output
P5	LTRS	Research output	+	LTRS
P5	Research	Use of VLs	+	Time to do research
P5	Staff	Staff recruitment	+	Fit for purpose
P5	Staff	Desire to do research	-	Desire to do teaching
P5	Staff	Desire to be promoted	-	Ability to do research
P5	Staff	Ability to do research	+	SSMR
P5	Staff	Right staff	+	SSMR
P5	Staff	Right staff	+	SSERCE
P5	Staff	Perception of HEI as a good place to work	+	SSMR
P5	Staff	Working conditions	+	SSMR
P5	Staff	Good working practices	+	SSMR
P5	Staff	Lead time to recruit	-	SSMR
P5	Staff	Application of workload consistent	+	SSMR
P5	Staff	Allocations appropriate	+	SSMR
P5	Staff	Pressure on work group	-	SSMR
P5	Staff	Staff experience	-	Prep time
P5	Staff	Lead time before delivery	+	SSMR
P5	Staff	Right support	+	SSMR
P5	Staff	Promotion opportunities	+	SSMR
P5	Staff	Appropriateness of academic cycle	+	SSMR
P5	Staff	Academic support	+	SSMR
P5	Staff	Academic support	+	Quality of support materials
P5	Staff	Use of VLs	+	Time to manage

P5	Student	Working conditions	-	SSERCE
P5	Student	Appropriateness of portfolio	+	SSERCE
P5	Student	Time to make changes	-	SSERCE
P6	Student	University brand	+	Student applications
P6	Student	LTRS	+	Student applications
P6	Student	Open day attendance	+	Student applications
P6	Student	Clearing student tariff	+	University brand
P6	Student	Student tariff	+	Engagement
P6	Student	Data system	+	Retention
P7	Research	Size of research allowance	+	Research output
P7	Research	Amount of teaching	-	Research output
P7	Research	Squeeze of academic cycle	-	Research output
P7	Staff	Retention strategy	+	SSMR
P7	Staff	Recruitment strategy	+	SSMR
P7	Staff	Financial strategy	-	SSMR
P7	Staff	Perception of workload fairness	+	SSMR
P7	Staff	Amount of teaching	-	SSMR
P7	Staff	Impact of workload model	+	SSMR
P7	Staff	Advertising strategy	+	Calibre of applicants
P7	Staff	Age of applicant	+	Amount of experience
P7	Staff	Attractiveness of HEI as a place to work?	+	SSMR
P7	Staff	Promotion opportunities	+	SSMR
P7	Staff	Staff satisfaction	+	Staff retention
P7	Staff	Staff wellbeing	+	Staff motivation
P7	Staff	Recognition and reward	+	Staff motivation
P7	Staff	Student Voice	+	SSMR
P7	Staff	Reaction to NSS	+	SSMR
P8	Student	Breadth of offering	+	Attractiveness of university
P8	Student	Attractiveness of university	+	Student applications
P8	Student	Parent opinion	+	Student applications

P8	Student	Student confidence	+	Engagement in ancillary services
P8	Student	Student tariff	+	Attractiveness of university
P8	Student	Competitiveness of market	-	Student applications
P8	Student	Tariff	+	Student engagement and retention
P8	Student	Attendance monitoring	+	Student engagement and retention
P8	Student	Admin support	+	Student engagement and retention
P8	Student	Appropriate assessment practices	+	SSERCE
P8	Student	Student community	+	SSERCE
P9	Student	Student motivation	+	Student engagement
P9	Student	Student confidence	+	Student engagement
P9	Student	Engagement in MMF	+	Student voice
P9	Student	Student community	+	Student engagement
P9	Student	Preference of assessment	+	Student success
P9	Student	Likeability of module	+	Student engagement
P9	Student	Prior educational experiences	+	Student success
P10	Staff	Staff experience	+	Prep time
P10	Staff	Amount of student comms	+	Time managing module
P10	Staff	Ease of use of tech	+	SSMR
P10	Staff	Amount of student voice	+	SSMR
P10	Student	Tariff	+	Academic offences
P10	Student	Student self-awareness	+	Engagement with support systems
P10	Student	Tariff	+	Engagement / attendance
P10	Student	Tutor support of students	+	Student satisfaction
P10	Student	Student contact time	+	SSERCE
P10	Student	Preference of assessment	+	Student results
P11	Research	Research comms - amount, quality	+	Research environment
P11	Research	Confidence in process	+	Researcher confidence
P11	Research	Inclusion in REF	+	Researcher confidence
P11	Research	Research environment	+	SSMR
P11	Research	Importance of research to HEI	+	Research environment

P11	Research	Admin support for staff	+	Research output
P11	Research	Ability to attend conferences	+	Researcher confidence
P11	Research	Ability to network	+	Winning research grants
P11	Research	Support for research (for example research office)	+	Research output
P11	Research	Amount of RIT	+	SSERCE
P11	Research	Amount of RIT	+	teaching quality
P11	Research	Amount teaching is blocked	+	Research output
P11	Research	Support research mentorship	+	Researcher confidence
P11	Research	Research environment	+	Ease of recruiting new research staff
P11	Research	Amount of teaching	-	Research output
P11	Student	Tutor time on supporting students	+	SSERCE
P12	Staff	PM strategy	+	SSMR
P12	Staff	SSMR	+	SSERCE
P12	Staff	SSMR	-	Staff sickness
P12	Staff	Recruiting right people	+	PEFS
P12	Staff	Amount of academic support	-	SSR
P12	Staff	Access to line manager	+	SSMR
P12	Student	Use of supporting tech	+	SSERCE
P13	Research	Quality of publications	+	Research quality
P13	Research	Quality of collaborations	+	Research quality
P13	Research	Funding	+	Research quality
P13	Research	Research quality	+	Funding
P13	Research	Research environment	+	Research quality
P13	Research	Bidding activity and success	+	Research environment
P13	Research	Doctoral recruitment and completions	+	Research environment
P13	Research	Amount of doctorally qualified staff	+	Research environment
P13	Research	Student numbers	-	Ref result
P13	Research	REF result	+	Funding
P13	Research	ECR appointments	+	Research environment

P13	Staff	ECR appointments	+	Uptake of LTIs
P13	Staff	Amount of performance management	-	SSMR
P13	Student	ECR appointments	+	SSERCE

Appendix 7: Conceptual framework lines of enquiry

BSC perspective and activities	NSS Objectives	REF Objectives	GO Objectives	TEF Objectives	KEF Objectives
Customer	Teaching on my course Academic support, org and man Learning community and student voice Student satisfaction Line of enquiry 1	Output Impact Line of enquiry 2	Employability Line of enquiry 1	Teaching quality Learning environment Student outcomes and learning gain Line of enquiry 1	Knowledge exchange Line of enquiry 2
Internal business processes	Teaching on my course Learning opportunities Academic support, org and man Learning resources Learning community and student voice Line of enquiry 3	Output Environment Line of enquiry 2		Teaching quality Learning environment Line of enquiry 3	Knowledge exchange Line of enquiry 2
Learning and growth	Learning opportunities Assessment and feedback Learning resources	Outputs Impact Environment		Teaching quality Learning environment	Knowledge exchange

	Lines of enquiry 4&5	Line of enquiry 5		Lines of enquiry 4&5	Line of enquiry 5
Finance	Academic support, org and man Line of enquiry 6	Output Environment Line of enquiry 6			

Appendix 8: Second round interview lines of enquiry and participants

Number 1 – relates to the *students* and their impact on the PEFs (NSS, GO, TEF, PTES)

Participants: ADSE(UG), ADSE(PG), PL(UG), PL(PG)

Number 2 – relates to *research*, how students and decisions in the IBP perspective impact the PEFs (REF and KEF)

Focusses on the IBPs of staff recruitment, satisfaction, motivation, retention; academic support; student support and research environment

Participants: ADR, Professors

Number 3 – relates to *staffing*, how decisions in the IBP perspective impact the PEFs (NSS and TEF)

Focusses on the IBPs of staff recruitment, satisfaction, motivation, retention; academic support; student support and research environment

Participants: Deputy Dean, HoG

Number 4 – relates to *LTI*, how decisions in the L&G perspective impact the PEFs (NSS and TEF)

Focusses on the LTI component in the L&G perspective

Participants: ADLT, Lecturers

Number 5 – relates to *staff T&D*, how decisions in the L&G perspective impact the PEFs (NSS, TEF and REF)

Focusses on the T&D component in the L&G perspective

Participants: HoG, Lecturers

Number 6 – relates to *finance*, how decisions in the finance perspective impact all PEFs

Participants: Dean and Deputy Dean

Appendix 9: Second round interviews participants and themes for questioning

No.	Position	Themes
P1	School Deputy dean • • • • • • Research, staff, student	•What are the relevant IBPs wrt staffing? That need to be made / in place to achieve PEF success •What are the KPIs for these PEFs (NSS,TEF)? •How do the IBPs impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI results •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?
P2	School Senior Manager with responsibility for L&T • • • • • • Teaching and Learning, student	•What LTI need to be introduced in order to be successful in the PEFs? •What are the KPIs for these PEFs (NSS,TEF)? •How does L&G impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI results •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?
P3	School Senior Manager with responsibility for student experience • • • • • • Student	•Who is the customer? (Student) •What are the KPIs for these PEFs (NSS, GO, TEF, PTES)? •How does the customer impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI results •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?

P4	School Senior Manager with responsibility for staff (permanent) • • • • • • Staff	•What are the relevant IBPs wrt staffing? That need to be made / in place to achieve PEF success •What are the KPIs for these PEFs (NSS,TEF)? •How do the IBPs impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI scores? •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?
P5	Professor • • • • • • Research	•What are the relevant IBPs that need to be made / in place in order to achieve the PEFs? •What are the KPIs for these PEFs (REF, KEF)? •How do the IBPs impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI scores? •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?
P6	School Programme Leader largest generalist PG programme • • • • • • Student	•Who is the customer? (Student) •What are the KPIs for these PEFs (NSS, GO, TEF, PTES)? •How does the customer impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI scores? •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?

P7	School Dean • • • • • All areas	•What are the sources of finance? •What are the KPIs related to finance? •How do financial decisions impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI scores? •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?
P8	School Programme Leader largest UG specialist programme • • • • • • Student	•Who is the customer? (Student) •What are the KPIs for these PEFs (NSS, GO, TEF, PTES)? •How does the customer impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI scores? •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?
P9	Professor • • • • • • Research	•What are the relevant IBPs that need to be made / in place in order to achieve the PEFs? •What are the KPIs for these PEFs (REF, KEF)? •How do the IBPs impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI scores? •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?
P10	School Senior Manager with responsibility for staff (permanent) • • • •	•What are the relevant IBPs wrt staffing? That need to be made / in place to achieve PEF success •What are the KPIs for these PEFs (NSS,TEF)? •How do the IBPs impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved?

	• • Staff	•What interventions / decisions need to be made to drive up KPI scores? •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?
P11	Full time Senior lecturer with a research allowance and teaching • • • • • • • Teaching and Learning, research	•What LTI need to be introduced in order to be successful in the PEFs? •What are the KPIs for these PEFs (NSS,TEF)? •How does L&G impact the KPIs? •What are the inputs for each KPI? How can each KPI be achieved? •What interventions / decisions need to be made to drive up KPI scores? •What constrains or impedes success? •How are the KPIs monitored? •What corrective actions can be taken if they are falling below target?

Appendix 10: Second round interviews variable pairings, evidence and key words

Participant	Variable	Influence	Variable	CLD No.	Evidence	Theme 1	Theme 2
Participant 1	Robust / transparent assessment	+	Student satisfaction	1	E10	Assessment	NSS
Participant 1	Class size	+	Relationships	1	E33	Cohort size	Community
Participant 1	Class size	+	Student satisfaction	1	E33a	Cohort size	NSS
Participant 1	Time in class	+	Student satisfaction	1	E34a	Contact time	NSS
Participant 1	Student happy	+	NSS	1	E3	Student	NSS
Participant 1	Student feels supported	+	NSS	1	E4	Student	NSS
Participant 1	Student community	+	NSS	1	E7	Student	NSS
Participant 1	Pastoral care	+	Student satisfaction	1	E9	Student support	NSS
Participant 1	Student feels cared for	+	Student satisfaction	1	E11	Student support	NSS
Participant 1	Enthusiastic teachers	+	Student satisfaction	1	E8	Teaching	NSS
Participant 1	Interesting teaching	+	Student satisfaction	1	E8a	Teaching	NSS
Participant 1	Attendance	+	Enthusiastic teaching	2	E15	AAE	Teaching
Participant 1	Time in class	+	Results	2	E34	Contact time	AAE
Participant 1	Interesting teaching, enthusiasm	+	Attendance	2	E14	Teaching	AAE
Participant 1	Relationship to tutor	+	Attendance	2	E16	Teaching	AAE
Participant 1	Tutor ability	+	Attendance	2	E17	Teaching	AAE
Participant 1	Sense of community	+	Staff satisfaction	4	E23	Community	SSMR
Participant 1	Time and space with subject group	+	Staff satisfaction	4	E24	Community	SSMR
Participant 1	Relationship to LM	+	Staff satisfaction	4	E21	Management	SSMR

Participant 1	Fit / talent of PL	+	NSS	4	E5	PL team	NSS
Participant 1	Investment in PL/PT	+	NSS	4	E6	PL team	NSS
Participant 1	Recruitment process	+	Staff satisfaction	4	E18	Recruitment	Staff
Participant 1	Motivated staff	+	NSS	4	E26	SSMR	NSS
Participant 1	Staff satisfaction	+	Interesting teaching, enthusiasm	4	E20	SSMR	Teaching
Participant 1	Staff recruitment	+	NSS	4	E1	Staff	NSS
Participant 1	Staff support	+	NSS	4	E2	Staff	NSS
Participant 1	'Best staff'	+	Student satisfaction	4	E12	Staff	NSS
Participant 1	Happy, positive, supported staff	+	Student satisfaction	4	E13	Staff	NSS
Participant 1	'Right people'	+	NSS	4	E25	Staff	NSS
Participant 1	Feel pay fair	+	SSMR	4	E31	Staff	SSMR
Participant 1	Care and support	+	Staff satisfaction	4	E19	Staff support	Staff
Participant 1	Feel workload fair	+	Staff satisfaction	4	E22	Workload	SSMR
Participant 1	Identify correct activities	+	Revenue	12	E32	Portfolio	Revenue
Participant 1	Number of students	+	Revenue	12	E27	Cohort size	Revenue
Participant 1	Staff spend	+	Spending	10	E30	Staff	Investment
Participant 1	Franchise activity	+	Revenue	12	E28	Income	Revenue
Participant 1	REF, research, QR funding	+	Revenue	12	E29	REF	Revenue
Participant 2	Appropriate assessment	+	Assessment and feedback is fair	1	E3	Assessment	A&F score
Participant 2	Use of rubrics (LTI)	+	Assessment and feedback is fair	1	E5	Assessment	Assessment
Participant 2	Assessment and feedback is fair	+	NSS	1	E2	Assessment	NSS
Participant 2	MMF	+	NSS	1	E12	KPI	NSS
Participant 2	Student complaints	-	NSS	1	E13	KPI	NSS
Participant 2	Staff T&D and support	+	Appropriate assessment	1	E4	Staff	Assessment

Participant 2	Student support (PL, PT)	+	Student satisfaction	1	E18	Student support	NSS
Participant 2	Interesting teaching	+	NSS	1	E1	Teaching	NSS
Participant 2	Teaching quality	+	Student satisfaction	1	E20	Teaching	NSS
Participant 2	Student engagement	-	Academic misconduct	2	E14	AAE	AMC
Participant 2	Appropriate assessment	+	Student engagement	2	E9	Assessment	AAE
Participant 2	Appropriate staff T&D	+	SSMR	5	E25	T&D	SSMR
Participant 2	Amount of academic freedom	+	SSMR	4	E24	Management	SSMR
Participant 2	SSMR	+	Student satisfaction	4	E32	SSMR	NSS
Participant 2	Ability to change practice	+	SSMR	4	E23	Staff	SSMR
Participant 2	Staff support	+	Staff engagement	4	E10	Staff support	SSMR
Participant 2	Staff support	+	SSMR	4	E15	Staff support	SSMR
Participant 2	Staff support	+	Ability to do job	4	E16	Staff support	SSMR
Participant 2	Staff support	+	Cope with large student numbers	4	E17	Staff support	SSMR
Participant 2	Appropriate peer review	+	Staff support	4	E33	Staff support	SSMR
Participant 2	Staff time on workload	+	Interesting teaching	4	E11	Workload	Teaching
Participant 2	Staff time on module prep	+	Teaching quality	4	E19	Workload	Teaching
Participant 2	Success of new initiatives	+	Student satisfaction	9	E29	LTI	NSS
Participant 2	Support for new initiatives	+	Success of new initiatives	9	E30	LTI	LTI
Participant 2	Staff T&D and comms	+	Appreciate need for tools	9	E7	Staff	LTA
Participant 2	Staff T&D and support	+	Appropriate rubrics and tools	9	E6	Staff	LTA

Participant 2	Staff T&D and support	+	Adoption of tech / tools	9	E8	Staff	LTA
Participant 2	Success of new initiatives	+	Staff satisfaction	6	E26	LTI	SSMR
Participant 2	Support for new initiatives	+	Staff satisfaction	6	E27	LTI	SSMR
Participant 2	Tech available	+	Staff ability to do job	9	E21	LTI	SSMR
Participant 2	Tech support	+	Staff ability to do job	9	E22	Staff support	SSMR
Participant 2	Training on new initiatives	+	Staff satisfaction	9	E28	LTI	SSMR
Participant 2	Training on new initiatives	+	Success of new initiatives	9	E31	LTI	LTI
Participant 3	Personalised assessment	+	Time to create and mark	1	E5	Assessment	Workload
Participant 3	Number of students	-	Individual student support	1	E30	Cohort size	GO
Participant 3	Student cohort size	-	Personalization	1	E43	Cohort size	Personalisation
Participant 3	Sense of community	+	NSS	1	E34	Community	NSS
Participant 3	Hygiene factors	+	Student satisfaction	1	E48	Student	NSS
Participant 3	Investment in workload	+	Personalised assessment	1	E6	Workload	Assessment
Participant 3	Student engagement with available support	+	Student progression / achievement	2	E23	AAE	AAE
Participant 3	Attendance	+	Connectiveness	2	E39	AAE	AAE
Participant 3	Student understanding of assessment	+	Achievement	2	E46	Assessment	AAE
Participant 3	Good assessment and support	+	Progression rates	2	E3	Assessment	GO
Participant 3	Cohort size	-	Student results	2	E7	Cohort size	AAE
Participant 3	Cohort size	-	Student engagement	2	E15	Cohort size	AAE

Participant 3	Student engagement in wider learning activities	+	Student achievement	2	E24	Community	AAE
Participant 3	Sticky campus	+	Attendance	2	E42	Community	AAE
Participant 3	Upfront investment	+	Student engagement / achievement	2	E22	Investment	AAE
Participant 3	Focus on employability	+	Student engagement / achievement	2	E25	GO	AAE
Participant 3	Value add	+	LTRS	2	E29	GO	GO
Participant 3	Student motivation	+	Student results	2	E9	Student	AAE
Participant 3	Student time for study	+	Student engagement	2	E10	Student	AAE
Participant 3	Student time for study	+	Progression rates	2	E11	Student	AAE
Participant 3	Student time for study	+	Results	2	E12	Student	AAE
Participant 3	Avoidant attitude	+	Attendance	2	E40	Student	AAE
Participant 3	Distance to campus	-	Attendance	2	E41	Student	AAE
Participant 3	Student ability to pay for study abroad	+	Uptake of study abroad opportunities	2	E31	Student	GO
Participant 3	How supported student feels	+	Student engagement	2	E14	Student support	AAE
Participant 3	Time spent supporting students	+	Results	2	E17	Student support	AAE
Participant 3	Appropriate induction / acculturation	+	Student engagement / achievement	2	E18	Student support	AAE
Participant 3	Amount of contact time	+	Engagement and achievement	2	E36	Student support	AAE
Participant 3	Appropriate support for example CASE	+	Progression rates	2	E4	Student support	GO
Participant 3	Tariff	+	Student results	2	E8	Tariff	AAE

Participant 3	Tariff	+	Graduate achievement	2	E20	Tariff	AAE
Participant 3	Appropriate L3 qualifications	+	Student engagement / achievement	2	E21	Tariff	AAE
Participant 3	Tariff	+	Graduate outcomes	2	E26	Tariff	GO
Participant 3	Tariff	+	Uptake of study abroad opportunities	2	E32	Tariff	GO
Participant 3	Tariff	-	Intervention and support needed	2	E27	Tariff	Student support
Participant 3	Teaching personality and fit	+	Engagement	2	E47	Teaching	AAE
Participant 3	Good teaching	+	Progression rates	2	E2	Teaching	GO
Participant 3	Attractiveness of timetable	+	Engagement	2	E38	Timetable	AAE
Participant 3	Amount of support needed	+	Investment required	8	E28	Student support	Investment
Participant 3	Interesting content	+	Assessment achievement	1	E45	Teaching	Assessment
Participant 3	Leadership attitude	+	L&T pedagogy	9	E44	Management	LTI
Participant 3	Investment in workload	+	Personalised delivery, teaching, curriculum	4	E16	Investment	Personalisation
Participant 3	Staff engagement	+	NSS engagement	4	E1	SSMR	NSS
Participant 3	Space on workload	+	Relationship with student	4	E19	Workload	Community
Participant 3	PL relationship with student	+	NSS	8	E33	PL team	NSS
Participant 3	Investment	+	LTI	9	E13	Investment	LTI
Participant 3	Sense of community	+	Post purchase dissonance	1	E35	Community	NSS
Participant 3	Opportunities for engagement	+	Cost	?	E37	Portfolio	Investment

Participant 4	Payment of student PSRB Subs	+	employability	2	E22	Investment	GO
Participant 4	Use of technology	+	Student engagement	2	E20	LTI	AAE
Participant 4	Access to the right CPD	+	SSMR	6	E19	L&T	SSMR
Participant 4	Cohort size	+	Demand for staff	4	E5	Cohort size	Staff
Participant 4	Industry experience	+	Student experience	4	E16	SSMR	NSS
Participant 4	Enthusiasm	+	Productivity	4	E11	SSMR	Staff
Participant 4	Salary	+	Quality of staff recruited	4	E13	SSMR	Staff
Participant 4	Right people	+	Student experience	4	E1	Staff	NSS
Participant 4	Recognition, title	+	SSMR	4	E24	Staff	SSMR
Participant 4	Promotional opportunities	+	Retention	4	E25	Staff	SSMR
Participant 4	Demand for staff	+	Quality of staff recruited	4	E6	Staff	Staff
Participant 4	Right personality	+	Quality of staff recruited	4	E7	Staff	Staff
Participant 4	Type of person	+	Productivity	4	E8	Staff	Staff
Participant 4	PLs	+	Student experience	8	E2	PL team	NSS
Participant 4	PL hours	+	Student experience	8	E3	PL team	NSS
Participant 4	PL dedication and motivation	+	Student experience	8	E4	PL team	NSS
Participant 4	PL allowances	+	Attractiveness of role	8	E23	PL team	PL team
Participant 4	Type of person	+	PL skills and competence	8	E9	Staff	PL team
Participant 4	Commitment to teaching versus admin	+	PL care	8	E10	Staff	PL team
Participant 4	Research activity	+	Interest in students	6	E15	Research	Student support
Participant 4	Investment in staff CPD	+	SSMR	6	E17	Investment	SSMR
Participant 4	Spend on CPD	+	Staff T&D opportunities	11	E18	Investment	Staff

Participant 4	Staff tech training	+	Staff support	9	E21	LTI	SSMR
Participant 4	Length in service	-	Enthusiasm	?	E12	SSMR	SSMR
Participant 4	Length in service	-	Student support offered	?	E14	SSMR	Student support
Participant 5	Outreach activities	+	Reputation	2	E10	GO	Reputation
Participant 5	Articles accepted	+	Recognition	6	E15	Output	Recognition
Participant 5	Conference papers	+	Recognition	6	E16	Output	Recognition
Participant 5	Journal ranking	+	Impact	6	E5	Output	Impact
Participant 5	Outreach activities	+	Impact	6	E9	Research	Impact
Participant 5	Publications	+	Research environment	6	E30	Output	Research environment
Participant 5	Quality of outputs	+	Reputation	6	E4	Output	Reputation
Participant 5	Quality of publications	+	Research output	6	E2	Output	REF
Participant 5	Recognition	+	Chance of good publications	6	E3	Recognition	REF
Participant 5	Recognition of research	+	Impact	6	E13	Recognition	Impact
Participant 5	Recognition of research	+	Publication success	6	E14	Recognition	REF
Participant 5	Research allowance	+	Research bid success	6	E12	Investment	REF
Participant 5	Research environment	+	Research output and success	6	E24	Research environment	Output
Participant 5	Research impact	+	REF	6	E1	Impact	REF
Participant 5	Research reputation	+	Research bid success	6	E11	Reputation	REF
Participant 5	Review activities	+	Recognition	6	E17	Research	Recognition
Participant 5	ECRs	+	Research environment	6	E33	Investment	Research environment
Participant 5	Mentoring	+	Research environment	6	E34	Investment	Research environment
Participant 5	Research focus	-	Teaching focus	6	E37	Staff	Staff
Participant 5	Teaching load	+	Research output	6	E28	Workload	Output

Participant 5	Funding	+	Ability to buy in support	13	E26	Funding	Resource
Participant 5	More opportunities and sources of funding	+	Fund success	6	E25	Funding	Revenue
Participant 5	Doctoral students	+	Research environment	6	E31	Doctoral students	Research environment
Participant 5	Number of doctoral students	+	Demand for supervisors	6	E22	Doctoral students	Supervisors
Participant 5	Number of doctoral students	+	Teaching capacity	6	E21	Doctoral students	Workload
Participant 5	Conference attendance	+	Research environment	6	E32	Investment	Research environment
Participant 5	Reputation	+	Doctoral applications	6	E27	Reputation	Doctoral students
Participant 5	Mentors available	+	Research environment	6	E18	Research environment	Research environment
Participant 5	Mentors available	+	Support to ECRs	6	E19	Research environment	Research environment
Participant 5	Demand for supervisors	+	Supervisor training required	6	E23	Supervisors	T&D
Participant 5	Staff T&D	+	Impact	9	E6	T&D	Impact
Participant 5	Research funding	+	Investment in research	6	E35	Funding	Investment
Participant 5	Amount of external funding	+	Reputation	12	E29	Funding	Reputation
Participant 5	Scholarships / studentships	+	Doctoral student numbers	12	E20	Investment	Doctoral students
Participant 5	Research success	+	Investment in staff	6	E36	REF	Investment
Participant 5	Amount of sources of funding	+	Funding	6	E7	Research	Funding
Participant 5	Success at applying for funding	+	Funding	6	E8	Research	Funding
Participant 6	Academic support	+	Student satisfaction	1	E5	Academic support	NSS
Participant 6	Appropriate assessment mechanism	+	Student satisfaction	1	E3	Assessment	NSS

Participant 6	Clarity of assessments	+	Student satisfaction	1	E4	Assessment	NSS
Participant 6	Community	+	Student satisfaction	1	E10	Community	NSS
Participant 6	Programme leader support	+	student satisfaction	1	E32	PL team	NSS
Participant 6	Pastoral support	+	Student satisfaction	1	E8	Student support	NSS
Participant 6	Complexity of students issues	+	Time to resolve	1	E9	Student support	Workload
Participant 6	Subject interesting	+	Student satisfaction	1	E1	Teaching	NSS
Participant 6	Engagement	+	Learning	2	E31	AAE	AAE
Participant 6	Penalties associated with non-engagement	+	Reputation	2	E13	AAE	Reputation
Participant 6	Academic support	+	Attendance / engagement	2	E6	Academic support	AAE
Participant 6	Academic support	+	Achievement	2	E7	Academic support	AAE
Participant 6	Penalties associated with AMC	+	Reputation	2	E14	AMC	Reputation
Participant 6	Appropriate assessment	-	Failure rate	2	E25	Assessment	AAE
Participant 6	Community	+	Attendance / engagement	2	E11	Community	AAE
Participant 6	Use of technology	+	Student engagement	2	E23	LTI	AAE
Participant 6	Tutor skill	+	Student engagement	2	E21	Staff	AAE
Participant 6	Student profile	+	Attendance / engagement	2	E17	Student	AAE
Participant 6	Student available time to spend on study	+	Attendance / engagement	2	E18	Student	AAE
Participant 6	Culture	+	Attendance / engagement	2	E19	Student	AAE

Participant 6	Appreciation of impact and consequences	+	Attendance / engagement	2	E20	Student	AAE
Participant 6	Students start of year arrival time	-	Engagement and community	2	E39	Student	AAE
Participant 6	Attention to learning / student motivation	+	Engagement and achievement	2	E40	Student	AAE
Participant 6	Preparedness to learn	+	Engagement and achievement	2	E42	Student	AAE
Participant 6	Peer support	+	Student engagement	2	E29	Student support	AAE
Participant 6	Tariff	+	Engagement and achievement	2	E41	Tariff	AAE
Participant 6	Academic engaging	+	Attendance / engagement	2	E2	Teaching	AAE
Participant 6	Module design	+	Student engagement	2	E22	Teaching	AAE
Participant 6	Use of contemporary materials	+	Student engagement	2	E24	Teaching	AAE
Participant 6	Reputation	+	Recruitment	4	E12	Reputation	Enrolment
Participant 6	Attractiveness of portfolio	+	Student recruitment	1	E16	Portfolio	Enrolment
Participant 6	Programme size	-	Ability to build student relationships	8	E36	Cohort size	Community
Participant 6	Community	+	Culture	NA	E26	Community	Community
Participant 6	Closeness of programme	+	Community	1	E35	Community	Community
Participant 6	Cohesiveness of programme	-	Ability to build student relationships	1	E38	Community	Community
Participant 6	Community	+	Reputation	NA	E27	Community	Reputation
Participant 6	Social events	+	Reputation	2	E30	Community	Reputation

Participant 6	Programme team communications	+	Relationships	8	E28	PL team	Community
Participant 6	Communications appropriate and timely	+	Community	8	E33	PL team	Community
Participant 6	Access to programme leader team	+	Community	8	E34	PL team	Community
Participant 6	SSR	-	Ability to build student relationships	8	E37	Student	Community
Participant 6	Word of mouth	+	Reputation	?	E15	Reputation	Reputation
Participant 7	Relationship with students	+	NSS	1	E13	Community	NSS
Participant 7	NSS	+	LTRS	1	E5	NSS	LTRS
Participant 7	Appropriate recruitment policy	+	Appropriate staff recruited	5	E22	Recruitment	Staff
Participant 7	Number of professors	+	Reputation	6	E28	Research environment	Reputation
Participant 7	Attractiveness of campus	+	Applications from open days	1	E18	Community	Enrolment
Participant 7	Number of students	+	Number of staff needed	4	E47	Cohort size	Investment in staff
Participant 7	Number of students	+	Workload	4	E40	Cohort size	Workload
Participant 7	Number of students	-	Ease of delivery	4	E41	Cohort size	Workload
Participant 7	Number of staff	+	Amount of staff spend	4	E46	Investment in staff	Investment in staff
Participant 7	Amount of academic freedom	+	SSMR	4	E42	Management	SSMR
Participant 7	SSMR	+	student experience	4	E31	SSMR	NSS
Participant 7	SSMR	+	NSS and learning and teaching	4	E32	SSMR	NSS
Participant 7	Job security	+	SSMR	4	E39	SSMR	SSMR
Participant 7	Reward and recognition	+	SSMR	4	E24	Staff	SSMR
Participant 7	Promotional opportunities	+	SSMR	4	E34	Staff	SSMR
Participant 7	Flexible working	+	SSMR	4	E35	Staff	SSMR

Participant 7	Opportunities to travel	+	SSMR	4	E38	Staff	SSMR
Participant 7	People strategy	+	Staff and student experience	4	E16	Staff	SSMR / NSS
Participant 7	Staff capacity to support students	+	NSS	4	E14	Workload	NSS
Participant 7	Pressure on staff	-	SSMR	4	E19	Workload	SSMR
Participant 7	Staff capacity	-	Pressure on staff	4	E20	Workload	SSMR
Participant 7	Appropriate balance in workload	+	SSMR	4	E23	Workload	SSMR
Participant 7	Buy talent	+	Associated cost	11	E6	Investment	Investment
Participant 7	SSMR	+	REF	6	E33	SSMR	REF
Participant 7	Amount and calibre of professors	+	Research environment	6	E27	Research environment	Research environment
Participant 7	Number of professors	+	Quality and volume of external relationships	6	E29	Research environment	Research environment
Participant 7	Professor attitude	+	Research environment	6	E26	Research environment	Research environment
Participant 7	Research activity	-	Desire to teach	6	E12	REF	Staff
Participant 7	Staff resource allocated to L&T	-	Staff resource allocated to research	6	E43	Workload	Investment in research
Participant 7	Financial strategy	+	NSS	1	E15	Investment	NSS
Participant 7	Financial strategy focus on estates	-	Expenditure on staff	11	E21	Investment	Investment
Participant 7	Investment	+	LTRS	13	E8	Investment	LTRS
Participant 7	Investment in estates	+	Attractiveness of campus	1	E17	Investment	Community
Participant 7	Number of staff	+	Total research allowance allocated	6	E45	Investment in staff	Workload

Participant 7	Research allowances in the school	+	Amount and quality of research output	6	E44	Research investment	Output
Participant 7	Conference attendance	+	SSMR	6	E37	Investment	SSMR
Participant 7	Savings	-	LTRS	12	E7	Investment	LTRS
Participant 7	size of programme	+	Resources	8	E2	Cohort size	Investment
Participant 7	SSR	+	Spend	1	E1	Cohort size	Investment
Participant 7	T&D opportunities	+	SSMR	6	E36	T&D	SSMR
Participant 7	Tariff	-	Short-term revenue generation	12	E9	Tariff	Investment
Participant 7	Tariff	+	LTRS	1	E10	Tariff	LTRS
Participant 7	Investment	+	Business opportunities	NA	E3	Investment	Enterprise
Participant 7	Value added	+	LTRS	2	E11	GO	LTRS
Participant 7	Desire to build surplus	-	Amount available to invest	12	E4	Investment	Investment
Participant 7	Investment in research	+	Number of professors	6	E30	Investment	Research environment
Participant 7	Size of HEI	-	Focus on research	?	E25	Cohort size	Research environment
Participant 8	How good student is	+	Success of individual learning	1	E33	AAE	Student
Participant 8	Appropriateness of pedagogy and fit	+	Student satisfaction	1	E32	Appropriateness	NSS
Participant 8	Transparency of assessment and feedback	+	Satisfaction assessment and feedback	1	E19	Assessment	A&F score
Participant 8	Underlying processes including marking	+	Satisfaction assessment and feedback	1	E20	Assessment	A&F score

Participant 8	Amount of formative opportunities	+	Satisfaction assessment and feedback	1	E21	Assessment	A&F score
Participant 8	Marking turn around time	+	Satisfaction assessment and feedback	1	E22	Assessment	A&F score
Participant 8	Amount of feedforward	+	Satisfaction assessment and feedback	1	E23	Assessment	A&F score
Participant 8	Use of examples and exemplars	+	Satisfaction assessment and feedback	1	E24	Assessment	A&F score
Participant 8	Confidence in process	+	Satisfaction assessment and feedback	1	E25	Assessment	A&F score
Participant 8	Assessment fit to programme	+	Student satisfaction with A and F	1	E43	Assessment	A&F score
Participant 8	Amount of generic feedback	+	Student satisfaction with A and F	1	E44	Assessment	A&F score
Participant 8	Speed of marking	+	Student satisfaction with A and F	1	E45	Assessment	A&F score
Participant 8	Amount of marking	-	Time available to support students	1	E38	Assessment	Workload
Participant 8	Number of students	-	Personalization	1	E12	Cohort size	Personalization
Participant 8	Student identity	+	Student satisfaction	1	E1	Community	NSS
Participant 8	Learning environment	+	Student satisfaction	1	E28	Community	NSS
Participant 8	Investment in PT	+	Student identity	1	E52	Investment	Community

Participant 8	Value add	+	Student identity	1	E15	GO	Community
Participant 8	Chances to become successful	+	Student satisfaction	1	E3	GO	NSS
Participant 8	Personalization	+	Student identity	1	E4	Personalisation	Community
Participant 8	Time spent on PT activities	+	Student identity	1	E18	PL team	Community
Participant 8	Support available	+	Student identity	1	E5	Staff	Community
Participant 8	Perception of process	+	Satisfaction with assessment and feedback	1	E48	Student	A&F score
Participant 8	Engagement and extracurricular activity	+	Attainment	2	E8	AAE	AAE
Participant 8	Attendance	+	Attainment	2	E36	AAE	AAE
Participant 8	Attendance and engagement	+	Attainment	2	E47	AAE	AAE
Participant 8	Appropriateness of pedagogy and fit	+	Attainment	2	E31	Appropriateness	AAE
Participant 8	Time until assessment deadline	+	Attendance	2	E27	Assessment	AAE
Participant 8	Use of formative feedback	+	Attainment	2	E46	Assessment	AAE
Participant 8	Opportunities to cheat	+	Incidences of AMC	2	E40	Assessment	AMC
Participant 8	Sense of community	-	Incidences of AMC	2	E41	Community	AMC
Participant 8	Access to employers	+	Employability	2	E17	Employability	GO
Participant 8	Access to employers	+	Student satisfaction	2	E16	Employability	NSS
Participant 8	Developing of soft skills	+	Confidence	2	E7	GO	GO
Participant 8	Student confidence in learning process	+	Attainment	2	E39	LTA	AAE
Participant 8	Appropriateness of pedagogy and fit	+	Attendance and engagement	2	E30	LTI	AAE
Participant 8	Appropriate use of technology	+	Engagement	2	E35	LTI	AAE
Participant 8	Relationship with PL	+	Engagement and attendance	2	E53	PL team	AAE

Participant 8	Confidence and ownership of learning	+	Attainment	2	E49	Student	AAE
Participant 8	Control over learning	+	Attainment	2	E50	Student	AAE
Participant 8	Appreciation of impact and consequences of AMC	-	Incidences of AMC	2	E42	Student	AMC
Participant 8	Student on the right programme	+	Employability	2	E10	Student	Employability
Participant 8	Aptitude for vocational learning	+	Employability	2	E11	Student	Employability
Participant 8	Supporting time management skills	+	Attainment	2	E26	Student support	AAE
Participant 8	Amount of support offered	+	Engagement	2	E34	Student support	AAE
Participant 8	Employability support	+	Student satisfaction	2	E14	Student support	NSS
Participant 8	Hours on timetable	+	Attendance	2	E29	Timetable	AAE
Participant 8	Full complement of activities on timetable	+	Attendance and attainment	2	E37	Timetable	AAE
Participant 8	Attractiveness of timetable	+	Attendance	2	E51	Timetable	AAE
Participant 8	Appropriateness of data available	+	Personalization	4	E9	Data	Personalization
Participant 8	Opportunity for self-development	+	Student satisfaction	4	E2	GO	NSS
Participant 8	Relationship with PL	+	Sense of community	8	E54	PL team	Community
Participant 8	Time available to Focus on study	+	Community	1	E6	Student	Community
Participant 8	Type of student	+	Community	1	E13	Student	Community
Participant 9	Collegial atmosphere	+	Research output (quality and amount)	6	E5	Research environment	Output
Participant 9	Engagement in consultancy	+	Quality and quantity of impact case studies	6	E23	Enterprise	Impact
Participant 9	Engagement in consultancy	+	Research outputs	6	E24	Enterprise	Output
Participant 9	Recruitment policy	+	SSMR	4	E19	Recruitment	SSMR

Participant 9	Research culture	+	Research output (quality and amount)	6	E7	Research environment	Output
Participant 9	Research mentor support	+	Research output (quality and amount)	6	E3	Research environment	Output
Participant 9	Research network	+	Research output (quality and amount)	6	E6	Research environment	Output
Participant 9	Research output (quality and amount)	+	Research allowance	6	E11	Output	Investment in research
Participant 9	RIT	+	Teaching quality	6	E21	LTA	Teaching quality
Participant 9	Availability of research mentors	+	Research culture	6	E8	Research environment	Research environment
Participant 9	Membership of appropriate research group	+	Research culture	6	E9	Research environment	Research environment
Participant 9	Research culture	+	SSMR	6	E18	Research environment	SSMR
Participant 9	Research resource	+	REF	6	E1	Research environment	REF
Participant 9	Sympathetic teaching schedule	+	Research output (quality and amount)	6	E4	Workload	Output
Participant 9	Time and support for research	+	Desire to do research	6	E2	Workload	Staff
Participant 9	Amount of resource allowance	+	SSMR	6	E17	Workload	SSMR
Participant 9	Recruitment policy	+	Amount of ECRs	6	E20	Recruitment	Research environment
Participant 9	Calibre of doctoral students	+	Doctoral student research output	6	E13	Doctoral students	REF

			quality and quantity				
Participant 9	Calibre of doctoral students	-	Supervisory support needed	6	E12	Doctoral students	Workload
Participant 9	Number of doctoral students teaching	+	Teaching capacity	6	E15	Doctoral students	Workload
Participant 9	Recruitment policy	+	Calibre of doctoral students	6	E16	Research environment	Doctoral students
Participant 9	Amount of sponsorships	+	Amount of doctoral students	6	E14	Investment in research	Doctoral students
Participant 9	Research allowance	+	Research output (quality and amount)	6	E10	Investment in research	Output
Participant 9	Investment in research	+	SSMR	6	E22	Investment in research	SSMR
Participant 10	Appropriateness of assessment	+	A&F score	1	E44	Assessment	A&F score
Participant 10	Reputation	+	Calibre of students	1	E6	Reputation	Student
Participant 10	Appropriateness of assessment	+	Student engagement in A&F	2	E45	Assessment	AAE
Participant 10	Use of digital tools	+	Student engagement	2	E46	LTA	AAE
Participant 10	SSMR	+	Engage in community and ethos	2	E18	SSMR	Community
Participant 10	Amount of timetabled activity	+	Perception of value add	2	E9	Timetable	GO
Participant 10	Ability to build competence	+	Ability to build workforce	NA	E42	HR	HR
Participant 10	Calibre of staff	+	Quality of outputs	6	E10	Staff	Output
Participant 10	Appropriate staff development	+	Staff value - SSMR	5	E13	T&D	SSMR
Participant 10	Quality of outputs	+	SSMR	6	E15	Output	SSMR

Participant 10	Quality of outputs	+	Attractiveness of HEI as a place of work	6	E16	Output	Staff
Participant 10	Relationships	+	SSMR	4	E19	Community	SSMR
Participant 10	Part of the HEI community	+	SSMR	4	E37	Community	SSMR
Participant 10	Applicant suitability	+	Chance of application	4	E28	HR	HR
Participant 10	Appropriateness of grade	+	Staff performance	4	E34	HR	HR
Participant 10	Cost of living in location	-	Attractiveness of HEI as a place of work	4	E39	HR	HR
Participant 10	Attractiveness of HEI as a place of work	+	Amount and calibre of staff applicants	4	E40	HR	HR
Participant 10	Amount of churn	+	Currency and mix	4	E41	HR	HR
Participant 10	Talent management plan	+	Talent reaching potential	4	E11	HR	SSMR
Participant 10	Talent reaching potential	+	SSMR	4	E12	HR	SSMR
Participant 10	Performance management appropriate	+	SSMR	4	E22	HR	SSMR
Participant 10	Distributed justice	+	SSMR	4	E23	HR	SSMR
Participant 10	Feel valued and listened to	+	SSMR	4	E26	HR	SSMR
Participant 10	Applicant suitability	+	SSMR	4	E29	HR	SSMR
Participant 10	Appropriateness of grade	+	SSMR	4	E35	HR	SSMR
Participant 10	Enabling individuals to build their value	+	SSMR	4	E36	HR	SSMR
Participant 10	Fairness of grade / pay	+	SSMR	4	E38	HR	SSMR
Participant 10	Reward and recognition	+	Attractiveness of HEI as a place of work	4	E21	HR	Staff
Participant 10	Location	+	Attractiveness of HEI as a place of work	4	E27	HR	Staff

Participant 10	Build capability	+	Teaching quality	4	E43	HR	Teaching quality
Participant 10	Ability to borrow / buy resource	+	Resource capacity	4	E30	HR	Workload
Participant 10	LTRS	+	Attractiveness of HEI to potential staff	4	E2	LTRS	Recruitment
Participant 10	Line manager fit	+	SSMR	4	E24	Management	SSMR
Participant 10	Confidence in HEI management team	+	SSMR	4	E25	Management	SSMR
Participant 10	Appropriateness of staff recruited	+	Quality of the product offering	4	E5	Recruitment	Portfolio
Participant 10	Appropriateness of HEI recruitment strategy	+	Appropriateness of staff recruited	4	E4	Recruitment	Recruitment
Participant 10	Reputation	+	Attractiveness of HEI to potential staff	4	E1	Reputation	Recruitment
Participant 10	Reputation	+	Calibre of staff	4	E7	Reputation	Staff
Participant 10	SSMR	+	Staff performance	4	E33	SSMR	HR
Participant 10	SSMR	+	Happy with workload	4	E20	SSMR	Workload
Participant 10	Clarity of expectations of staff	+	SSMR	4	E17	Staff	SSMR
Participant 10	Stakeholders' opinion	+	Attractiveness of HEI to potential staff	4	E3	Stakeholders	Recruitment
Participant 10	Audit staff needs	+	Develop appropriate opportunities	5	E49	T&D	HR
Participant 10	Workload model fit for purpose	+	Quality of outputs	6	E14	Workload	Output
Participant 10	Calibre of students	+	Reputation	1	E32	Student	Reputation
Participant 10	Develop T&L skills	+	Build workforce capacity and capability	5	E47	LTA	HR

Participant 10	Developmental opportunities	+	SSMR	5	E48	T&D	SSMR
Participant 10	LTRS	+	Stakeholders' opinion	1	E8	LTRS	Stakeholders
Participant 10	Number of students	-	Reputation	1	E31	Cohort size	Reputation
Participant 11	Amount of alternative modes used in delivery	+	Time needed to support and deliver	1	E15	LTA	Workload
Participant 11	Knowledge about processes	+	Student experience	1	E11	Staff	NSS
Participant 11	Student expectations	-	Expected response time	1	E10	Student	Workload
Participant 11	Diversity of student body	+	Time needed to ensure all satisfied	1	E14	Student	Workload
Participant 11	Student attendance and engagement	+	Student understanding	2	E17	AAE	AAE
Participant 11	Student understanding	+	Attainment	2	E18	AAE	AAE
Participant 11	Attendance	+	Engagement	2	E23	AAE	AAE
Participant 11	Amount of alternative modes used in delivery	+	Student attendance and engagement	2	E16	LTA	AAE
Participant 11	Student conscientiousness	+	Student attendance and engagement	2	E19	Student	AAE
Participant 11	Time spent creating personal connection	+	Student attendance and engagement	2	E20	Student	AAE
Participant 11	Distance student lives from campus	-	Student attendance and engagement	2	E21	Student	AAE
Participant 11	Cost of travel to HEI	-	Student attendance and engagement	2	E22	Student	AAE

Participant 11	Student motivation	+	Student attendance and engagement	2	E25	Student	AAE
Participant 11	Student calibre	+	Engagement in extracurricular activities	2	E26	Student	Community
Participant 11	Convenience of timetable	+	Student attendance	2	E24	Timetable	AAE
Participant 11	Number of assessments	+	Amount of marking	4	E4	Assessment	Workload
Participant 11	Number of assessments	+	Amount of student emails	4	E5	Assessment	Workload
Participant 11	Clarity of assessment brief	-	Amount of student emails	4	E6	Assessment	Workload
Participant 11	Student understanding of processes	-	Amount of student emails	4	E7	Assessment	Workload
Participant 11	Process efficiency	-	Response time	4	E12	IPO	Workload
Participant 11	Desire for research success	+	Staff personal time invested	2	E27	Research	Staff
Participant 11	Knowledge about processes	-	Time responding to queries	4	E9	Staff	Workload
Participant 11	Amount of admin support	+	Academic time available for other academic activities	4	E13	Staff support	Workload
Participant 11	Amounts of training required	+	Hours on workload	4	E3	T&D	Workload
Participant 11	Allowances for personal development	+	Success	4	E1	Workload	SSMR
Participant 11	Amount of email traffic	+	Difficult to plan workload	4	E2	Workload	Workload
Participant 11	Amount of admin support	-	Academic time on admin support	4	E8	Workload	Workload

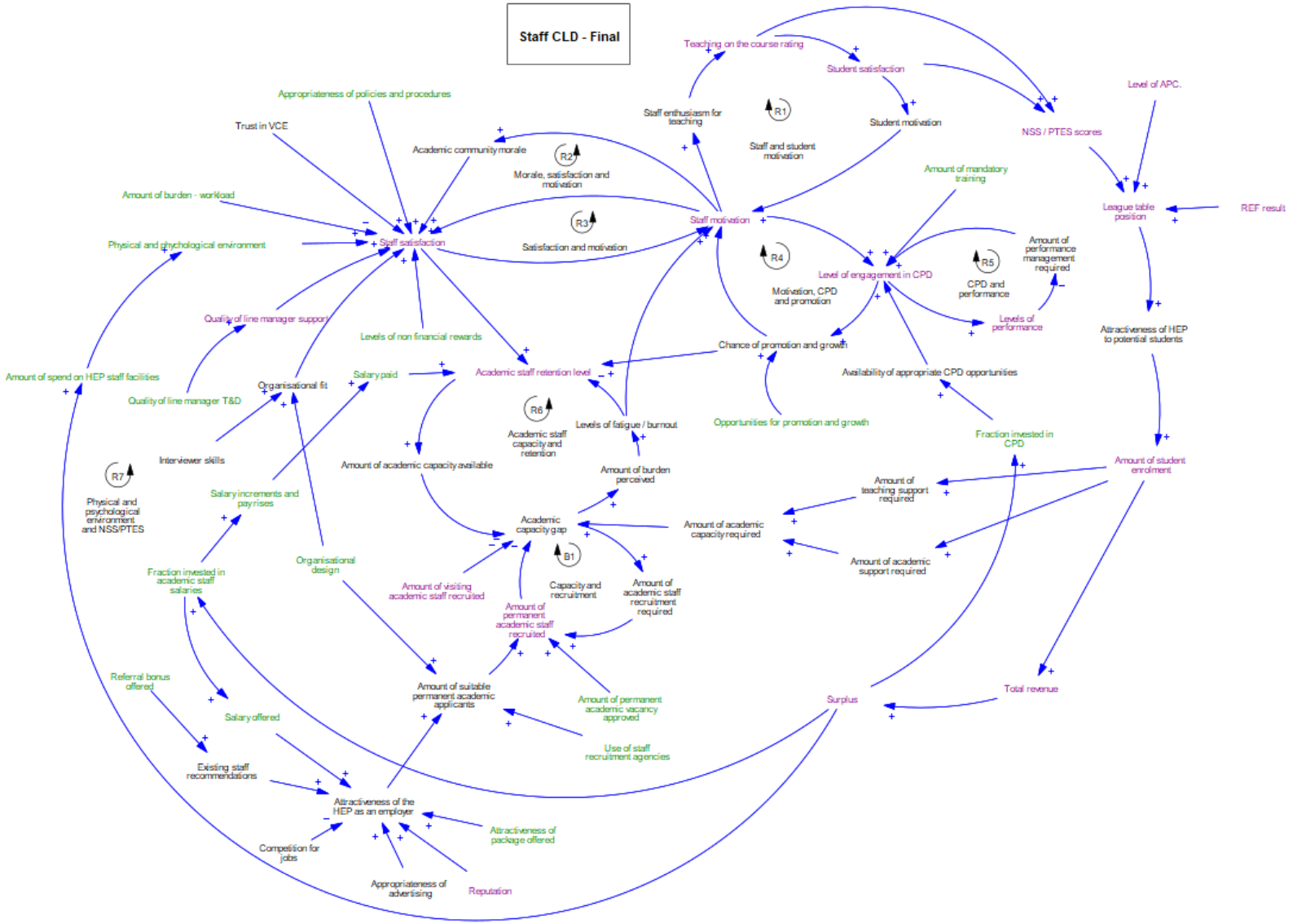
Appendix 11: School validation meetings participant list

No.	Position	Round	CLDs
P1	School Senior Manager with responsibility for staff (visiting) and staff development	R1P5	Staff
P2	Professor	R2P9	REF
P3	School Dean (as stand in for Associate Dean of Research)	R1P13	REF, finance
P4	School Programme Leader largest generalist PG programme	R2P6	Community, PLT
P5	School Programme Leader largest UG specialist programme	R2P8	PLT
P6	School Senior Manager with responsibility for student experience	R2P3	Community, PLT, employability, learning and teaching
P7	School Senior Manager with responsibility for staff (permanent)	R2P4	Community
P8	School Senior Manager with responsibility for staff (permanent) and workload	R1P7	Employability, staff
P9	School Deputy Programme Leader large PG programme	R1P9	Employability
P10	School Senior Manager with responsibility for academic quality	R1P14	Learning and teaching
P11	Full time Senior lecturer with a research allowance and teaching	R2P11	Staff, learning and teaching
P12	School Senior Manager with responsibility for staff (permanent)	R2P10	Staff

Appendix 12: External validation meetings participant list

No.	Position	CLD
P1	HEP Pro VC Research	REF
P2	HEP Deputy Director HR	Staff
P3	HEP Leader for Learning and Teaching	Community, PLT, learning and teaching
P4	HEP Director of Finance	Finance
P5	HEP Registrar (responsible for all professional staff decisions)	Staff
P6	HEP Deputy VC and Pro VC business and International Development	Community, learning and teaching, staff

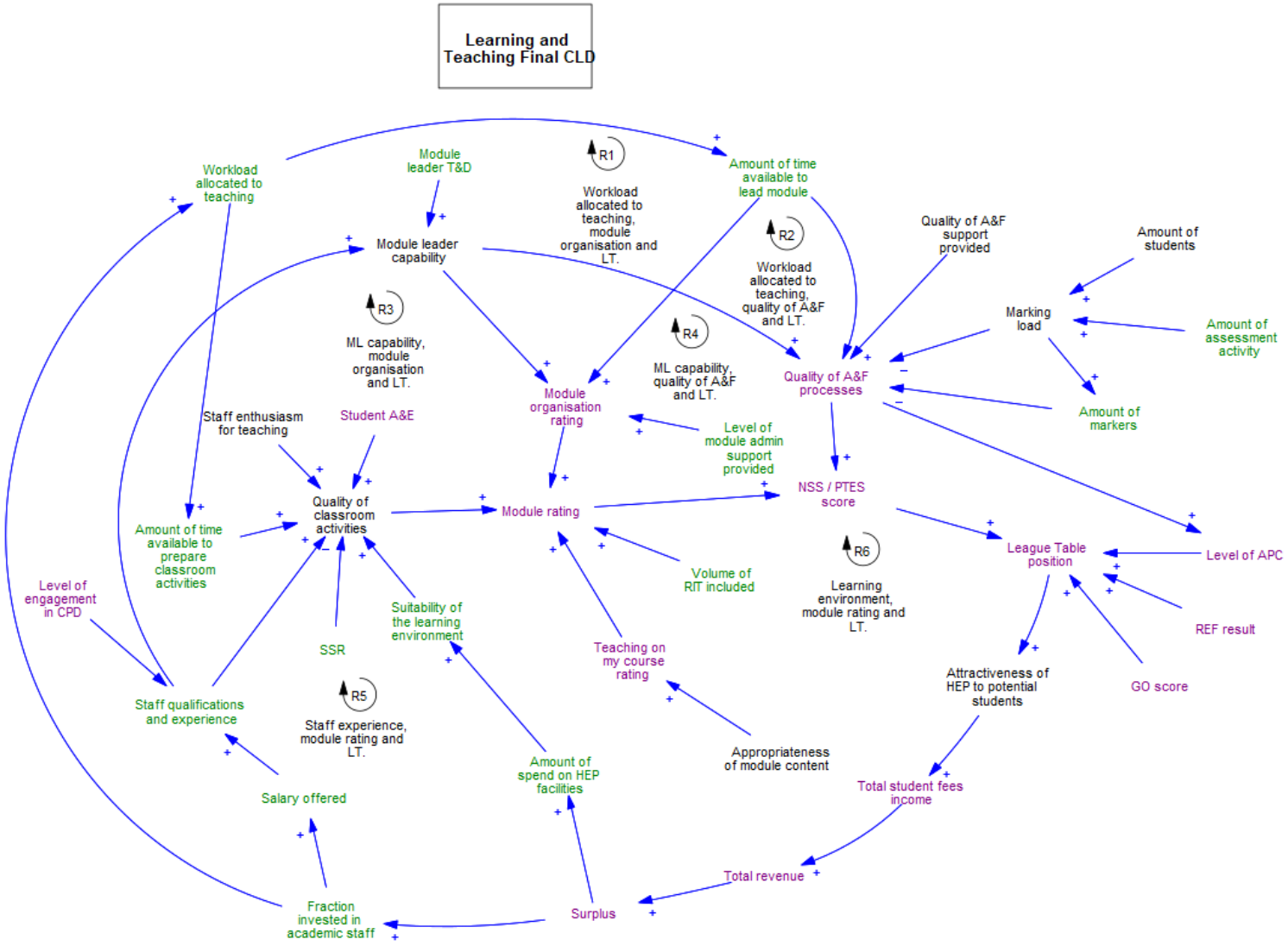
Appendix 13: Staff causal loop diagram



Appendix 14: Staff causal loop diagram variable list

Staff variables	Status	Definitions
Academic capacity gap		Difference between the amount of academic capacity required and the amount of academic capacity available and recruited
Academic community morale		Depends on staff motivation
Academic staff retention level	KPI	Depends on staff satisfaction, salary and chance of promotion and growth
Amount of academic capacity available		Depends on pool of staff and retention of those staff
Amount of academic capacity required		Depends on the amount of teaching and academic support required
Amount of academic staff recruitment required		Depends on the academic capacity gap
Amount of academic support required		Depends on the amount of student enrolment, this is the programme leader and study support provided by academics
Amount of burden - perceived		Depends on how big the academic capacity gap is as to how overworked staff feel
Amount of burden - workload	Lever	Depends on how high the workload is and how the workload is calculated
Amount of mandatory training	Lever	Decision to be made and depends level of capability required
Amount of performance management required		Depends on staff level of performance
Amount of permanent academic staff recruited		Depends on the amount of applicants but also how much recruitment has been approved
Amount of permanent academic vacancy approved	Lever	Decision about amount of staff to appoint
Amount of spend on HEP staff facilities	Lever	Spending on staff offices etc.
Amount of student enrolment	KPI	Depends on attractiveness of HEP to potential students
Amount of suitable permanent academic applicants		Depends on the organisational design, attractiveness of the HEP as an employer and use of staff recruitment agencies
Amount of teaching support required		Depends on the amount of student enrolment, this is the teaching activity required
Amount of visiting academic staff recruited		These are staff on visiting lecturer contracts that reduce the academic capacity gap
Appropriateness of advertising		This relates to where the academic vacancies are being advertised to attract applications
Appropriateness of policies and procedures	Lever	Relating to the staff employment rights
Attractiveness of HEP as an employer		Depends on salary, recommendations, competition, advertising, reputation and package offered
Attractiveness of HEP to potential students		Depends on league table position
Attractiveness of package offered	Lever	Includes holidays, pension and any other deals
Availability of appropriate CPD opportunities		This includes external and internal opportunities for both subject and pedagogic development
Chance of promotion and growth		Depends on the opportunities for promotion and growth
Competition for jobs		Depends on other HEP recruitment
Existing staff recommendations		Depends on referral bonus offered
Fraction invested in academic staff salaries	Lever	Decision to be made and depends on surplus
Fraction invested in continuing professional development	Lever	Decision to be made and depends on surplus
Interviewer skills		Ability of the interviewer to both determine and secure the appropriate candidate
League table position	KPI	Depends on NSS/PTES, level of APC and REF
Level of attainment, progression and continuation	KPI	Measure of student success
Level of non-financial rewards	Lever	Levels of non-financial awards (e.g. trips to visit foreign partners, opportunities to attend conferences)
Level of engagement in continuing professional development	KPI	Depends on staff motivation, amount of mandatory training and required training due to performance management
Levels of fatigue / burnout		Depends on the burden staff feel
Levels of performance	KPI	In staff delivery
NSS / PTES scores	KPI	PEF scores
Opportunities for promotion and growth	Lever	Decision about what opportunities are provided for staff
Organisational design	Lever	Appropriateness of job design (expectations of the role)
Organisational fit		How well the member of staff aligns to the organisation and its culture
Physical and psychological environment	Lever	Depends on spend and refers to offices but also how safe staff feel
Quality of line management support	KPI	Includes consistency of practice, impacted by quality of line manager training and development
Quality of line management training and development	Lever	Decision about who provides this and what this entails
REF result	KPI	PEF result
Referral bonus offered	Lever	Decision to offer this to staff to boost recruitment success
Reputation	KPI	External perception of HEP by potential applicants
Salary increments and pay rises	Lever	Depends on amount invested in academic staff salaries
Salary offered	Lever	Depends on amount invested in academic staff salaries
Salary paid	Lever	Depends on amount invested in academic staff salaries and increments and pay rises
Staff enthusiasm for teaching	KPI	Depends on staff motivation, enthusiasm in class
Staff motivation	KPI	Depends on staff satisfaction and also chance of promotion and growth
Staff satisfaction	KPI	Depends on multiple factors
Student motivation	KPI	Depends on student satisfaction
Student satisfaction	KPI	Depends on teaching on the course rating
Surplus	KPI	Determined by revenue
Teaching on the course rating	KPI	Depends on staff enthusiasm
Total revenue	KPI	Depends on amount of student enrolment
Trust in the VCE	Lever	Includes level of consultation, measured in staff survey
Use of staff recruitment agencies	Lever	Decision to be made that will impact success when recruiting

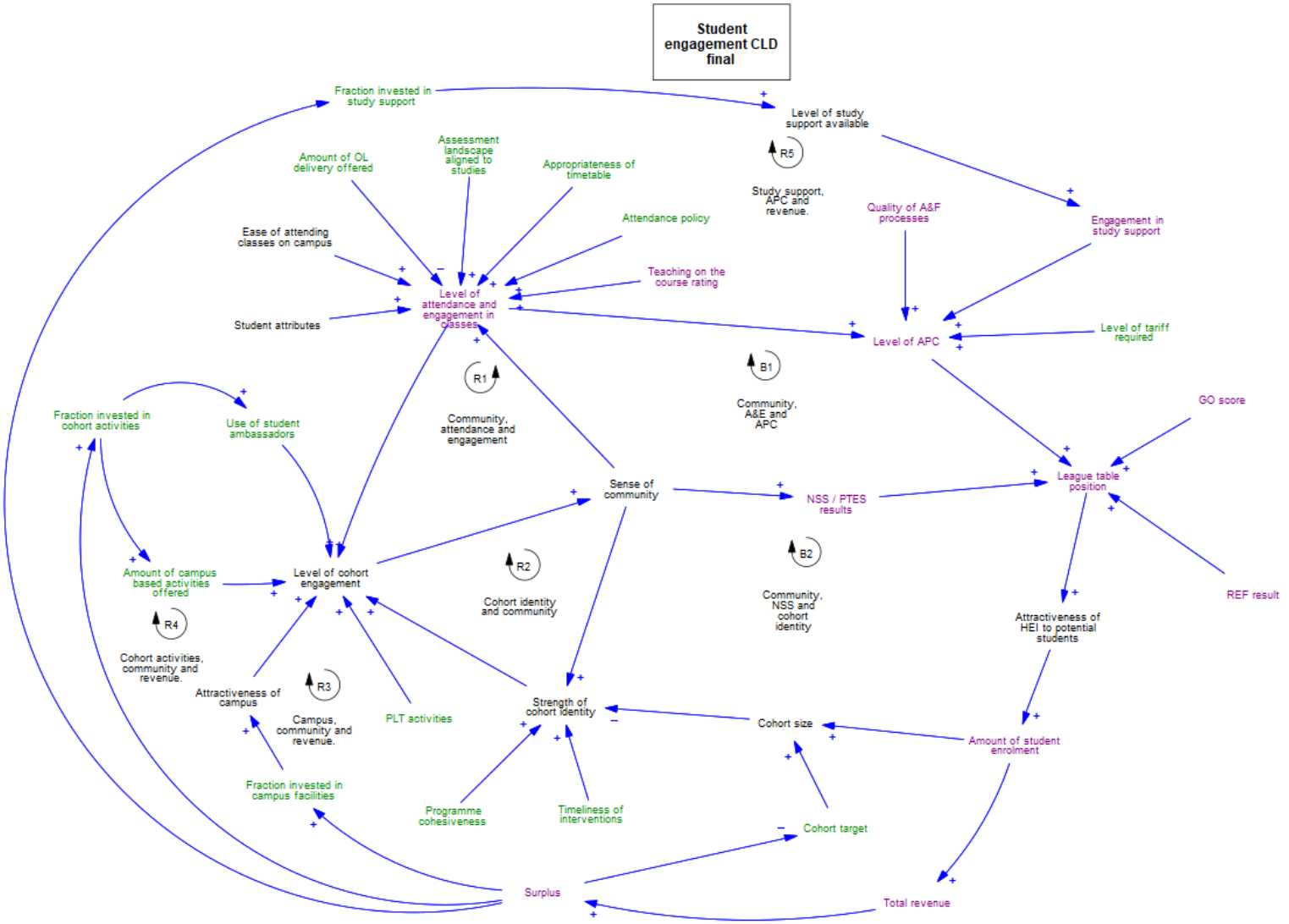
Appendix 15: Learning and teaching causal loop diagram



Appendix 16: Learning and teaching causal loop variable list

Learning and teaching variables	Status	Definitions
Amount of assessment activity	Lever	Number and type of assessment
Amount of spend on HEP facilities	Lever	Decision about the spending on student facilities
Amount of time available to lead module	Lever	Decision about the amount of workload allocated to this activity
Amount of time available to prepare classroom activities	Lever	Decision about the amount of workload allocated to this activity
Appropriateness of module content		Suitability of content for that level of student, contemporary issues covered
Attractiveness of HEP to potential students		Depends on league table position
Fraction invested in academic staff	Lever	Decision that impacts the amount of workload that is allocated to module delivery
Graduate outcomes score	KPI	PEF score
League table position	KPI	Depends on NSS/PTES, level of APC and REF
Level of attainment, progression and continuation	KPI	Measure of student success
Level of engagement in continuing professional development	KPI	Depends on staff motivation, amount of mandatory training and required training due to performance management
Level of module administrative support provided	Lever	Support for module leader with administrative tasks needed
Marking load		Amount of marking to be undertaken
Module leader capability		Depends on their qualifications and experience as well as their training and development
Module leader training and development	Lever	Decision about the training and development provided
Module organisation rating	KPI	Student rating of how well organised they consider the module to be
Module rating	KPI	Overall rating that inludes organisation and teaching
NSS / PTES scores	KPI	PEF scores
Amount of markers	Lever	Depends on marking load
Amount of students		Undertaking the assessment
Quality of assessment and feedback processes	KPI	Determined by the students and impacted by module leader capability and quality of the support provided
Quality of assessment and feedback support provided	Lever	Determined by the students
Quality of classroom activities		Determined by the students and impacted by multiple factors
REF result	KPI	PEF score
Salary offered	Lever	Depends on amount invested in academic staff salaries
Staff enthusiasm for teaching		Depends on staff motivation, enthusiasm in class
Staff qualifications and experience	Lever	Depends on salary offered
Staff student ratio	Lever	Decision about the ratio of staff to students
Student attendance and engagement		Measure of student attendance and engagement
Suitability of the learning environment	Lever	Spending of LRC, classrooms and student space
Surplus	KPI	Determined by revenue
Teaching on my course rating	KPI	Impacted by appropriateness of module content
Total revenue	KPI	Depends on total student fees income
Total student fees income	KPI	Depends on attractiveness of HEP to potential students
Volume of research informed teaching included	Lever	Decision based on HEP strategy
Workload allocated to teaching	Lever	Decision depends on fraction invested in academic staff

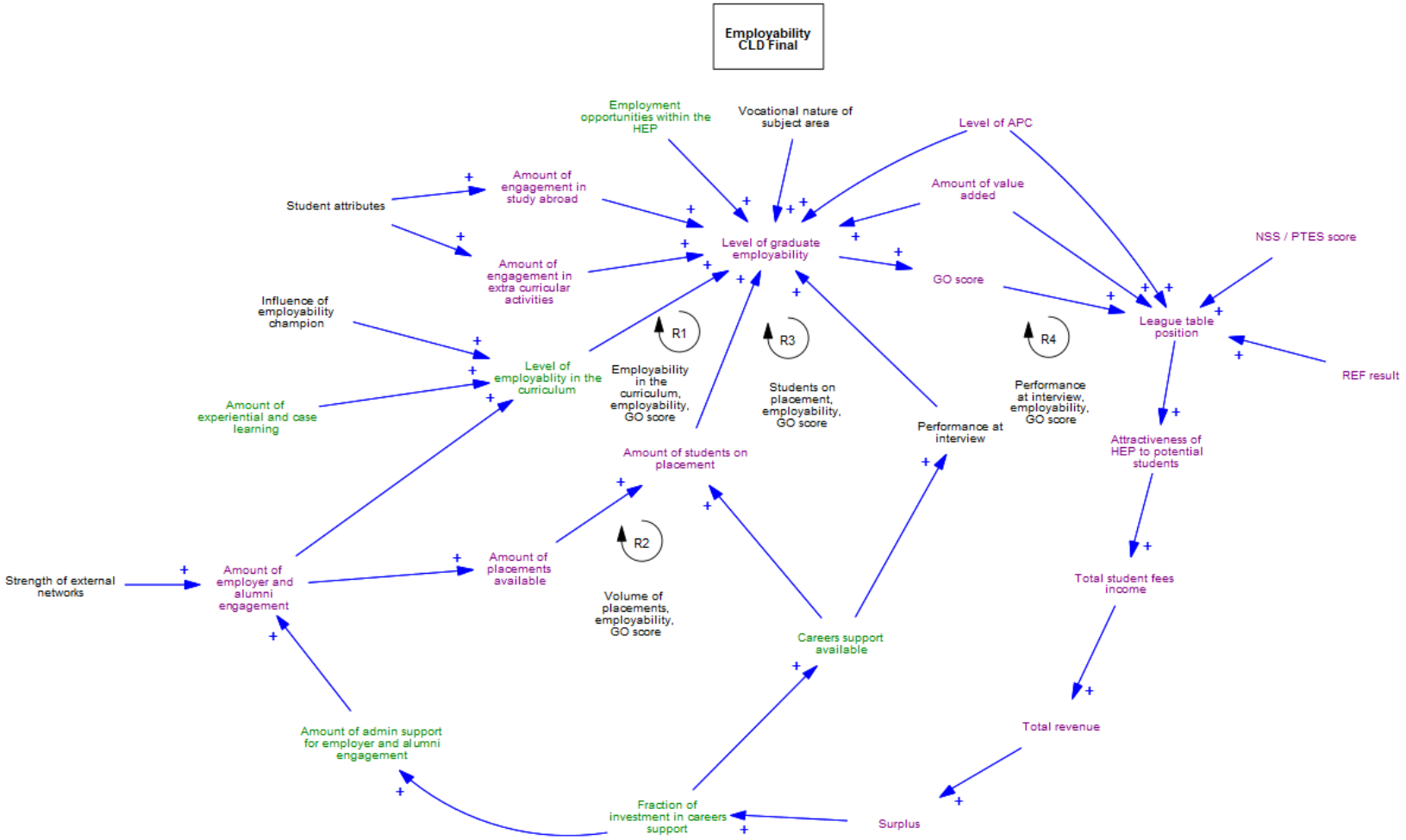
Appendix 17: Student engagement causal loop diagram



Appendix 18: Student engagement variable list

Student engagement variables	Status	Definitions
Amount of campus based activities offered		Depends on fraction invested in cohort activities
Amount of online delivery offered	Lever	Decision about pedagogy
Appropriateness of timetable	Lever	Decision about pedagogy
Assessment Landscape aligned to studies	Lever	Decision about pedagogy
Attendance policy	Lever	Decision about pedagogy
Attractiveness of campus		Depends on fraction invested in campus facilities
Attractiveness of HEP to potential students		Depends on league table position
Cohort size	Lever	Depends on amount of student enrolment and the cohort target
Cohort target	Lever	Decision to be made depending on the income required
Ease of attending classes on campus		Student driven variable
Engagement in study support	KPI	Depends on the level of study support available
Fraction invested in campus facilities	Lever	Decision to be made
Fraction invested in cohort activities	Lever	Decision to be made
Fraction invested in study support	Lever	Decision to be made
Graduate outcomes score	KPI	PEF score
League table position	KPI	Depends on NSS/PTES, level of APC and REF
Level of attainment, progression and continuation	KPI	Measure of student success
Level of attendance and engagement in classes	KPI	Depends on multiple variables
Level of cohort engagement		Measure of how engaged and present the cohort are and depends on multiple variables
Level of study support available		Depends on the fraction invested in study support
Level of tariff required	Lever	Decision that will impact student outcomes
NSS / PTES results	KPI	PEF scores
Programme cohesiveness	Lever	Decision which will depend on the size and structure of the programme
Programme leader team activities	Lever	Activities that the programme leader team provide to get the cohort to engage
Quality of assessment and feedback processes	KPI	Determined by the students and impacted by module leader capability and quality of the support provided
REF result	KPI	PEF score
Sense of community		How much the students feel that they are a part of a community
Strength of cohort identity		Depends on multiple factors and impacts the level of cohort engagement
Student attributes		Including their social, economic and educational backgrounds
Surplus	KPI	Determined by revenue
Teaching on the course rating	KPI	Impacted by appropriateness of module content
Timeliness of interventions	Lever	Decision about when to run events and activities
Total revenue	KPI	Depends on total student fees income
Use of student ambassadors	Lever	Decision dependent on investment available
Amount of student enrolment	KPI	Depends on attractiveness of HEP

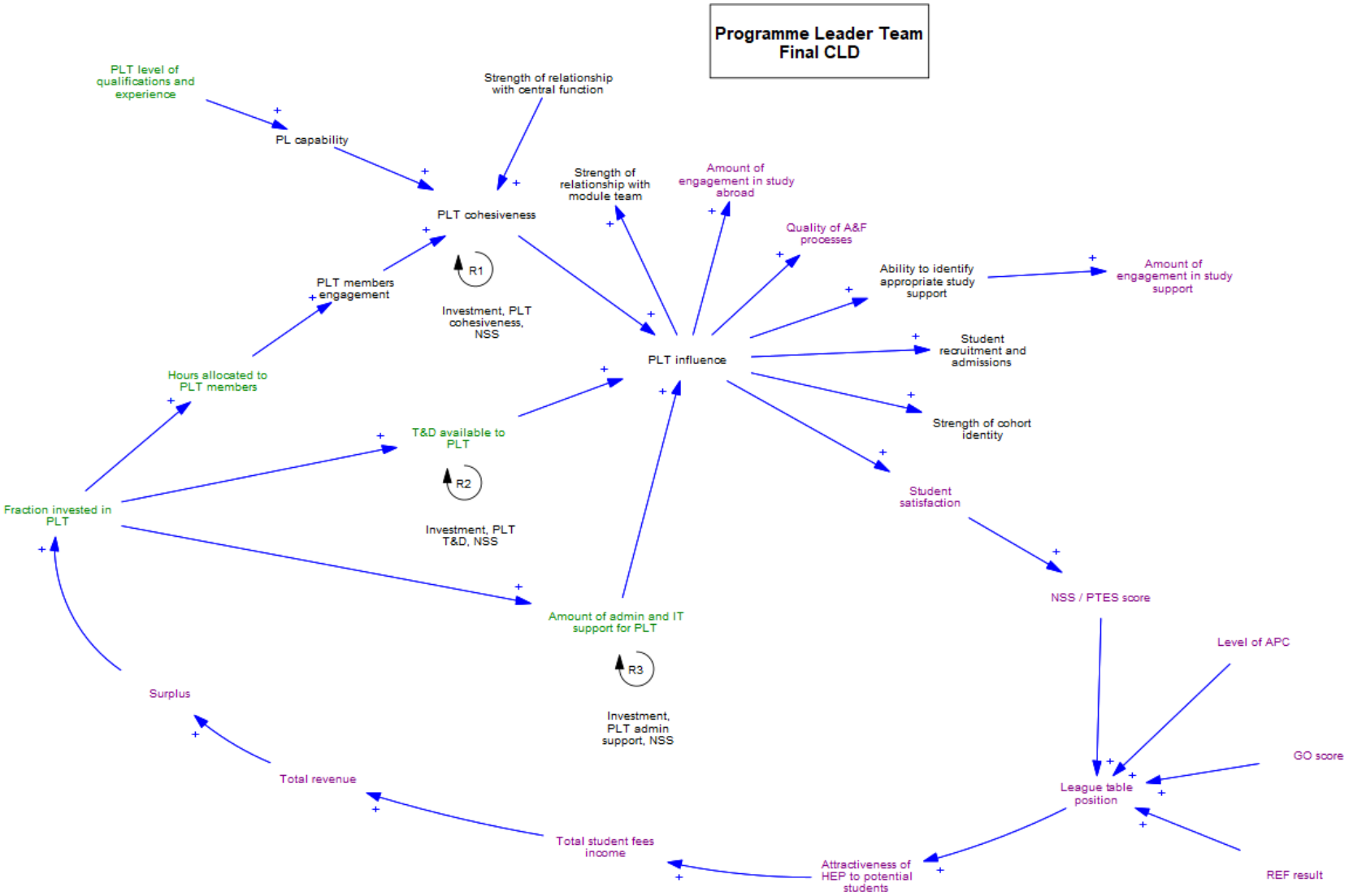
Appendix 19: Employability causal loop diagram



Appendix 20: Employability variable list

Employability variables	Status	Definitions
Amount of employer and alumni engagement		Depends on the strength of the external networks
Amount of engagement in extracurricular activities	KPI	Depends on student attributes and capability to engage
Amount of engagement in study abroad	KPI	Depends on student attributes and capability to engage
Amount of experiential and case learning	Lever	Decision about pedagogy
Amount of placements available	KPI	Depends on the amount of employer and alumni engagement
Amount of students on placement	KPI	Depends on the amount of placements available
Amount of value added		Impacts level of graduate employability and league table position
Attractiveness of HEP to potential students		Depends on league table position
Careers support available	Lever	Depends on the fraction of investment in careers support
Employability opportunities within the HEP		Decision to be made
Fraction of investment in careers support	Lever	Decision to be made
Graduate outcomes score	KPI	PEF score
Influence of employability champion		How much impact the employability champion has with this agenda
League table position	KPI	Depends on NSS/PTES, level of APC and REF
Level of admin support for employer and alumni engagement	Lever	Depends on the fraction of investment in careers support
Level of attainment, progression and continuation	KPI	Measure of student success
Level of employability in the curriculum	Lever	Depends on the influence of the employability champion and the pedagogy
Level of graduate employability	KPI	Depends on multiple factors
NSS / PTES scores	KPI	PEF scores
Performance at interview		Depends on careers support
REF result	KPI	PEF score
Strength of external networks		How well connected the HEP is with the local employers and industries
Student attributes		Including their social, economic and educational backgrounds
Surplus	KPI	Determined by revenue
Total revenue	KPI	Depends on total student fees income
Total student fees income	KPI	Depends on attractiveness of HEP to potential students
Vocational nature of the subject area		Will impact graduate employability

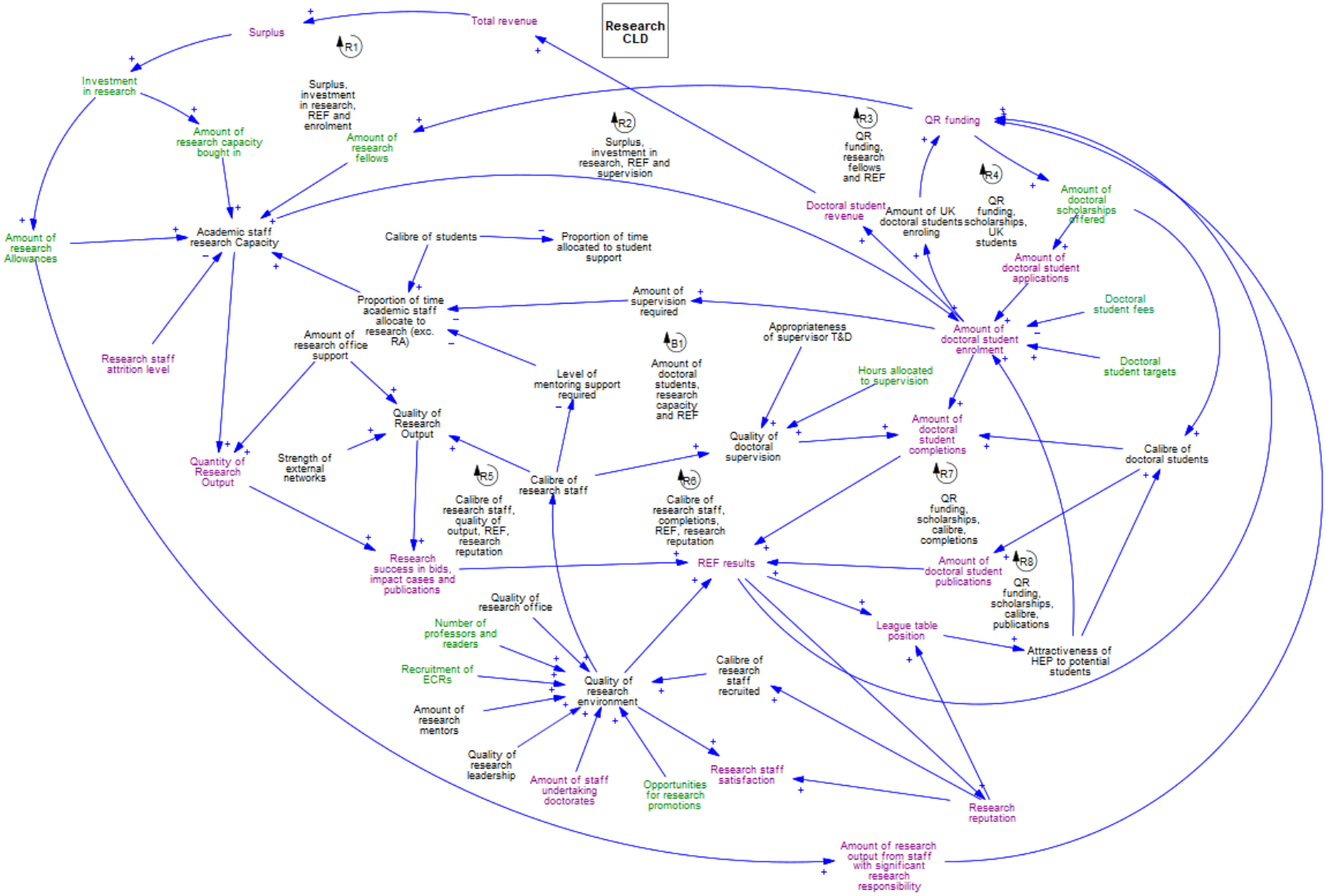
Appendix 21: Programme leader team causal loop diagram



Appendix 22: Programme leader team variable list

Programme leader team variables	Status	Definitions
Ability to identify appropriate study support		Depends on the PLT influence on what is offered
Amount of administrative and IT support for PLT		Depends on the fraction invested in programme leader team
Amount of engagement in study abroad	KPI	Depends on student attributes and capability to engage
Amount of engagement in study support	KPI	Depends on the PLT influence
Attractiveness of HEP to potential students		Depends on league table position
Fraction invested in programme leader team	Lever	Decision to be made
Graduate outcomes score	KPI	PEF score
Hours allocated to programme leader team members	Lever	Depends on the fraction invested in programme leader team
League table position	KPI	Depends on NSS/PTES, level of APC and REF
Level of attainment, progression and continuation	KPI	Measure of student success
NSS / PTES scores	KPI	PEF scores
Programme leader team capability		Depends on their level of qualifications and experience
Programme leader team cohesiveness		Depends on their capablity and engagement
Programme leader team influence	KPI	Depends on their cohesiveness, training and development and admin support
Programme leader team level of qualifications and experience	Lever	Decision relating to staff recruitment
Programme leader team members engagement		Depends on the hours alocated to the activity
Quality of assessment and feedback processes		Determined by the students and impacted by module leader capability and quality of the support provided
REF result	KPI	PEF score
Strength of cohort identity		Depends on multiple factors and impacts the level of cohort engagement
Strength of relationship with central function		Depends on the HEP strategy
Strength of relationship with module team		Depends on the programme leader team influence
Student recruitment and admissions		Depends on the programme leader team influence
Student satisfaction	KPI	Depends on multiple factors
Surplus	KPI	Determined by revenue
Total revenue	KPI	Depends on total student fees income
Total student fees income	KPI	Depends on attractiveness of HEP to potential students
Training and development available to programme leader team	Lever	Depends on the fraction invested in programme leader team

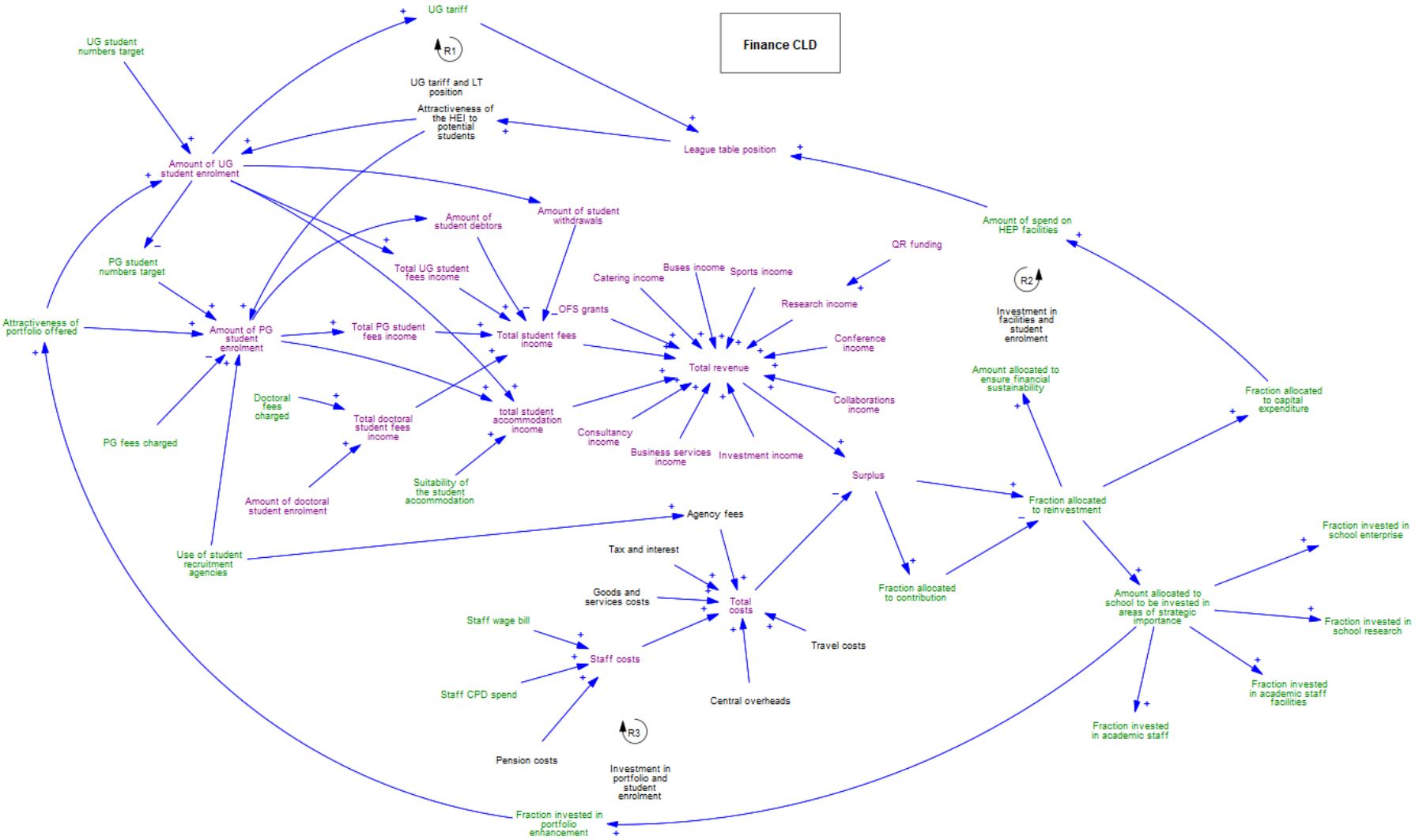
Appendix 23: Research causal loop diagram



Appendix 24: Research variable list

REF Variables	Status	Definitions
Academic staff research capacity		Total capacity from a variety of sources
Amount of doctoral scholarships offered	Lever	Depends on QR funding
Amount of doctoral student applications	KPI	Depends on amount of doctoral scholarships offered
Amount of doctoral student completions	KPI	Depends on the amount and calibre of the students as well as the quality of the supervision
Amount of doctoral student enrolment	KPI	Depends on multiple factors
Amount of doctoral student publications	KPI	Depends on the calibre of the students
Amount of research allowances	Lever	Depends on the fraction invested in research
Amount of research capacity bought in	Lever	Depends on the fraction invested in research
Amount of research fellows	Lever	Depends on QR funding
Amount of research mentors		Impacts the quality of the research environment
Amount of research office support		Depends on the HEP research strategy
Amount of research output from staff with significant research responsibility		Depends on the fraction invested in research
Amount of research staff (promoted)	Lever	
Amount of research staff (recruited)	Lever	
Amount of staff undertaking doctorates	KPI	Impacts the quality of the research environment and a HEP strategy
Amount of supervision required		Depends on the amount of doctoral student enrolment
Amount of UK doctoral students enrolling		Impacts QR funding
Appropriateness of supervisor training and development		Will impact the quality of supervision
Attractiveness of HEP to potential students	KPI	Depends on league table position
Calibre of doctoral students		Depends on amount of doctoral scholarships offered
Calibre of research staff		Depends on the quality of the research environment
Calibre of research staff recruited		Depends on HEP research reputation
Calibre of students		Will impact the amount of time required to support them and therefore impacts the time remaining for research
Doctoral student fees	Lever	Decision to be made
Doctoral student revenue	KPI	Depends on the amount of doctoral student enrolment
Doctoral student targets	Lever	Decision to be made
Fraction invested in research	Lever	Decision to be made
Hours allocated to supervision	Lever	Decision to be made
League table position	KPI	Depends on NSS/PTES, level of APC and REF
Level of mentoring support required		Depends on the calibre of the research staff and impacts the available time left to engage in research
Number of professors and readers	Lever	Depends on the HEP research strategy
Opportunities for research promotions	Lever	Depends on the HEP research strategy
Proportion of time academic staff allocate to research		Depends on the amount of time to be allocated to other activities
Proportion of time allocated to student support		Depends on the calibre of the students
QR funding	KPI	Impacted by amount of UK doctoral students, REF result and research output from staff with significant research responsibility
Quality of doctoral supervision		Depends on the time available, calibre of the staff and the training and development
Quality of research environment		Depends on multiple factors
Quality of research leadership		Depends on the HEP research strategy
Quality of research office		Depends on the HEP research strategy
Quality of research output		Depends on research office support, strength of external networks and the calibre of the research staff
Quantity of research output		Depends on research office support and research capacity
Recruitment of ECRs	Lever	Depends on the HEP research strategy
REF result	KPI	PEF result
Research reputation	KPI	Depends on REF result
Research staff attrition level		Impacts research capacity
Research staff satisfaction	KPI	Depends on the quality of the research environment
Research success in bids, impact cases and publications	KPI	Depends on the quality and quantity of research output
Strength of external networks		How well connected the HEP is with the local employers and industries
Surplus	KPI	Determined by revenue
Total revenue	KPI	Depends on total student fees income

Appendix 25: Finance causal loop diagram



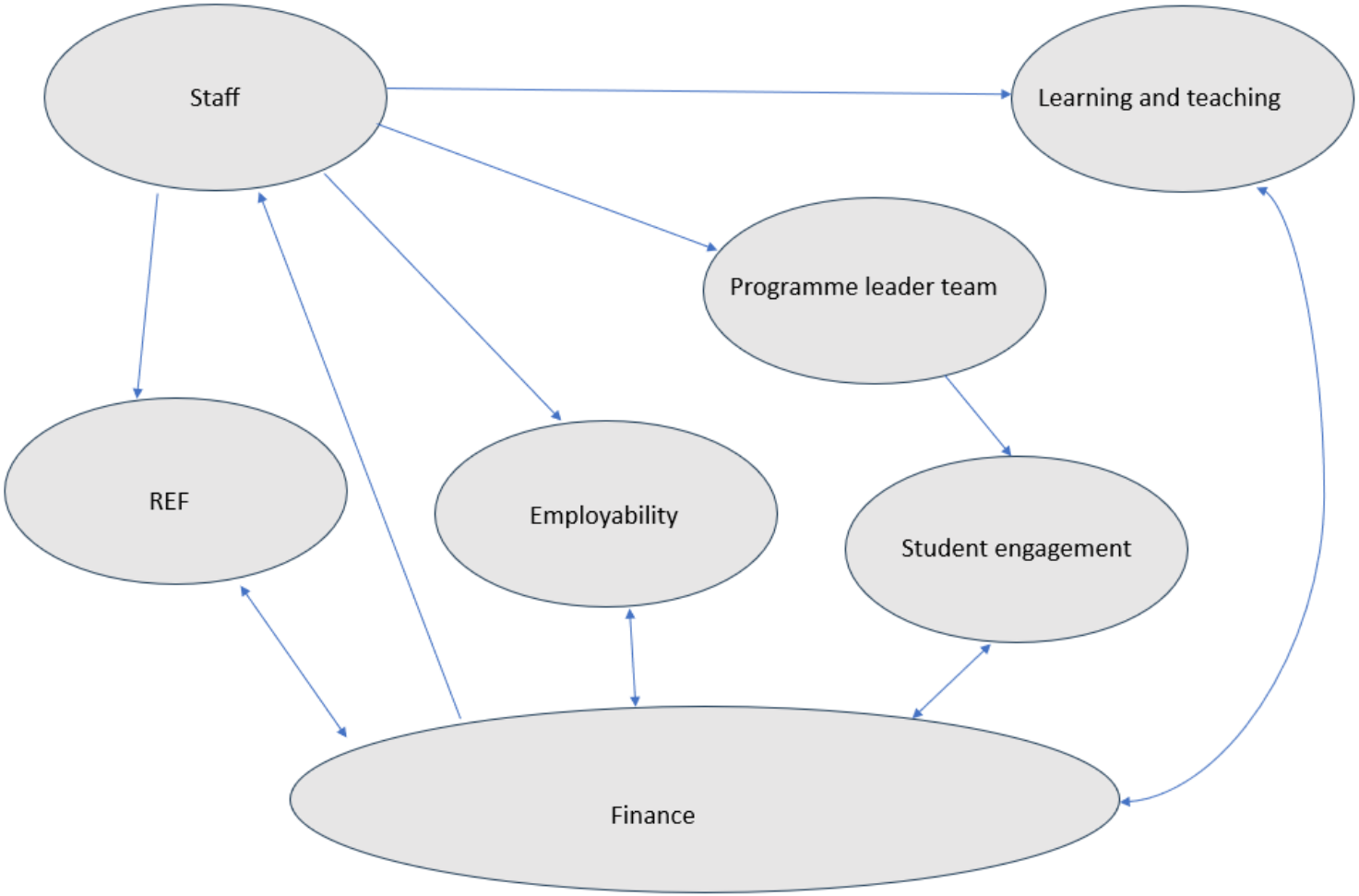
Appendix 26: Finance variable list

Finance Variables	Status	Definitions
Agency fees		One of the HEP costs
Amount allocated to ensure financial sustainability	Lever	Decision to be made
Amount allocated to school to be invested in areas of strategic importance	Lever	Decision to be made
Amount of doctoral student enrolment	KPI	Decision to be made
Amount of postgraduate student enrolment	KPI	Impacted by multiple variables
Amount of spend on HEP facilities	Lever	Decision to be made
Amount of student debtors	KPI	Increases as PG student enrolment increases and impacts income
Amount of student withdrawals	KPI	Increases as UG student enrolment increases and impacts income
Amount of undergraduate student enrolment	KPI	Impacted by multiple variables
Attractiveness of HEP to potential students		Depends on league table position
Attractiveness of portfolio offered	Lever	Decision to be made about the range of programmes offered
Buses income	KPI	One of the HEP sources of income
Business services income	KPI	One of the HEP sources of income
Catering income	KPI	One of the HEP sources of income
Central overheads		Costs of central functions including HR, marketing and accounting
Collaborations income	KPI	One of the HEP sources of income
Conference income	KPI	One of the HEP sources of income
Consultancy income	KPI	One of the HEP sources of income
Doctoral fees charged	Lever	Decision to be made
Fraction allocated to capital expenditure	Lever	Decision to be made
Fraction allocated to contribution	Lever	Decision to be made, amount the school pays back to the centre
Fraction allocated to reinvestment	Lever	Decision to be made
Fraction invested in academic staff	Lever	Decision to be made
Fraction invested in academic staff facilities	Lever	Decision to be made
Fraction invested in school enterprise	Lever	Decision to be made
Fraction invested in school research	Lever	Decision to be made
Fraction invested on portfolio enhancement	Lever	Decision to be made
Goods and services costs		One of the HEP costs
Investment income	KPI	One of the HEP sources of income
League table position	KPI	Depends on NSS/PTES, level of APC and REF
Office for students grants	KPI	One of the HEP sources of income
Pension costs		One of the HEP costs
Post graduate fees charged	Lever	Decision to be made
Postgraduate student numbers target	Lever	Decision to be made
QR funding	KPI	One of the HEP sources of income
Research income	KPI	One of the HEP sources of income partly from QR funding
Sports income	KPI	One of the HEP sources of income
Staff continuing professional development spend	Lever	Decision to be made
Staff wage bill	Lever	Decision to be made
Suitability of student accommodation	Lever	Decision to be made
Surplus	KPI	Determined by revenue
Tax and interest		One of the HEP costs
Total costs	KPI	Total HEP costs
Total doctoral student fees revenue	KPI	Depends on doctoral student enrolment
Total PG student fees revenue	KPI	Depends on PG student enrolment
Total revenue	KPI	Total HEP revenue from all sources of income
Total staff costs	KPI	Total HEP staff costs
Total student accommodation income	KPI	Depends on suitability of student accommodation
Total student fees income	KPI	Total income from all students in the HEP
Total UG student fees revenue	KPI	Depends on UG student enrolment
Travel costs		One of the HEP costs
Undergraduate student numbers target	Lever	Decision to be made
Undergraduate tariff	Lever	Decision to be made
Use of student recruitment agencies	Lever	Decision to be made

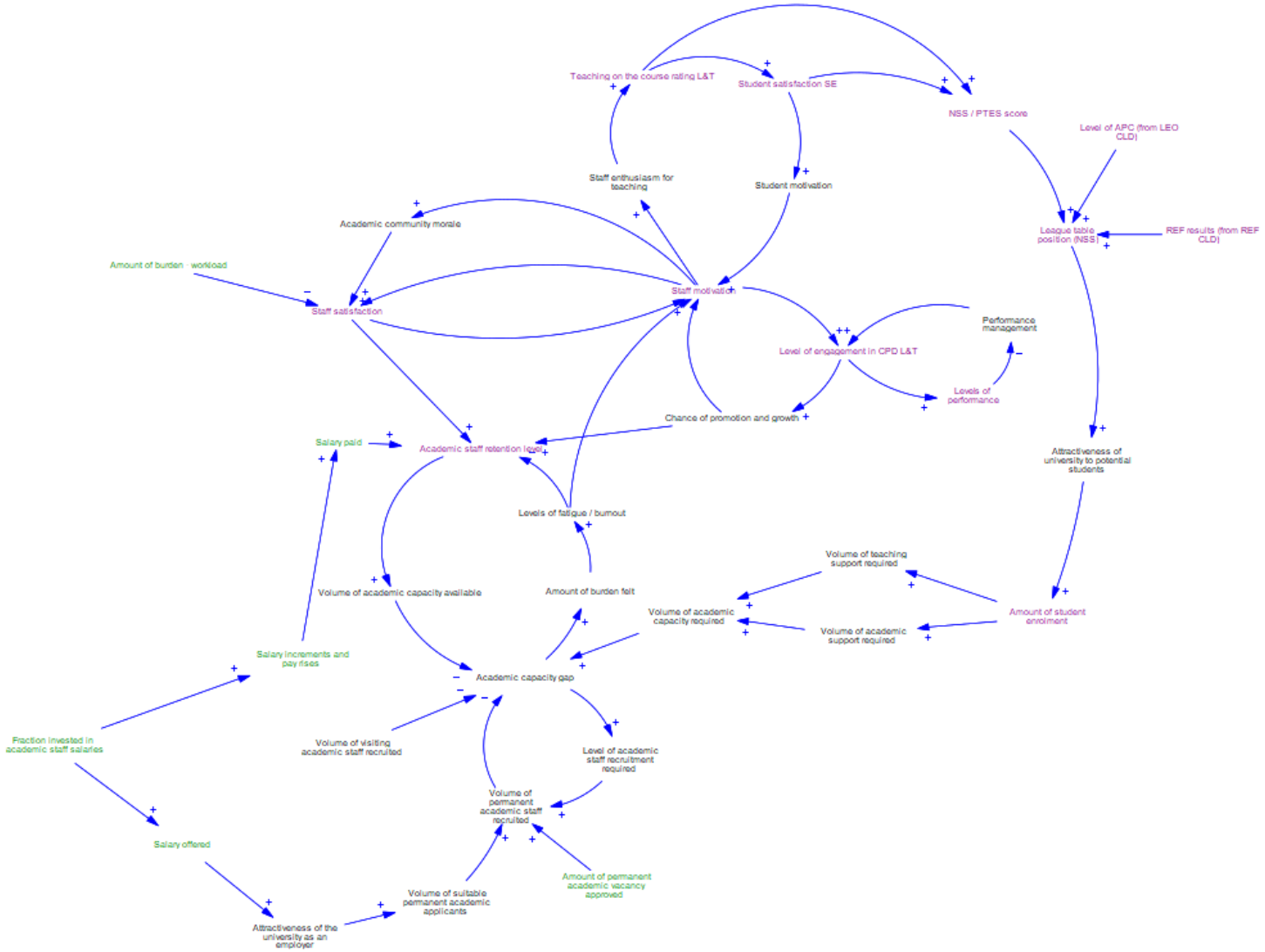
Appendix 27: Variables occurring in more than one causal loop diagram

CLD	All variables	Status	CLDs
Finance	Amount of doctoral student enrolment	KPI	Finance, REF
REF	Amount of doctoral student enrolment	KPI	Finance, REF
Employability	Amount of engagement in study abroad	KPI	Employability, PLT
PLT	Amount of engagement in study abroad	KPI	Employability, PLT
PLT	Amount of engagement in study support	KPI	PLT, Student engagement
Student engage	Amount of engagement in study support	KPI	PLT, Student engagement
Finance	Amount of spend on HEP facilities	Lever	Finance, L&T, Staff
L&T	Amount of spend on HEP facilities	Lever	Finance, L&T, Staff
Staff	Amount of spend on HEP facilities	Lever	Finance, L&T, Staff
Employability	Attractiveness of HEP to potential students	KPI	Employability, Finance, L&T, PLT, Staff, Student engagement
Finance	Attractiveness of HEP to potential students	KPI	Employability, Finance, L&T, PLT, Staff, Student engagement
L&T	Attractiveness of HEP to potential students	KPI	Employability, Finance, L&T, PLT, Staff, Student engagement
PLT	Attractiveness of HEP to potential students	KPI	Employability, Finance, L&T, PLT, Staff, Student engagement
REF	Attractiveness of HEP to potential students	KPI	Employability, Finance, L&T, PLT, Staff, Student engagement
Staff	Attractiveness of HEP to potential students	KPI	Employability, Finance, L&T, PLT, Staff, Student engagement
Student engage	Attractiveness of HEP to potential students	KPI	Employability, Finance, L&T, PLT, Staff, Student engagement
Finance	Fraction invested in academic staff	Lever	Finance, L&T
L&T	Fraction invested in academic staff	Lever	Finance, L&T
Employability	Graduate outcomes score	KPI	Employability, L&T, PLT, Student engagement
L&T	Graduate outcomes score	KPI	Employability, L&T, PLT, Student engagement
PLT	Graduate outcomes score	KPI	Employability, L&T, PLT, Student engagement
Student engage	Graduate outcomes score	KPI	Employability, L&T, PLT, Student engagement
Employability	League table position	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Finance	League table position	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
L&T	League table position	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
PLT	League table position	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
REF	League table position	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Staff	League table position	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Student engage	League table position	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Employability	Level of attainment, progression and continuation	KPI	Employability, L&T, PLT, Staff, Student engagement
L&T	Level of attainment, progression and continuation	KPI	Employability, L&T, PLT, Staff, Student engagement
PLT	Level of attainment, progression and continuation	KPI	Employability, L&T, PLT, Staff, Student engagement
Staff	Level of attainment, progression and continuation	KPI	Employability, L&T, PLT, Staff, Student engagement
Student engage	Level of attainment, progression and continuation	KPI	Employability, L&T, PLT, Staff, Student engagement
Employability	NSS / PTES results	KPI	Employability, L&T, PLT, Staff, Student engagement
L&T	NSS / PTES results	KPI	Employability, L&T, PLT, Staff, Student engagement
PLT	NSS / PTES results	KPI	Employability, L&T, PLT, Staff, Student engagement
Staff	NSS / PTES results	KPI	Employability, L&T, PLT, Staff, Student engagement
Student engage	NSS / PTES results	KPI	Employability, L&T, PLT, Staff, Student engagement
Finance	QR funding	KPI	Finance, REF
REF	QR funding	KPI	Finance, REF
L&T	Quality of assessment and feedback processes	KPI	L&T, PLT, Student engagement
PLT	Quality of assessment and feedback processes	KPI	L&T, PLT, Student engagement
Student engage	Quality of assessment and feedback processes	KPI	L&T, PLT, Student engagement
Employability	REF result	KPI	Employability, L&T, PLT, REF, Staff, Student engagement
L&T	REF result	KPI	Employability, L&T, PLT, REF, Staff, Student engagement
PLT	REF result	KPI	Employability, L&T, PLT, REF, Staff, Student engagement
REF	REF result	KPI	Employability, L&T, PLT, REF, Staff, Student engagement
Staff	REF result	KPI	Employability, L&T, PLT, REF, Staff, Student engagement
Student engage	REF result	KPI	Employability, L&T, PLT, REF, Staff, Student engagement
L&T	Salary offered	Lever	L&T, Staff
Staff	Salary offered	Lever	L&T, Staff
L&T	Staff enthusiasm for teaching	KPI	L&T, Staff
Staff	Staff enthusiasm for teaching	KPI	L&T, Staff
PLT	Strength of cohort identity		PLT, Student engagement
Student engage	Strength of cohort identity		PLT, Student engagement
Employability	Strength of external networks		Employability, REF
REF	Strength of external networks		Employability, REF
Employability	Student attributes		Employability, Student engagement
Student engage	Student attributes		Employability, Student engagement
PLT	Student satisfaction	KPI	PLT, Staff
Staff	Student satisfaction	KPI	PLT, Staff
Employability	Surplus	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Finance	Surplus	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
L&T	Surplus	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
PLT	Surplus	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
REF	Surplus	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Staff	Surplus	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Student engage	Surplus	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
L&T	Teaching on my course rating	KPI	L&T, Staff, Student engagement
Staff	Teaching on the course rating	KPI	L&T, Staff, Student engagement
Student engage	Teaching on the course rating	KPI	L&T, Staff, Student engagement
Employability	Total revenue	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Finance	Total revenue	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
L&T	Total revenue	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
PLT	Total revenue	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
REF	Total revenue	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Staff	Total revenue	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Student engage	Total revenue	KPI	Employability, Finance, L&T, PLT, REF, Staff, Student engagement
Employability	Total student fees income	KPI	Employability, Finance, L&T, PLT
L&T	Total student fees income	KPI	Employability, Finance, L&T, PLT
PLT	Total student fees income	KPI	Employability, Finance, L&T, PLT
Finance	Total student fees revenue	KPI	Employability, Finance, L&T, PLT

Appendix 28: Overview framework for the school causal loop diagram



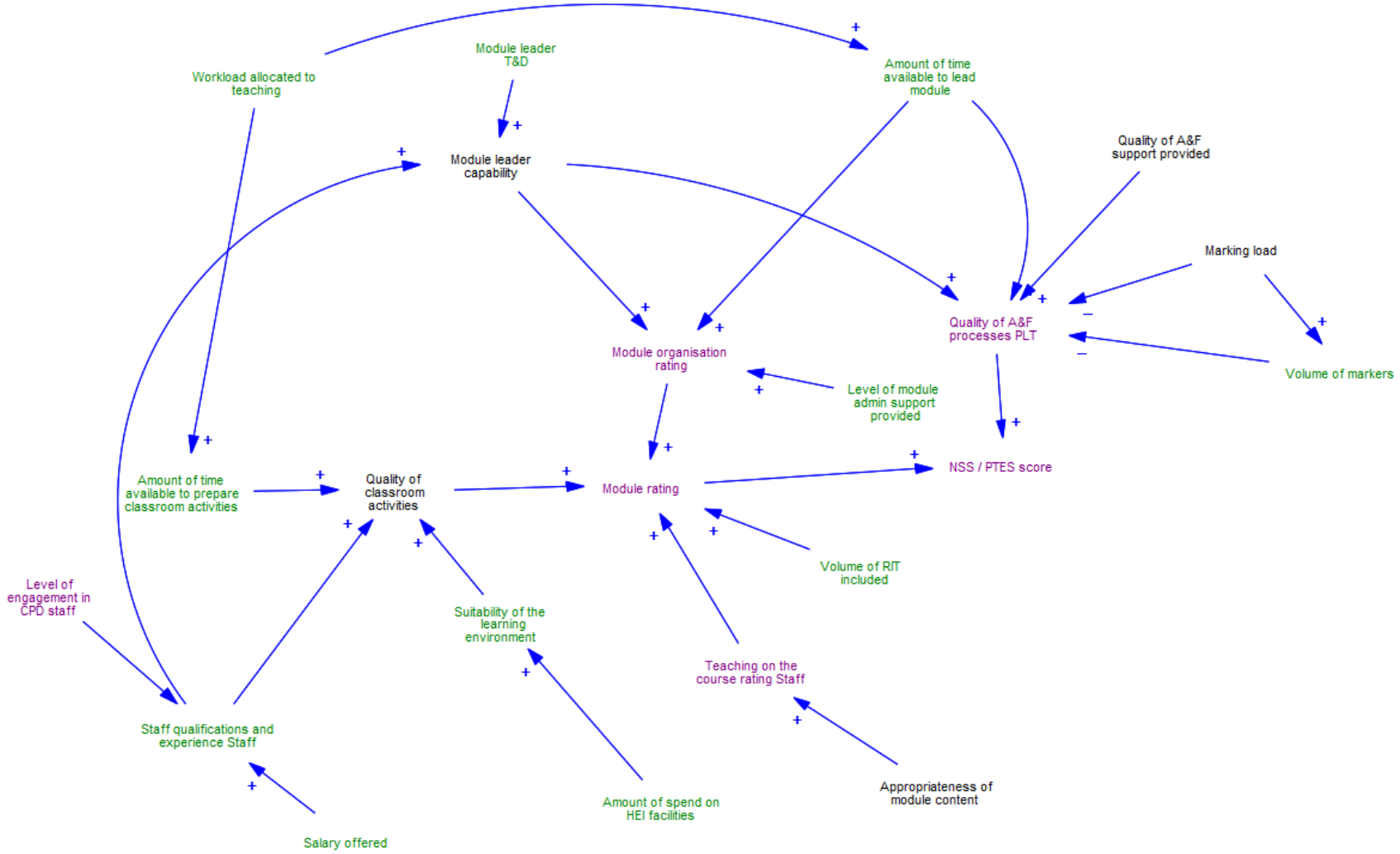
Appendix 29: Staff component in school causal loop diagram



Appendix 30: Staff component variables in school causal loop diagram

Staff variables	Status	SCLD	FL	Feedback loops	SM
Academic capacity gap		Y	R6, B1		
Academic community morale		O	R2	R1 Staff and student motivation	A
Academic staff retention level	KPI	Y	R6	R2 Morale, satisfaction and motivation	A
Amount of academic capacity available		Y	R6	R3 Satisfaction and motivation	Y
Amount of academic capacity required		Y		R4 Motivation, CPD and promotion	Y
Amount of academic support required		A		R5 CPD and performance	O
Amount of burden - perceived		R	R6	R6 Academic staff, capacity and retention	Y
Amount of burden - workload	Lever	A		B1 Capacity and recruitment	Y
Amount of mandatory training	Lever	O			
Amount of performance management required		O	R5		
Amount of permanent academic staff recruited	KPI	Y		A - Aggregated	
Amount of permanent academic vacancy approved		Y		E - Expanded	
Amount of spend on HEP staff facilities	Lever	O		M - Moved but in the overall map	
Amount of student enrolment	KPI	Y		O - Outside of scope of research	
Amount of suitable permanent academic applicants		Y		R - Renamed	
Amount of teaching support required		A		S - Superfluous	
Amount of visiting academic staff recruited	KPI	Y		Y - Yes	
Appropriateness of advertising		A			
Appropriateness of policies and procedures	Lever	O			
Attractiveness of HEP as an employer		A			
Attractiveness of HEP to potential students		A			
Attractiveness of package offered	Lever	A			
Availability of appropriate CPD opportunities		A			
Chance of promotion and growth		Y	R4		
Competition for jobs		A			
Existing staff recommendations		A			
Fraction invested in academic staff salaries	Lever	R			
Fraction invested in continuing professional development	Lever	Y			
Interviewer skills		O			
League table position	KPI	Y			
Level of academic staff recruitment required		Y			
Level of APC	KPI	Y			
Level of non-financial rewards	Lever	Y			
Levels of engagement in CPD	KPI	Y	R4, R5		
Levels of fatigue / burnout		Y	R6		
Levels of performance	KPI	O	R5		
NSS / PTES score	KPI	Y			
Opportunities for promotion and growth provided	Lever	Y			
Organisational design	Lever	O			
Organisational fit		O			
Physical and psychological environment	Lever	O			
Quality of line management support	KPI	O			
Quality of line management training and development	Lever	O			
REF results	KPI	Y			
Referral bonus offered	Lever	A			
Reputation	KPI	S			
Revenue	KPI	Y			
Salary increments and pay rises	Lever	Y			
Salary offered	Lever	A			
Salary paid	Lever	R			
Staff enthusiasm for teaching		Y	R1		
Staff motivation	KPI	Y	R1, R2, R3, R4		
Staff satisfaction	KPI	Y	R2, R3		
Student motivation		A	R1		
Student satisfaction	KPI	M	R1		
Surplus	KPI	S			
Teaching on my course rating	KPI	A	R1		
Total revenue	Lever	Y			
Trust in the VCE		O			
Use of staff recruitment agencies	Lever	A			

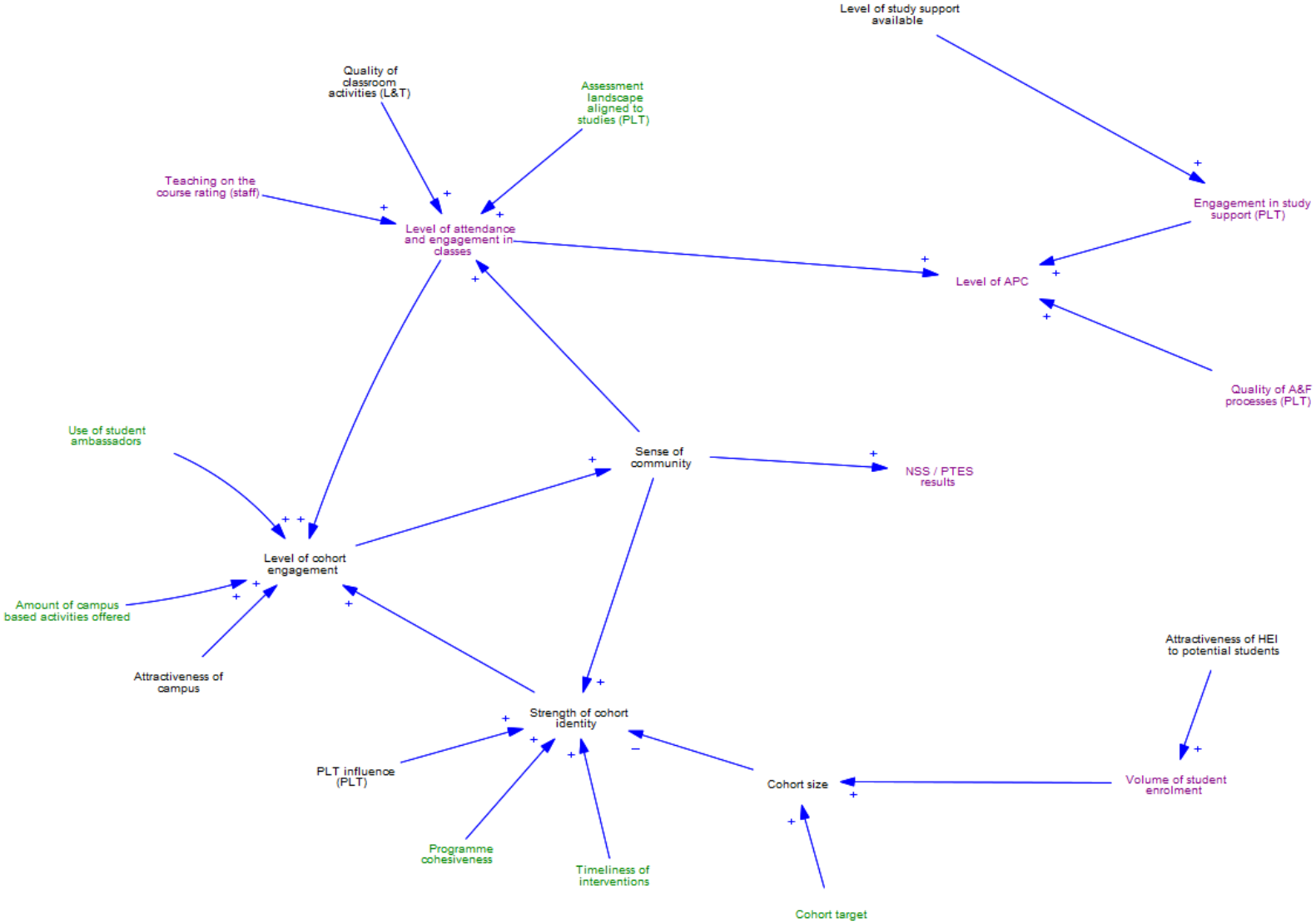
Appendix 31: Learning and teaching component in school causal loop diagram



Appendix 32: Learning and teaching component variables in school causal loop diagram

L&T variables	Status	SCLD	FL	Feedback loops	SCLD
Amount of assessment activity	Lever	S			
Amount of markers	Lever	S		R1 Workload allocated to teaching, module organisation and LT	Y
Amount of spend on HEP facilities	Lever	O		R2 Workload allocated to teaching, quality of A&F and LT	Y
Amount of students		S		R3 Module leader capability, module organisation and LT	Y
Amount of time available to lead module	Lever	Y	R1, R2	R4 Module leader capability, quality of A&F and LT	Y
Amount of time available to prepare classroom activities	Lever	R		R5 Staff experience, module rating and LT	Y
Appropriateness of module content		Y			
Attractiveness of HEP to potential students		A	R1, R2, R3, R4, R5	A - Aggregated	
Fraction invested in academic staff	Lever	E,R	R1, R2, R3, R4, R5	E - Expanded	
Graduate outcomes score	KPI	Y		M - Moved but in the overall map	
League table position	KPI	Y	R1, R2, R3, R4, R5	O - Outside of scope of research	
Level of attainment, progression and continuation	KPI	Y		R - Renamed	
Level of engagement in continuing professional development	KPI	Y		S - Superfluous	
Level of module administrative support provided	Lever	Y		Y - Yes	
Marking load		S			
Module leader capability		Y	R3, R4		
Module leader training and development	Lever	A			
Module organisation rating	KPI	Y	R1, R3		
Module rating	KPI	Y	R1, R3, R5		
NSS / PTES scores	KPI	Y	R1, R2, R3, R4, R5		
Quality of assessment and feedback processes	KPI	Y	R2, r4		
Quality of assessment and feedback support provided		A			
Quality of classroom activities		Y	R5		
REF result	KPI	Y			
Salary offered	Lever	M	R3		
Staff enthusiasm for teaching		Y			
Staff qualifications and experience	Lever	Y	R3, R5		
Staff student ratio	Lever	Y			
Student attendance and engagement	KPI	Y			
Suitability of learning environment	Lever	O			
Surplus	KPI	M,R	R1, R2, R3, R4, R5		
Teaching on my course rating	KPI	A			
Total revenue	KPI	Y	R1, R2, R3, R4, R5		
Total student fees income	KPI	Y	R1, R2, R3, R4, R5		
Volume of RIT included	Lever	Y			
Workload allocated to teaching	Lever	E	R1, R2		

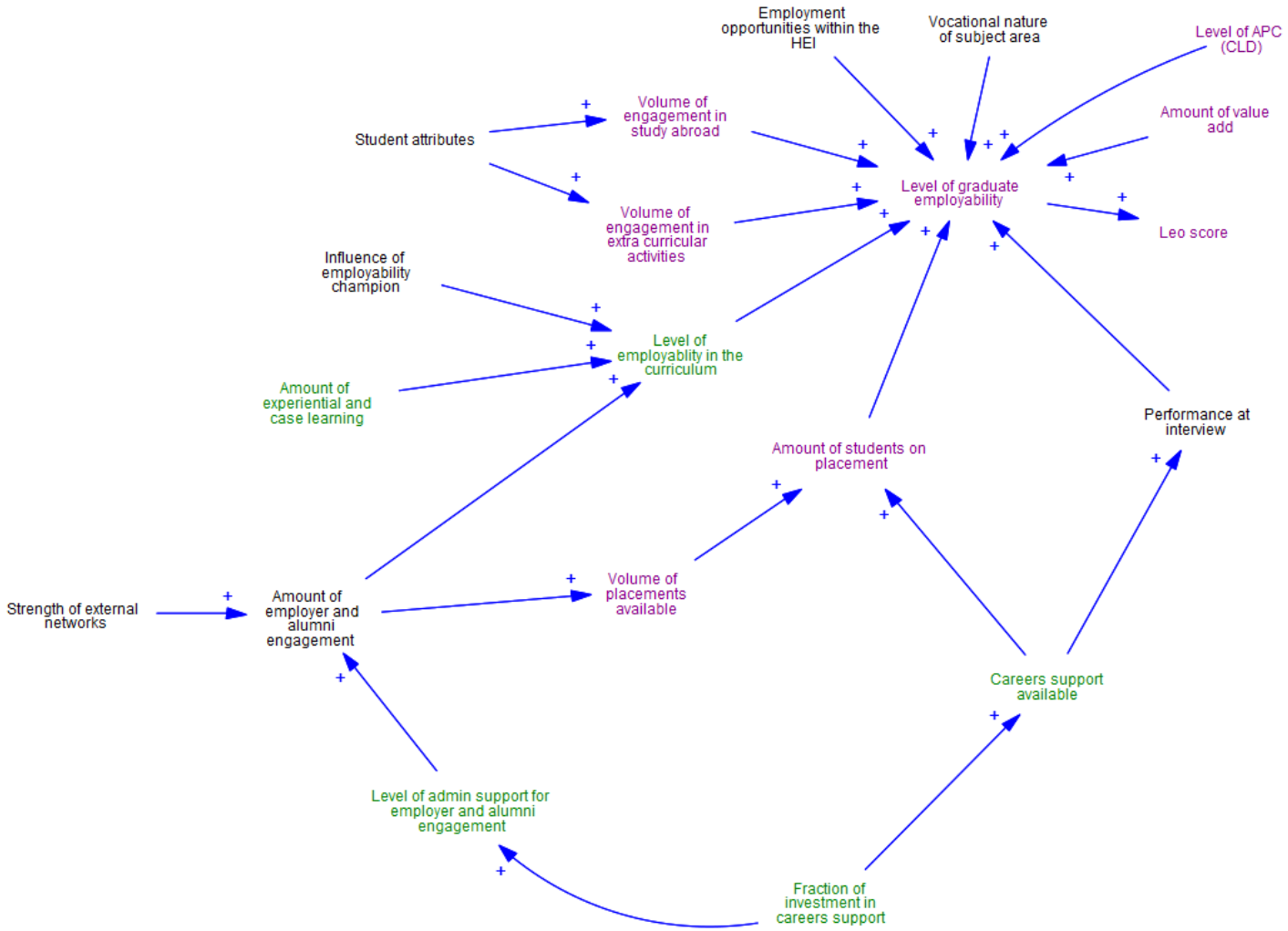
Appendix 33: Student engagement component in school causal loop diagram



Appendix 34: Student engagement component variables in school causal loop diagram

Student engagement variables	Status	SCLD	FL	Feedback loops	SM
Amount of campus based activities offered	Lever	Y	R4		
Amount of online delivery offered	Lever	A		R1 Community, attendance and engagement	Y
Amount of student enrolment	KPI	Y	R3, R4, B1, B2	R2 Cohort identity and community	S
Appropriateness of timetable	Lever	A		R3 Campus, community and revenue	A
Assessment landscape aligned to studies	Lever	A		R4 Cohort activities, community and revenue	M
Attendance policy	Lever	A		R5 Study support, APC and revenue	Y
Attractiveness of campus		O	R3	B1 Community, A&E and APC	A
Attractiveness of HEP to potential students		A	R3, R4, B1, B2	B1 Community, NSS and cohort identity	Y
Cohort size	KPI	Y	B1, B2		
Cohort target	Lever	O		A - Aggregated	
Ease of attending classes on campus		O		E - Expanded	
Engagement in study support	KPI	Y		M - Moved but in the overall map	
Fraction invested in campus facilities	Lever	O	R3	O - Outside of scope of research	
Fraction invested in cohort activities	Lever	Y	R4	R - Renamed	
Fraction invested in study support	Lever	Y		S - Superfluous	
Graduate outcomes score	KPI	Y		Y - Yes	
League table position	KPI	Y	R3, R4, B1, B2		
Level of attainment, progression and continuation	KPI	Y	B1		
Level of attendance and engagement in classes	KPI	Y	R1, B1		
Level of cohort engagement		Y	R1, R2, R3, R4, B1, B2		
Level of study support available		Y			
Level of tariff required	Lever	Y			
NSS / PTES scores	KPI	Y	R3, R4, B2		
Programme cohesiveness	Lever	O			
Programme leader team activities	Lever	R			
Quality of assessment and feedback processes	KPI	Y			
REF result	KPI	Y			
Sense of community		Y	R1, R2, R3, R4, B1, B2		
Strength of cohort identity		Y	R2, B1, B2		
Student attributes		O			
Surplus	KPI	A	R3, R4		
Teaching on my course rating	KPI	A			
Timeliness of interventions	Lever	O			
Total revenue	KPI	Y	R3, R4		
Use of student ambassadors	Lever	A	R4		

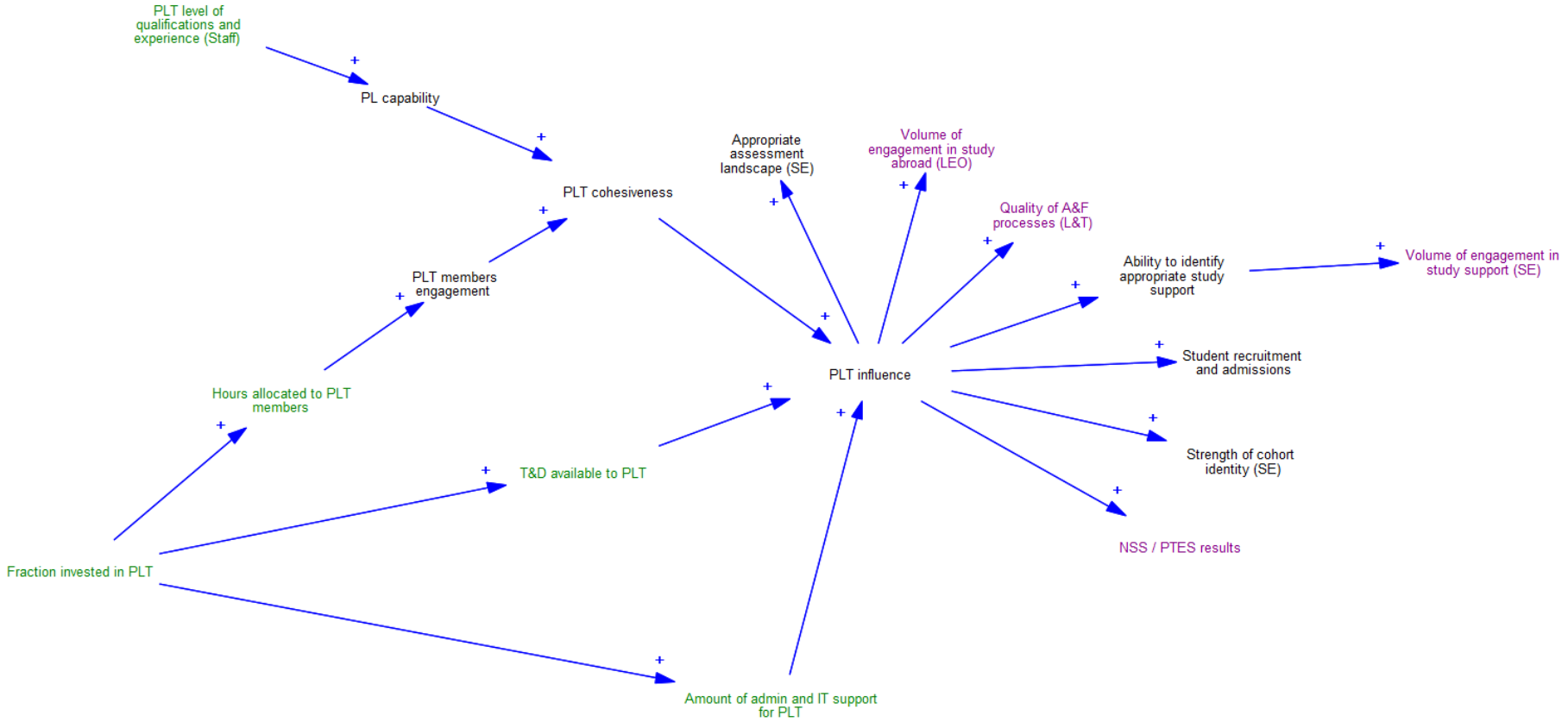
Appendix 35: Employability component in school causal loop diagram



Appendix 36: Employability component variables in school causal loop diagram

Employability Variables	Status	SCLD	FL	Feedback loops	SM
Amount of employer and alumni engagement		Y	R1, R2		
Amount of engagement in extra curricular activities	KPI	Y		R1 Employability in the curriculum, employability, LEO score	Y
Amount of engagement in study abroad	KPI	A		R2 Volume of placements, employability, LEO score	A
Amount of experiential and case learning	Lever	A		R3 Students on placement, employability, LEO score	Y
Amount of placements available	KPI	Y	R2	R4 Performance at interview, employability and LEO score	R
Amount of students on placement	KPI	Y	R2, R3		
Amount of value add	KPI	O		A - Aggregated	
Attractiveness of HEP to potential students		A	R1, R2, R3, R4	E - Expanded	
Careers support available	Lever	A	R3, R4	M - Moved but in the overall map	
Employment opportunties within the HEP	Lever	O		O - Outside of scope of research	
Fraction invested in careers support	Lever	R	R1, R2, R3, R4	R - Renamed	
Graduate outcomes score	KPI	Y	R1, R2, R3, R4	S - Superfluous	
Influence of employability champion		R		Y - Yes	
League table position	KPI	Y	R1, R2, R3, R4		
Level of admin support for employer and alumni engagement	Lever	Y	R1, R2		
Level of attainment, progression and continuation	KPI	Y			
Level of employability in the curriculum	Lever	Y	R1		
Level of graduate employability	KPI	Y	R1, R2, R3, R4		
NSS / PTES scores	KPI	Y			
Performance at interview		A	R4		
REF result	KPI	Y			
Strength of external networks		Y			
Student attributes		O			
Surplus	KPI	A	R1, R2, R3, R4		
Total revenue	KPI	Y	R1, R2, R3, R4		
Total student fees income	KPI	Y	R1, R2, R3, R4		
Vocational nature of the subject studied		O			

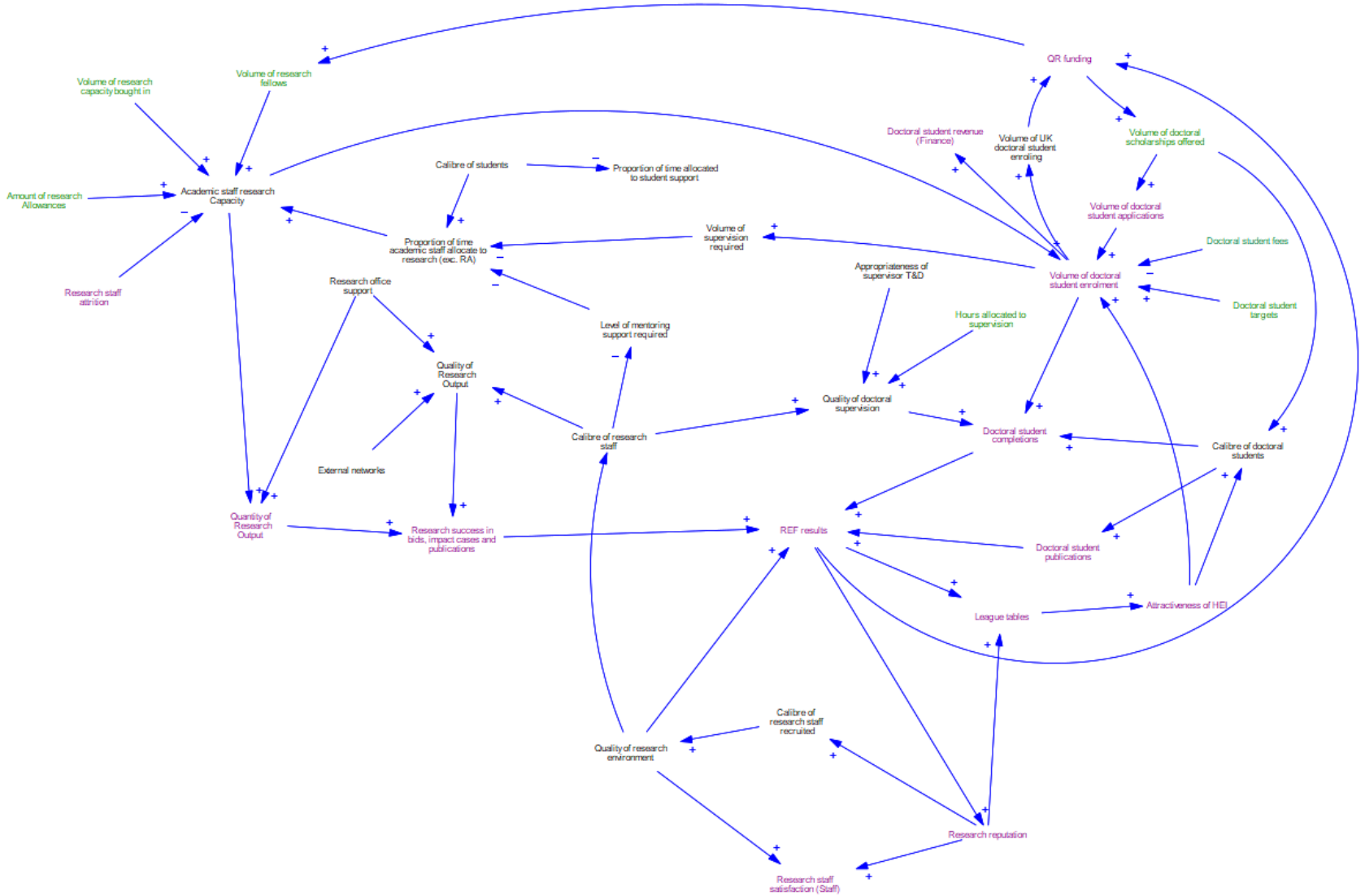
Appendix 37: Programme leader team component in school causal loop diagram



Appendix 38: Programme leader team component variables in school causal loop diagram

PLT Variables	Status	SCLD	FL	Feedback loops	SM
Ability to identify appropriate study support		A			
Amount of administrative and IT support for PLT	Lever	Y	R3	R1 Investment, PLT cohesiveness, NSS	Y
Amount of engagement in study abroad	KPI	A		R2 Investment, PLT, T&D, NSS	A
Amount of engagement in study support	KPI	Y		R3 Investment, PLT admin support, NSS	Y
Attractiveness of HEP to potential students		A	R1, R2, R3		
Fraction invested in programme leader team	Lever	E	R1, R2, R3	A - Aggregated	
Graduate outcomes score	KPI	Y		E - Expanded	
Hours allocated to programme leader team members	Lever	Y	R1	M - Moved but in the overall map	
League table position	KPI	Y	R1, R2, R3	O - Outside of scope of research	
Level of attainment, progression and continuation	KPI	Y		R - Renamed	
NSS / PTES scores	KPI	Y	R1, R2, R3	S - Superfluous	
Programme leader team capability		Y		Y - Yes	
Programme leader team cohesiveness		S	R1, R2, R3		
Programme leader team influence	KPI	Y	R1, R2, R3		
Programme leader team level of qualifications and ex	Lever	R			
Programme leader team members engagement		A	R1		
Quality of assessment and feedback processes	KPI	Y			
REF result	KPI	Y			
Strength of cohort identity		Y			
Strength of relationship with central function		O			
Strength of relationship with module team		A			
Student recruitment and admissions		Y			
Student satisfaction	KPI	Y			
Surplus	KPI	A	R1, R2, R3		
Total revenue	KPI	Y	R1, R2, R3		
Total student fees income	KPI	Y	R1, R2, R3		
Training and development available to programme le	Lever	A	R2		

Appendix 39: Research component in school causal loop diagram



Appendix 40: Research component variables in school causal loop diagram

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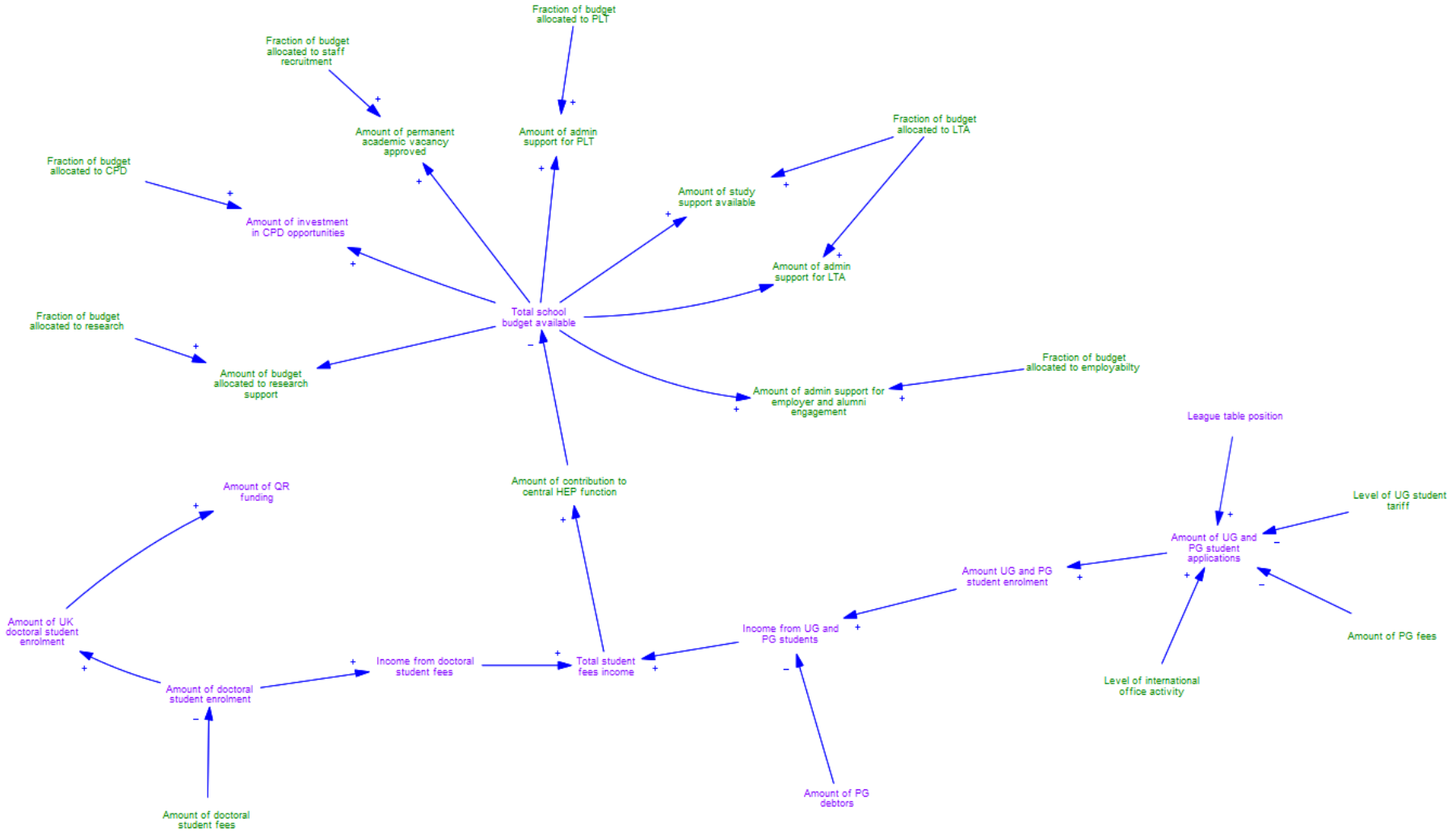
REF Variables	Status	SCLD	FL	Feedback loops	SM
Academic staff research capacity		Y	R1, R2, R3, B1		
Amount of doctoral scholarships offered	Lever	Y	R4, R7, R8	R1 Surplus, investment in research, REF, enrolment	Big loop
Amount of doctoral student applications	KPI	Y	R4	R2 Surplus, investment in research and doctoral enrolments	Big loop
Amount of doctoral student completions	KPI	Y	R6, R7	R3 QR funding, research fellows and REF	Y
Amount of doctoral student enrolment	KPI	Y	R1, R2, R4, B1	R4 QR funding, scholarships and UK students	Y
Amount of doctoral student publications	KPI	A	R8	R5 Calibre of research staff, quality of output, REF and research reputation	R
Amount of research allowances	Lever	Y	R1, R2	R6 Calibre of research staff, completions, REF and research reputation	R
Amount of research capacity bought in	Lever	Y	R1, R2	R7 QR funding, scholarships, calibre and completions	Y
Amount of research fellows	Lever	Y	R3	R8 QR funding, scholarships, calibre and publications	A
Amount of research mentors		O		R9 Research reputation, calibre of research staff and REF	R
Amount of research office support		O		B1 Volume of doctoral students, research capacity and REF	S
Amount of research output from staff with significant research responsibility	KPI	Y			
Amount of research staff (promoted)	Lever	A		A - Aggregated	
Amount of research staff (recruited)	Lever	A		E - Expanded	
Amount of staff undertaking doctorates	KPI	Y		M - Moved but in the overall map	
Amount of supervision required		Y	B1	O - Outside of scope of research	
Amount of UK doctoral student enroling		Y	R4	R - Renamed	
Appropriateness of supervisor training and development		A		S - Superfluous	
Attractiveness of HEP to potential students		A	R1, B1	Y - Yes	
Calibre of doctoral students		Y	R7, R8		
Calibre of research staff		Y	R5, R6		
Calibre of research staff recruited		A	R5, R6		
Doctoral student fees	Lever	Y			
Doctoral student revenue	KPI	Y	R1, R2		
Doctoral student targets	Lever	O			
Fraction invested in research	Lever	R	R1, R2		
Hours allocated to supervision	Lever	R			
League table position	KPI	Y	R1, B1		
Level of mentoring support required		O			
Number of professors and readers	Lever	Y			
Opportunities for research promotions	Lever	Y			
Proportion of time academic staff allocate to research		A	B1		
Proportion of time allocated to student support		A			
QR funding	KPI	Y	R3, R4, R7, R8		
Quality of doctoral supervision		Y	R6		
Quality of research environment		Y	R5, R6		
Quality of research leadership		O			
Quality of research office		O			
Quality of research output		A	R5		
Quantity of research output		A	R1, R3, B1		
Recruitment of early careers researchers	Lever	Y			
REF result	KPI	Y	R1, R3, R5, R6, R7, R8, B1		
Research reputation	KPI	A	R5		
Research staff attrition	KPI	A			
Research staff satisfaction	KPI	A			
Research success in bids, impact cases and publications	KPI	Y	R1, R3, R5, B1		
Strength of external networks		Y			
Surplus	KPI	A	R1, R2		
Total revenue	KPI	Y	R1, R2		

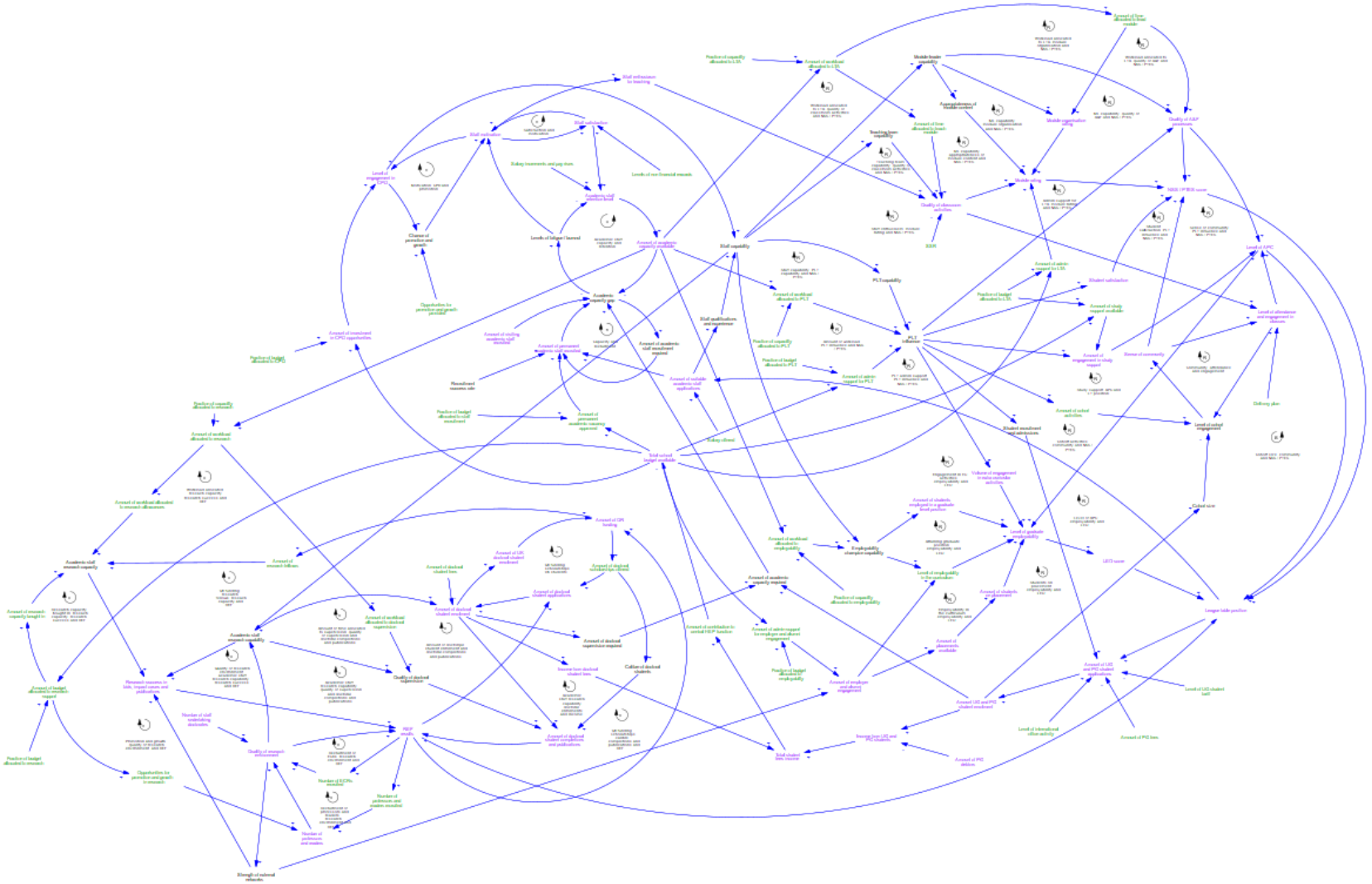
Appendix 41: Finance component in school causal loop diagram



Appendix 42: Finance component variables in school causal loop diagram

Finance Variables	Status	SCLD	FL		Feedback loops
Amount allocated to SBU to be invested in areas of strategic importance	Lever	A	R3		
Attractiveness of HEP to potential students		A	R1, R2		R1 UG tariff and LT position
Central overheads		A			R2 Investment in facilities and student enrolment
Staff costs	KPI	A			R3 Investment in portfolio and student enrolment
Total costs	KPI	A			
Use of student recruitment agencies	Lever	A			A - Aggregated
Fraction allocated to contribution	Lever	R			
Fraction invested in academic staff	Lever	R			
Fraction invested in enterprise	Lever	R			
Fraction invested in SBU research	Lever	R			
Staff CPD spend	Lever	R			
Staff wage bill	Lever	R			
QR funding	KPI	y			
Doctoral fees charged	Lever	Y			
Doctoral student enrolment	KPI	Y			
Doctoral student fees income	KPI	Y			
League table position	KPI	Y	R1, R2		
PG fees charged	Lever	Y			
PG student enrolment	KPI	A	R2, R3		
PG student fees income	KPI	A	R2, R3		
Research income	KPI	A			
Student debtors	KPI	Y			
Surplus	KPI	O	R2, R3		
Total revenue	KPI	O	R2, R3		
Total student fees income	KPI	Y	R2, R3		
UG student enrolment	KPI	A	R1, R2, R3		
UG student fees income	KPI	A	R2, R3		
UG tariff	Lever	Y	R1		

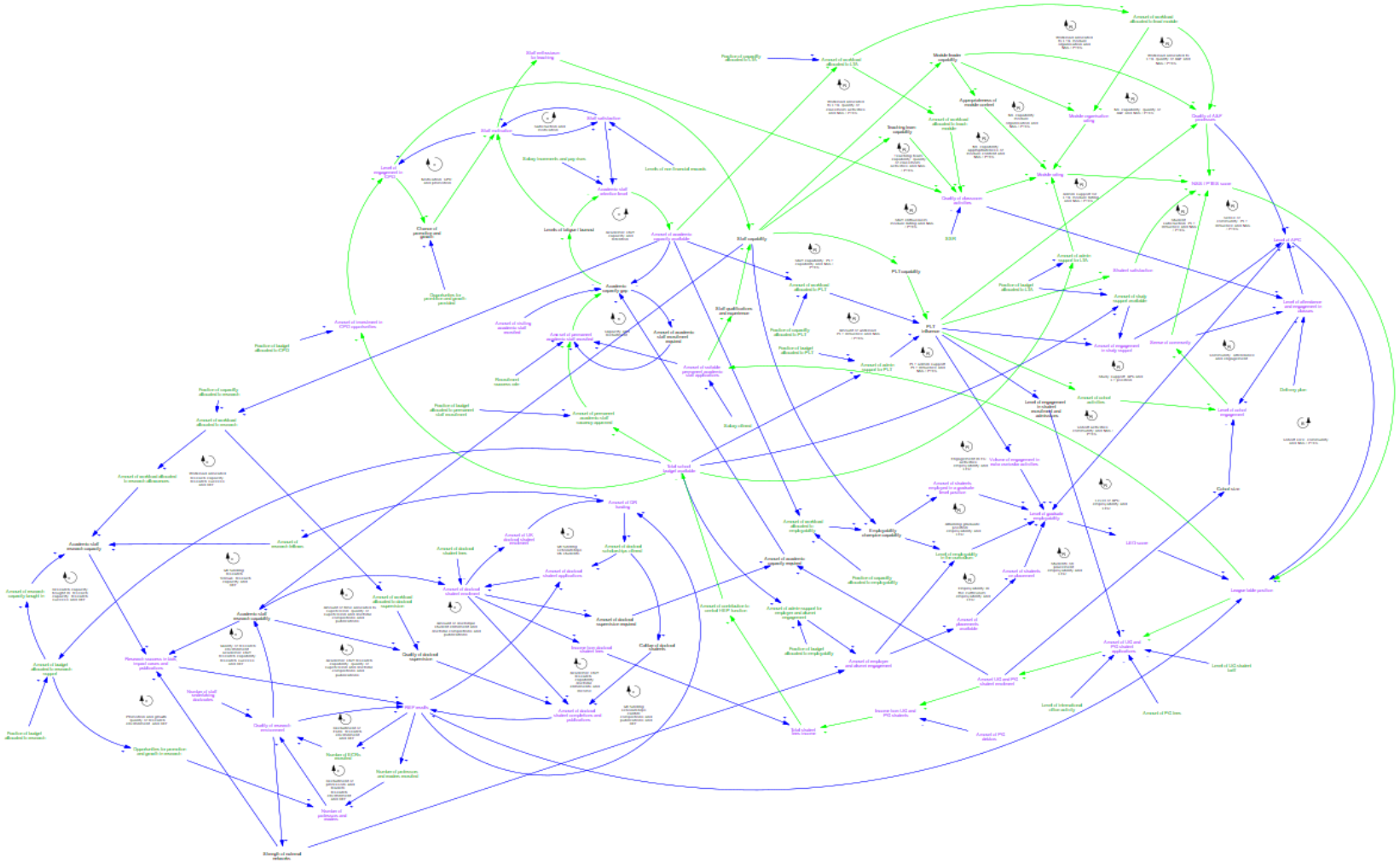
Appendix 43: School causal loop diagram



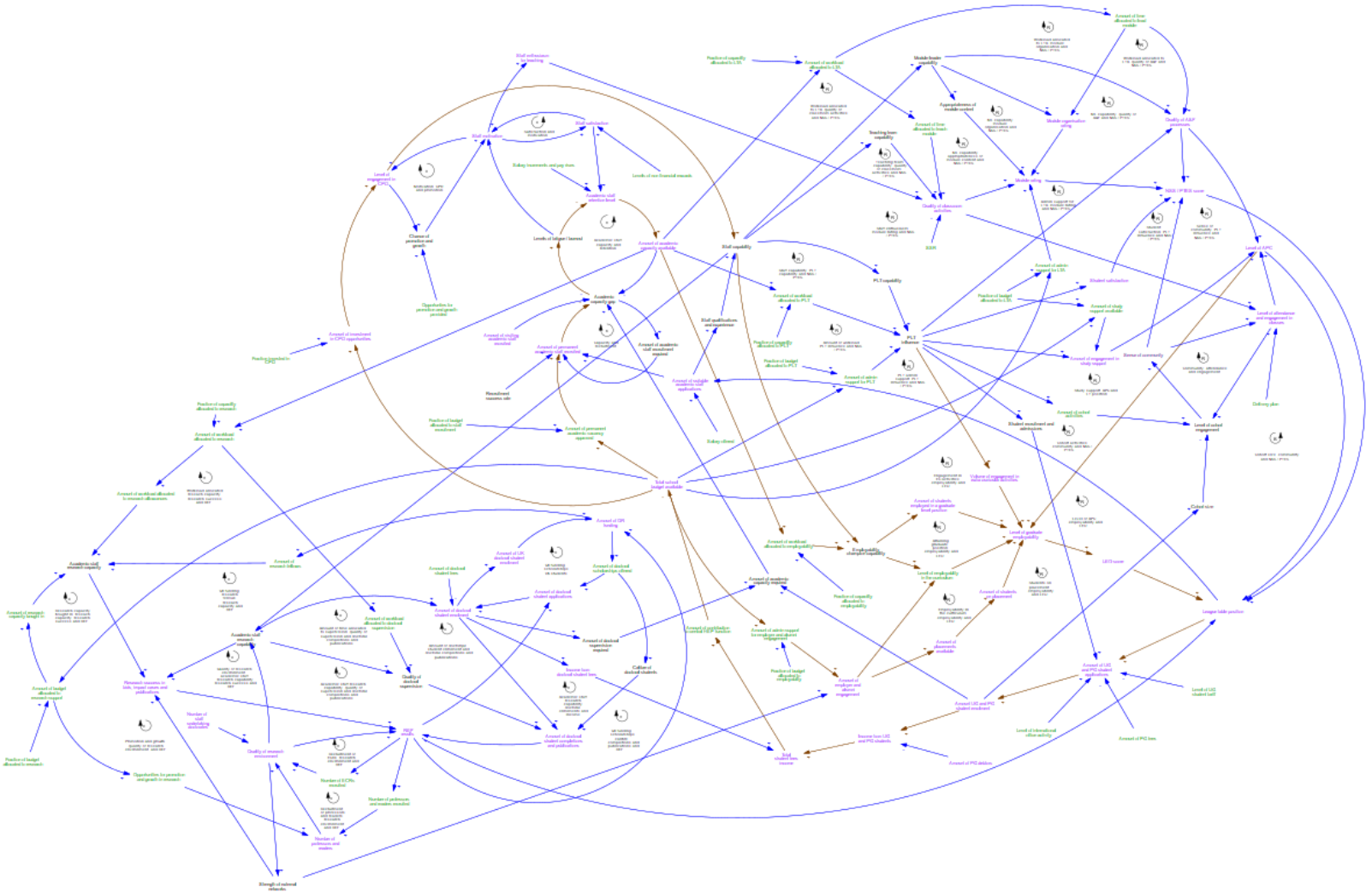
Appendix 44: School causal loop diagram variables list

CLD	School CLD variables	Status	FBL
Employability	Amount of placements available	KPI	Y
Employability	Amount of students employed in a graduate level position	KPI	Y
Employability	Amount of students on placement	KPI	Y
Employability	Level of graduate employability	KPI	Y
Employability	Volume of engagement in extra curricula activities	KPI	Y
Employability	Amount of admin support for employer and alumni engagement	Lever	Y
Employability	Amount of workload allocated to employability	Lever	Y
Employability	Fraction of budget allocated to employability	Lever	
Employability	Fraction of capacity allocated to employability	Lever	
Employability	Level of employability in the curriculum	Lever	Y
Employability	Amount of employer and alumni engagement		Y
Employability	Employability champion capability		Y
Finance	Amount of PG debtors	KPI	
Finance	Amount of UG and PG applications	KPI	Y
Finance	Amount of UG and PG student enrolment	KPI	Y
Finance	Income from UG and PG student	KPI	Y
Finance	Total school budget available	KPI	Y
Finance	Amount of contribution to central HEP function	Lever	Y
Finance	Amount of PG fees	Lever	
Finance	Level of international office activity	Lever	
Finance	Level of UG tariff	Lever	
General	League table position	KPI	Y
General	LEO score	KPI	Y
General	Level of APC	KPI	Y
General	NSS / PTES score	KPI	Y
General	REF results	KPI	Y
L&T	Amount of admin support for LTA	Lever	Y
L&T	Amount of time allocated to lead module	Lever	Y
L&T	Amount of time allocated to teach module	Lever	Y
L&T	Amount of workload allocated to LTA	Lever	Y
L&T	Appropriateness of module content		Y
L&T	Fraction of budget allocated to LTA	Lever	
L&T	Fraction of capacity allocated to LTA	Lever	
L&T	Module leader capability		Y
L&T	Module organisation rating	KPI	Y
L&T	Module rating	KPI	Y
L&T	Quality of A&F processes	KPI	Y
L&T	Quality of classroom activities		Y
L&T	SSR	Lever	
L&T	Teaching team capability		Y
PLT and SE	Amount of admin support for PLT	Lever	Y
PLT and SE	Amount of cohort activities	Lever	Y
PLT and SE	Amount of engagement in study support	KPI	Y
PLT and SE	Amount of study support available	Lever	Y
PLT and SE	Amount of workload allocated to PLT	Lever	Y
PLT and SE	Cohort size	KPI	Y
PLT and SE	Delivery plan	Lever	
PLT and SE	Fraction of budget allocated to PLT	Lever	
PLT and SE	Fraction of capacity allocated to PLT	Lever	
PLT and SE	Level of attendance and engagement in classes	KPI	Y
PLT and SE	Level of cohort engagement	KPI	Y
PLT and SE	Level of engagement in student recruitment and admissions		Y
PLT and SE	PLT capability		Y
PLT and SE	PLT influence	KPI	Y
PLT and SE	Sense of community	KPI	Y
PLT and SE	Student satisfaction	KPI	Y
PLT and SE	Volume of engagement in study support	KPI	Y
Research	Academic staff research capability		Y
Research	Academic staff research capacity		Y
Research	Amount of budget allocated to research support	Lever	Y
Research	Amount of doctoral scholarships offered	Lever	Y
Research	Amount of doctoral student applications	KPI	Y
Research	Amount of doctoral student completions and publications	KPI	Y
Research	Amount of doctoral student enrolment	KPI	Y
Research	Amount of doctoral student fees	Lever	
Research	Amount of doctoral supervision required		Y
Research	Amount of QR funding	KPI	Y
Research	Amount of research capacity bought in	Lever	Y
Research	Amount of research fellows	Lever	Y
Research	Amount of UK doctoral student enrolment	KPI	Y
Research	Amount of workload allocated to doctoral supervision	Lever	Y
Research	Amount of workload allocated to research	Lever	Y
Research	Amount of workload allocated to research allowances	Lever	Y
Research	Calibre of doctoral students		Y
Research	Fraction of budget allocated to research	Lever	
Research	Fraction of capacity allocated to research	Lever	
Research	Income from doctoral student fees	KPI	Y
Research	Number of ECRs recruited	Lever	Y
Research	Number of professors and readers	KPI	Y
Research	Number of professors and readers recruited	Lever	Y
Research	Number of staff undertaking doctorates	KPI	
Research	Opportunities for promotion and growth in research	Lever	Y
Research	Quality of doctoral supervision		Y
Research	Quality of research environment	KPI	Y
Research	Research success in bids, impact cases and publications	KPI	Y
Research	Strength of external networks		Y
Staff	Academic capacity gap		Y
Staff	Academic staff retention level	KPI	Y
Staff	Amount of academic capacity available	KPI	Y
Staff	Amount of academic capacity required		Y
Staff	Amount of academic staff recruitment required		Y
Staff	Amount of investment in CPD opportunities	KPI	Y
Staff	Amount of permanent academic staff recruited	KPI	Y
Staff	Amount of permanent academic staff vacancy approved	Lever	Y
Staff	Amount of suitable permanent academic staff applications	KPI	Y
Staff	Amount of visiting academic staff recruited	KPI	
Staff	Chance of promotion and growth		Y
Staff	Fraction of budget allocated to CPD	Lever	
Staff	Fraction of budget allocated to permanent staff recruitment	Lever	
Staff	Level of engagement in CPD	KPI	Y
Staff	Level of non-financial rewards	Lever	
Staff	Levels of fatigue / burnout		Y
Staff	Opportunities for promotion and growth provided	Lever	
Staff	Recruitment success rate		
Staff	Salary increments and pay rises	Lever	
Staff	Salary offered	Lever	
Staff	Staff capability		Y
Staff	Staff enthusiasm for teaching	KPI	Y
Staff	Staff motivation	KPI	Y
Staff	Staff qualifications and experience	Lever	Y
Staff	Staff satisfaction	KPI	Y

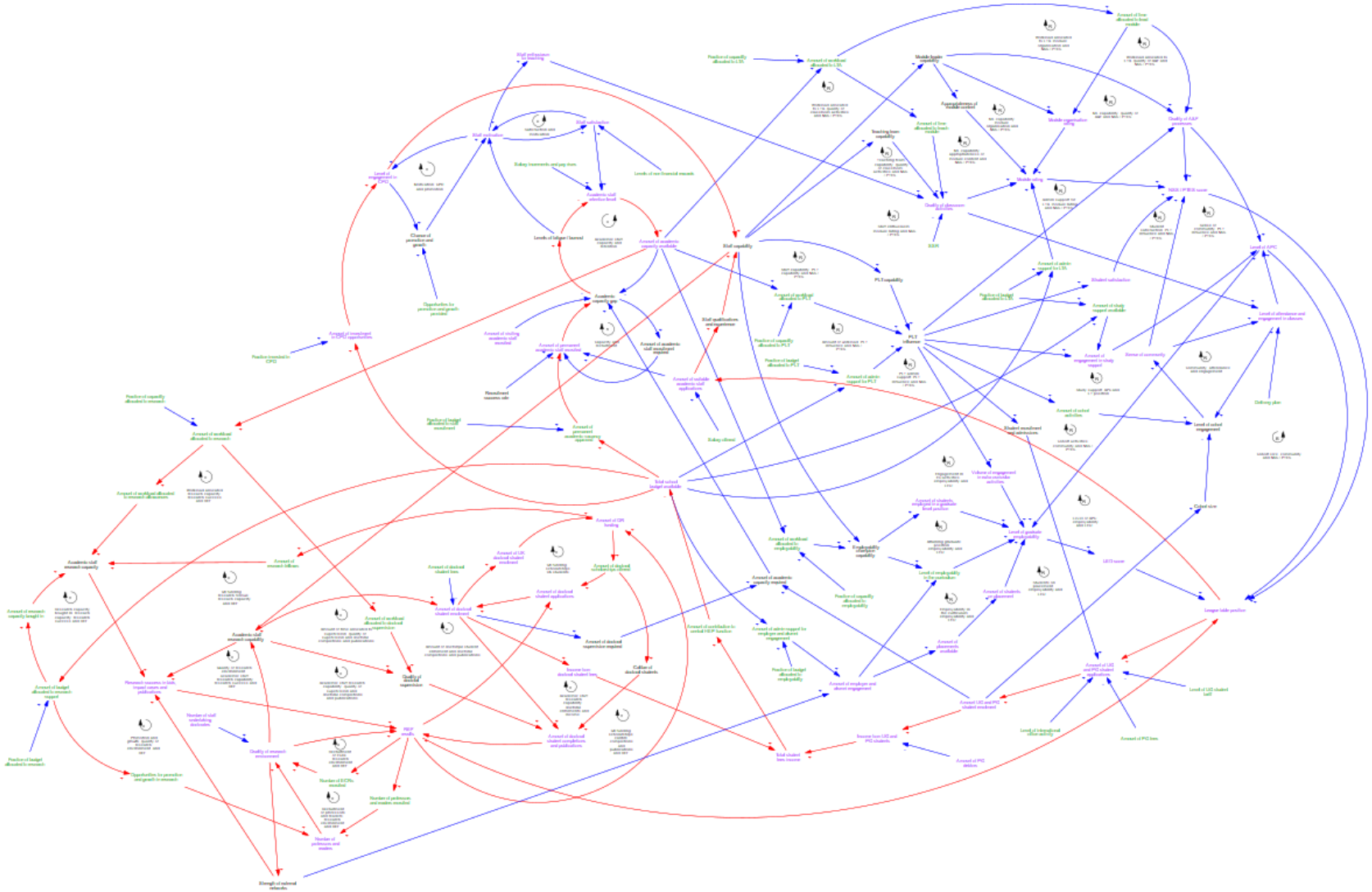
Appendix 45: School causal loop diagram National Student Survey / Postgraduate Taught Experience Survey feedback loops



Appendix 46 School causal loop diagram Graduate Outcomes Survey feedback loops



Appendix 47: School causal loop diagram Research Excellence Framework feedback loops



Appendix 48: School management team workshop participant list

Code	Role and policy making area of responsibility	Prior participation in study
P1M	Dean of school (all) acting ADR (research)	Interviewed in rounds 1 and 2
P2M	Deputy Dean (all), ADLT (LTA) and was ADPGSE (PLT)	None
P3F	ADUGSE (PLT)	Interviewed in rounds 1 and 2 and validation
P4F	ADCPD (GO)	None
P5F	ADAQ (LTA)	Interviewed in round 2 and validation
P6F	ADVL (staff)	Interviewed in round 1 and validation
P7F	Head of group (staff)	Interviewed in round 2 and validation

Appendix 49: School management team workshop notes

Participants:

- SP1 – Dean of School
- SP2 – Deputy Dean (Learning and Teaching)
- SP3 – Associate Dean Undergraduate Student Experience
- SP4 – Associate Dean Entrepreneurship, Employability & Professional Development
- SP5 – Associate Dean Academic Quality
- SP6 – Associate Dean Visiting Lecturers
- SP7 – Head of Subject Group

Workload – How do we decide to allocate workload to Learning and Teaching for module delivery?

SP3	We look at the data at a modular level. As NSS data is not at a modular level, we are required to look backwards at the MFQs and break it down, also reviewing performance data. It is also reviewed at a cohort level. This is looked at in conjunction with the MEFs and any problem modules.
	More time provided in ML workloads results in a successful module
	There are not enough hours for module leadership to have an impact, as we are restricted by it.
SP6	VLs are not used for module leadership as the workload model is exploitative.
	The VL workload is not strategic.
SP7	Workload is the common denominator for productiveness and effectiveness.
	There are other areas for support, such as CASE, personal tutors, teaching assistants, visiting lecturers, BAME advocates.
	None of the above support is factored into workload as this is not tracked. There is a cost implication with this too.
	There is a cost implication against other KPIs/priorities.
	Learning and Teaching resource is high, but we do not evaluate if this works.

Capability and recruitment

SP6	Staff can start as VLs with masters so that they can teach PG students. UG teaching is considered if there's a gap. We want staff with teaching experience because there is no time to develop staff. VLs support Learning and Teaching and go on to become MLs and PLs.
SP7	Skills and competence = capability. Competence at the level to deliver the skill.
	Volume can impact competency unless they have the skills to cope with volume.
	There is an optimum with the SSR – this can be increased with CPD, and a structured approach would help.
	We cannot create a structured plan, or plan anything else, if we don't know what our ideal SSR is.
	Perhaps there should be more diversity in recruitment for other agendas covered in the JDs.
	We can only work within the institution framework.
SP1	We were previously held accountable to the AACSB requirements of 50% PhD educated staff. We now have the flexibility to recruit suitable staff based on our requirements.

Programme Leadership – workload aside, how to you drive Programme Leader capacity?

SP3	We tweak resource, utilise our community (Horizons), make information available in the same place (SharePoint site). We save time by completing activities in bulk. We use dedicated personal tutors. We make the PL role a more attractive position
	We focus our institutional investment on the PLs developing the programmes. This is backfilled with Horizons. It is then anecdotally reviewed and reflected on.
	Formal roles have support. If someone is not delivering, we encourage change and we have a community of managers who provide support.
	It is harder to deliver measurables if you are at a level that can't impact change. You can only be measured of those you're in control of. It's both measures AND behaviours.
	Capabilities do not dictate resource allocation, risk does.
	Programme leaders are measured, NOT targeted, whereas senior management are targeted.

REF – Research staff workload allocation

SP1	Similar to normal – X has a working FTE and has to adhere to significant responsibility for research. HESA is a risk to REF. Those with significant responsibility for research have a 20% allowance or more, and will be included in the REF.
SP6	Is it considered about staff completing doctorates and the cost to the school?
SP7	Do we make workload decisions based on anything other than REF?
SP1	Some colleagues are clear contributors to REF. Some have promise and are provided support. The PVCR thinks we need to remove SRR (PIP). Someone research trained would bring more skills as a ML. If it's working well, increases output, and can compete for the best doctoral students in the UK. Our doctoral students are not top tiered applicants, therefore produce less 3 and 4 star publications.

School CLD – Academic capacity links to total students – how does this impact the league tables

SP3	We are focused on delivering the product
SP5	Projects not on Learning and Teaching from the OVC
SP3	During lockdown, our only focus was on delivery
SP7	This depends on external factors, impacting the volume and quality of delivery
SP6	Our priority is making money, by teaching students
SP4	Making money is a sustainability model via students and other income streams
SP7	The school CLD shouldn't change if our goals do, but our allocated resource will change.
SP4	Are we delivering the basics (Learning and Teaching) or everything?
SP3	We have a contract and a promise to our students.
SP7	Some factors are out of our control. For example, GO is externally driven
SP2	MSc Management, whilst it has lower entry requirements, the students achieve hugely.
SP5	It is under our control; it depends on the pool we recruit from. We are everything to everybody.
SP6	What is the Business School for? That will allow the school to focus.
SP7	Strategy of UH is income generation. We are still committed to quality learning and teaching, research etc. It has to be led by the institution.
SP4	We have external measures against us such as fees.
SP5	We need to invest to keep our license.

Budget – does our budget impact targets?

SP4	No. Finance have to meet their own targets.
SP3	Measures and targets influence spend needs
SP4	Damian has agreed to operate within the constraints of UH.
SP5	LTIC central resources have been offered to us.
SP1	How many students forecasted, adjustments to staff costs, franchise and online all impact budgets.
SP7	Do we look at impact i.e. professors and their research? We should focus resource on what is working.
SP1	Finance and HR are blocking us from spending on recruitment. They're not asking us if the recruitment will drive income. They're asking if we'll still meet the 50% contribution target.

PEFs

SP4	Are the PEFs weighted?
SP2	NSS is likely the most important both internally and externally.
SP7	This is risk and impact
SP5	NSS impacts our league table position.
SP3	Awareness of UH is our issue, but this may be due to our league table position.
SP1	No one would have suggested recruiting large cohorts of international PG students, but it's the biggest strategic impact to the school.

Reflections

SP5	The connectivity of various factors is thought provoking
SP3	I previously didn't appreciate the workload constraints and the impact this has
SP7	It provides a narrative to the table, allowing us to focus on strategic aims
SP4	We focus on our own areas and don't review how our decisions impact others

Appendix 50: Central management team workshop participant list

Code	Role and policy making area of responsibility	Prior participation in study
P1M	Vice Chancellor (all)	None
P2F	Deputy Vice Chancellor (all)	Validation
P3M	Pro Vice Chancellor Research	Validation
P4F	Pro Vice Chancellor Student Experience	None
P5M	Director of Finance	Validation
P6F	Registrar	Validation

Appendix 51: Central management team workshop notes

Participants

- VP1 – VC
- VP2 – DCV
- VP3 – Pro VC Research
- VP4 – Pro VC Student experience
- VP5 – Director of Finance
- VP6 – Registrar

Q1 How is the amount of workload allocated to activities determined?

VP4 distribution of workload to PLs, disparity, will be addressed through the adoption of a common workload allocation framework

This should lead to equity, transparency and sanity (?)

Relationship and time needs to be equitable

Never going to be agreed the best aim is equity

Good to see the PLT so pivotal to NSS/PTES, student voice and community key to influencing NSS/PTES

VP3 research allocation across the university not that consistent

More recently with REF 2021 has been particularly necessary to develop a code of practice involving time allocation to staff

All staff with a significant responsibility for research get a base allowance of 0.2 FTE, which should equate to one day a week depending on their timetable

Staff promoted in research i.e. associate professor (research) or reader gets a 0.3 research allocation

The professorial research allowance is dependent on the school, the research allowance is driven by the acquisition of research funding which can be used to support their research

Q2 how is the workload reviewed or altered is the NSS/PTES scores are not as desired?

VP4 The NSS/PTES scores all reviewed annually and there are ongoing conversations which should include a review of the resource is pretty early in the cycle depending on the Dean

The analysis of the data indicates the areas that are good or bad then meet with the deans about the data and the changes needed which gets to the programme level

Programmes work well is about 90% due to relationships and 10% to the rest

A persistently poor programme is normally due to staff capability and confidence, some about resource as much as time

Easy to say with more time they would do better

Sometimes it's about the timetable and communications

I also work with the head of HR about staff turnover and recruitment times, head of estates and the head of LRC

That are formal reviews at the end of the year but also mid-year

the main focus has been on community and student voice and staff student relationships

SSR inconsistency, need to build programme teams that talk to each other as well as look at student relationships especially with group work there is discontentment

Q3 what actions do you take to ensure SSMR?

VP4 university has high staff retention and low ill health

VP1 plagued by staff survey results negative about the VCE, P6 is working on that

VP6 motivation post COVID has changed due to the work environment, dependent on finances

People strand is now focused on EDI

Next will consider lived experience, working here and modern employer

Individual motivation, generalised changes across communication (??)

VP1 industry dispute over salary, university was relatively unaffected by strike and marking boycott

Broad salary regulated centrally

Discussing embracing a broader view of the whole package

Recruitment affected by marketplace more than attractiveness of institution

VP6 recruitment is bouncing back, now at 10% turnover higher in some areas than others especially if staff can work from home for a London company and hence earn more

Less about salary more about salary add on, cost of living in the county

Grades are benchmarked across the sector, especially in non-academic departments like markcomms and finance need to benchmark to get staff thus do a market rate analysis

Teaching an admin or more concerned about professional staff bar points, annual leave and local cost of living weighting

VP2 slowly moving back with staff moving towards the being in the office again

VP1 recruitment application numbers per post are increasing, was as low as 8 now at 30

Q4 how do you determine the targets for each programme?

VP1 have had a massive influx of international students, tasked the Deans to do this because of finances but resources have caught up now

VP2 had to change speedily, Google and Ocado are now laying people off so there are more techie people to recruit (before they were like hen's teeth)

Have a different problem

Recruitment issues about salary

The staff that are here are motivated independent of pay, more about employment, voice, being listened to, finding their work interesting and this is a good place to work

VP6 satisfaction is negatively correlated with length of service particularly if you have been in service for more than 15 years, some very demotivated staff

Motivation is different for different people, for some it is about CPD for others the Christmas bonus is very well received

VP4 we do think about staffing when we think about growth specially international PG growth it grew enormously and of course there was a lag but there was a window of opportunity for financial security

it is curious how well we advanced in the PTES in this, higher than expected

Staff and students were building positive and strong relationships

VP2 Staff were getting it done, somehow

Students see the institutions being successful, it is a good problem to have

Student CSS successful international student institution, the air of you are in a successful place

Now need to keep chin up about UG, keep the morale up as a senior team

UG people morale is an issue, it was showing up in the NSS students were wondering if this was the place to come to

This is the real value of the senior leadership team, building morale and self-belief

International and PG don't need to, staff have worked hard and there's energy and a sense of success
Q5 Are all the HEP KPIs achievable?

VP1 We have no option we are complex organisation competing against other complex organisations, very few do one or the other

Philosophically do we want teaching **and** research integrated

Concludes trying to maintain a more integrated system

VP3 we have a significant proportion of academic staff not research active, so they can be busy with learning and teaching development

VP1 need to be careful that you do not sell students a lie students attend a prestigious university because they expect to absorb some of that reflected glory from the institution

It is about success 70 HEIs are currently in deficit we have a £60 million surplus which provides security

VP2 another point about resource, before we add more resources we need to consider affordability, within this envelope of research how do I do it? have to allocate your time, the size of the group will vary according to the allocation it may be 20 to 1, 30 to 1 or 40 to 1

VP6 Students are satisfied despite the staff student ratios in teaching

VP6 we have a broad basis staff increasingly pracademic how would they know what they wanted to do or be if they didn't have a workload that was spread across learning teaching and research?

VP1 the PhD is evolved to become the training or currency in research activity

VP3 instant attend because of the research but the reputation of the university with Russell groups, the research is not sold in the open days it is the reputation

VP2 this is still very rooted in our class structure

VP4 returning to the KPIs yes there is room for all but only in so far that staff can see the relevance of them

Need a range of KPIs reflecting the ambition but needs to be easily communicated for example NSS top 25%

Ambitions in KPIs need to be spread across the whole portfolio

Need a balance between teaching and research, we are an alliance university

This means inter professional and technical education

Need a space for a range of academic workloads including professional experience academics who are here because of their business and technical expertise

University encouraging their learning and reflective practice

Needs to be a space for research it's not necessarily important that everyone does everything equally

don't have to be experts in everything equally can be only one or another need a mix so that students are technically competent in the professional qualifications

Appendix 52: Board of governors key performance indicators

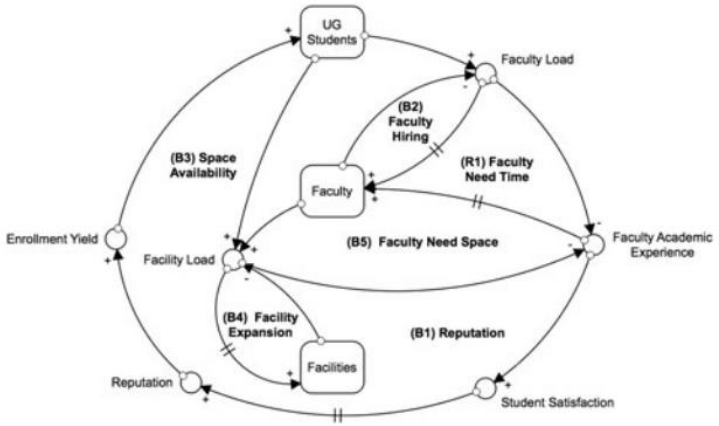
- Reduce the BAME attainment gap by 50%
- Obtain outcomes above TEF benchmark in NSS for Teaching Quality, Assessment and Feedback, Learning Community, Student Support and Student Voice
- All academic programmes will use a flexible, blended pedagogy by 2025
- Achieve highest level of recognition in the new TEF (to be confirmed as government consultation expected, new TEF arrangements to be in place from September 2022)
- Increase external income for research by 45%
- Increase international student numbers to 25% of UH total
- Increase income from commercial (other) activity by 10%
- Increase staff engagement score in staff survey to 70%
- Meet the budget target before non-cash pension adjustments each year
- We will aspire to meet the Race to Zero commitment by building in sustainability into core University Group and commit to year-on-year reduction of carbon emissions in Scopes 1 and 2.

Appendix 53: Comparison of the school causal loop diagram to the existing literature

Reference	Relevance to school CLD
Al Hallak, L., Ayoubi, R.R., Moscardini, A. and Loutfi, M. (2017) *A system dynamic model of student enrolment at the private higher education sector in Syria*, Studies in Higher Education.	Hallak et al produced a dynamics of university growth CLD which shows a similar overview to the school CLD but does include some variables that are external to the school CLD produced in this research. However, their variable investment in facilities was included on the original L&T CLD as amount of spend on HEP facilities, but during the creation of the school CLD it was decided that this was outside of the school's decision-making responsibility and was therefore removed. In their student population loop they included the variable 'probability of rejecting applications'. In the school CLD student applications directly impact enrolments, this is because admissions is managed centrally and thus is another variable that it not within the school's area of responsibility. The concept of their staff population loop is similar to the staff component in the school CLD. The financial loop is also similar except because they are looking at a university level, they have included reinvestment which is outside of the school's decision-making responsibility and was therefore not included.
Barlas, Y. and Diker, V.G., 1996. Decision support for strategic university management: a dynamic interactive game. In *Proceedings of the 14th System dynamics Conference*.	Has no similarity as they presented an interactive simulation model which focuses specifically on the graduate instruction sector and is considerably more detailed that required for this research.
Galbraith, P.L., 1999. Systems thinking: a missing component in higher educational planning? Higher Education Policy, 12(2), pp.141-157.	Galbraith 1999 describes the relationships between staff recruitment and capacity, faculty expertise and doctoral applications, and research capacity and REF all of which have been incorporated into the school CLD.
Hussein, S.E. and El-Nasr, M.A., 2013. Resources allocation in higher education based on system dynamics and genetic algorithms. International Journal of Computer Applications, 77(10).	No similarities in their CLD and the school CLD as their CLD is too condensed.
Ismail, M.F., Moscardini, A. and Elsamadicy, A.M., 2017. A dynamic modelling of the key quality management factors affecting students' satisfaction in the Egyptian public higher	Some similarites in the CLD re student satisfaction, including impact of assessment method (included in the L&T CLD), quality of teaching and class size.

education. In Conf. on Bus Ent. and Sup. Chain Mgt. and Inf Sys (Vol. 8, pp. 294-298).	
Kennedy, M., 1998a, July. A pilot system dynamics model to capture and monitor quality issues in higher education institutions experiences gained. In Proceedings of the 16th system dynamics conference, Quebec City, Canada (p. 7).	There are a lot of similar relationships in his influence diagram that were reflected in the school CLD. In the L&T component the relationship quality of teaching is impacted by staff commitment to teaching (equivalent to quality of classroom activities and staff enthusiasm for teaching in this research). Variables that were not included in the component include: reviews of courseware and plans, assessment methods, and quality of units. Of these only assessment method was mentioned in the interviews but was amalgamated into the variable quality of assessment and feedback in the school CLD. The next section of the diagram shows student performance as influenced by student motivation, quality of facilities, student perception of employment opportunities, quality of teaching, staff performance, student contact time, class size and staff motivation. In the school CLD student performance is named level of APC and is impacted by quality of A&F, amount of engagement in student support and level of A&E in class, which are influenced by many of the same variables that Kennedy included. The variables that have not been included in the school CLD are student motivation, qualities of facilities, student perception of employment opportunities and staff performance. The school CLD did not include student or programme attributes as this was not mentioned in the interviews. The quality of the facilities is determined by the centre and hence was outside of the school's decision-making responsibility. Staff performance was included in the original staff CLD but only in relation to engaging in CPD. The quality of research is impacted by internal and external funding and research output. The research component in the school CLD is considerably more detailed than this. The section of the influence diagram relating to professional activity is considered outside of the scope of the school CLD, except for the impact that admin support has on student delivery. Staff motivation is influenced by communication overhead (i.e. with management), remuneration, number of staff appraised and student performance. In the staff CLD student motivation, not performance, was included as a variable impacting staff motivation but was removed as, although it is an impacting variable, it is not a lever that can be applied. Trust in VCE (similar to communication) impacted staff satisfaction in the staff CLD but was removed as it is outside of the school's decision-making responsibility. Salary increments and pay rises are included as impacting retention, as are levels of non-financial rewards impacting satisfaction. Lastly, the quality of line manager support (which includes appraisals) was not included in the school CLD as there was no evidence that this was an issue in the school.

van Kersbergen, R.J., van Daalen, C.E., Meza, C.C. and Horlings, E. (2016) The Impact of Career and Funding Policies on the Academic Workforce in The Netherlands: A System dynamics based Promotion Chain Study.	Created a simplistic CLD of the academic workforce development, the relationship between capacity and recruitment is also included in the school CLD.
Kim, H. and Rehg, M. (2018). Faculty performance and morale in higher education: A systems approach. Systems Research and Behavioral Science, 35(3), pp.308-323.	There are some similarities between their CLD on faculty workload and morale and the staff CLD. They use morale and the school CLD has included motivation and satisfaction, the concept of burnout and the impact on staff motivation and the subsequent enthusiasm for teaching is included in both. The school CLD does not have a link between staff motivation and effectiveness in research delivery though. The also produced a CLD on equity in faculty compensation, the school map does include the impact of salary increments and pay rises on academic staff retention levels and there is no benchmarking of academic salaries at the HEP that forms the case study for this research.
Merkulov, N., Nezamoddini, N. and Sabounchi, N. (2015). Modeling Graduate Education Management System Using System dynamics Approach. In *Binghamton University. https://www. systemdynamics.org/assets/conferences/2015/ proceed/papers* (Vol. 1381).	They created a simple system dynamics model that considered reputation and rankings which is not similar to the school CLD produced for this research.
Oyo, B. (2010) Integration of system dynamics and action research with application to higher education quality management. Unpublished PhD Thesis.	The dynamic hypothesis for the funding and quality system has some similarities to the school CLD but is a simplified version. The key relationships which are present in both are that the quality of staff impacts the quality of teaching, research allocations impact the quality of research and that enrolled students impact the funding available. In his PhD Oyo produced a research and publications influence diagram which has more detail than the research CLD in this research but similarities re student publications, effectiveness of students research supervision (quality of doctoral supervision), proportion of staff with PhD (impact of staff capability) and full time staff (workload allocated to doctoral supervision).

Zaini, R.M., Pavlov, O.V., Saeed, K., Radzicki, M.J., Hoffman, A.H. and Tichenor, K.R., 2016. Let's talk change in a university: A simple model for addressing a complex agenda. Systems Research and Behavioral Science, 34(3), pp.250-266.	 *Figure 5 Causal loop diagram showing the feedback back loops generated by enrollment growth. (B) and (R) at the beginning of each loop title indicate a balancing and reinforcing loop, respectively* They produced a CLD for enrolment growth which is quite simple, but the feedback loops described resonate with the school CLD. These are the impact of workload on student experience and the time delay in staff recruitment. The feedback loops that they describe that have not been included in the school CLD relate to facilities, as this is a central HEP decision and not within the purview of the school SMT. The other area that was not mentioned during the data collection phase was the relationship between new staff recruitment and an erosion of academic experience.

Appendix 54: Strategy map components

Perspective	NSS	GO	REF
Customer	Q1 Student happy / supported PL / PT Community / student identity Tutors, teaching, A&F Teaching quality Timetable Attendance and engagement Attainment	Q2 Progression Continuation Engagement Employability	Q3 Research informed teaching Teaching quality Assessment and feedback Output
IPO	Q4 Staff recruitment/ support Line management Performance management Fit in organisation Workload Pay / grade Promotional opportunities	Q5 Tariff Relationship with employers Employer engagement Student community PT relationship	Q6 Funding Research environment and culture Enterprise activities Research office Workload
L&T	Q7 Amount and appropriateness CPD Timing and support including admin and tech PL / PT training	Q8 Study abroad Extra-curricular Appropriate employer focused delivery	Q9 Doctoral students Staff training and support in Coaching and mentoring Conference attendance Creating networks
Finance	Q10 Enrolment Investment in research, L&T, facilities, pay Investment in student support, tech and admin Timetable Workload	Q11 Investment in study skills Scholarships Bursaries PSRB funded Enrolment	Q12 Investment in research Internal bids Research allowances PSRB membership Conferences Article fees Scholarships

Need to create a CLD for quadrant, then establish how they interlink

Q1 – customer / NSS is about the key drivers of NSS from the student perspective which will relate to student satisfaction which is broken down into community, teaching quality, assessment and feedback scores and organisation and management (PL team, timetable

Q2 – customer / GO is about the key drivers of GO from the student perspective which relate to progression, graduation and employability so this will include AAE (attainment, attendance and engagement) as well as any variables that impact employability.

Q3 – customer / REF is about the key drivers of REF from the student perspective which relate to how research active staff feed that back into their delivery to improve LTA but also how success in the REF impacts reputation and LTRS and makes the HEI a more attractive proposition and thus drives up enrolment.

Q4– IPO / NSS is about the key drivers of NSS from a process perspective which relate to staffing including recruitment, capacity, work loading and SSMR.

Q5– IPO / GO is about the key drivers of GO from a process perspective which relate to employer relationships, employability skills, tariff.

Q6– IPO / REF is about the key drivers of REF from a process perspective which relate to funding and the research environment.

Q7– L&G / NSS is about the key drivers of NSS from a L&G perspective which relate to training and support around LTI.

Q8– L&G / GO is about the key drivers of GO from a L&G perspective which relate to student uptake of extracurricular activity and delivery of appropriate employability focused curriculum.

Q9– L&G / REF is about the key drivers of REF from a L&G perspective which relate to doctoral students, staff training and support including mentoring and engagement in conferences

Q10– Financial / NSS is about the key drivers of NSS from a financial perspective which relate to investment in student support, staff capacity / workloads and Pl teams; as well as revenue.

Q11– Financial / GO is about the key drivers of GO from a financial perspective which relate to investment in enhancing students' employability skills.

Q12– Financial / REF is about the key drivers of REF from a financial perspective which relate to investment in research.

Appendix 55: Review of proposed strategy map vs original conceptual framework

Perspective	KPIs in CF	KPIs in Strategy Map	KPI
Customer	Teaching quality	Module rating	NSS/PTES
Customer		Classroom activity	NSS/PTES
Customer		Quality of A&F	NSS/PTES
Customer		Module leadership	NSS/PTES
Customer	Student satisfaction	Student satisfaction	NSS/PTES
Customer		Community	NSS/PTES
Customer		Level of APC	GO
Customer		Study support	GO
Customer		PLT influence	GO
Customer	% students employed	Graduate employability	GO
Customer		Students on placement	GO
Customer		Employability champion	GO
Customer	Research output	Doctoral completions and publications	REF
Customer		Research output	REF
IBP	Academic / student support	Admin support (L&T)	NSS/PTES
IBP		Workload (L&T)	NSS/PTES
IBP	SSM	SSM	NSS/PTES
IBP		Staff retention	NSS/PTES
IBP		Capacity	NSS/PTES
IBP	Staff recruitment	Staff recruitment	NSS/PTES
IBP		Workload (PLT)	GO
IBP	Academic / student support	Admin support (PLT)	GO
IBP		Workload (EC)	GO
IBP	Academic / student support	Admin support (EC)	GO
IBP		Staff capability	GO
IBP		Workload (RES)	REF
IBP		Employer engagement	REF
IBP	Research environment	Research environment	REF
L&G		Opportunities for promotion	NSS/PTES
L&G	Staff T&D	CPD	NSS/PTES
L&G	Investment in staff	Investment in CPD	NSS/PTES
L&G		Salary rises	NSS/PTES
L&G		Vacancy approved	NSS/PTES
L&G		Recruitment success	NSS/PTES
L&G		Salary offered	NSS/PTES
L&G		Staff quals and exp	GO
L&G		Investment in admin	GO
L&G	Student tariff	Tariff	GO
L&G	Investment in research	Research fellow recruitment	REF
L&G		No. of professors, readers and ECRs	REF
L&G	Investment in research	Promotions in research	REF
Finance		Budget	NSS/PTES
Finance		Contribution	NSS/PTES
Finance		Targets	GO
Finance	Student enrolment	UG and PG student enrolment	GO
Finance		PG debtors	GO
Finance		Student fees	GO
Finance	Revenue	Income from fees	GO
Finance	Student enrolment	Doctoral student enrolment	REF
Finance		UK doctoral students	REF
Finance		Doctoral student scholarships	REF
Finance	Research funding	QR funding	REF