A Multi-Framing Approach to Analysing the Effectiveness of the PhD Application Process at the Victoria Business School

By

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Abstract

In the eight years from 2007 to 2015, Victoria Business School has seen over a 500% increase in the number of annual submissions of PhD applications. The increase in the number of applications is straining the scarce resources allocated to the process and raising concerns about time pressures among some of the PhD Directors.

This research looks to uncover whether the PhD application process in its current form serves the university in achieving its strategic goals and how the process might be improved. Interviewing multiple stakeholders within the Victoria Business School in an semi-structured interview, generated information on different aspects of the process as the stakeholders see it.

The interview data was examined using a multi-framing methodology, analysing the data using the three frames of Business Process Modelling & Notation, Theory of Constraints, and Qualitative Systems Thinking, to draw out different insights and aspects of the problems impacting the PhD application process. In conclusion, it was found the current PhD application process was not effectively supporting the achievement of the university's strategic goals.

The issues brought out by the application of multi-framing show the PhD application process is not effectively helping the university to achieve its strategic goals. Furthermore, the identification of different issues from each different frame analysis demonstrates the benefits of adopting a multi-framing approach to problem-solving.

Recommendations were made as to how the problems can be addressed, negated or mitigated for the benefit of all stakeholders, while at the same time demonstrating the benefits of adopting a multi-framing approach to problem-solving.

In the end recommendations were made to address all the issues brought out by the different frames. The issues fell into two categories, process issues or university issues, and affected different stakeholders.

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Chapter 1. Introduction

Victoria University is one of New Zealand's oldest and most prestigious tertiary institutions. Victoria University has around 21,000 students, including over 3,000 international students from more than 100 countries (Victoria University of Wellington, 2016b). In 2014, the Victoria University Council signed off on its strategic plan for the period 2015 to 2019 (Victoria University of Wellington, 2014). An important component of the strategy is increasing the quantity and quality of its research outputs. One way of achieving such a goal would be through the increased intake and graduation of PhD students. Over the eight years from 2007 to 2015 the number of PhD applications had increased approximately 345% across the university. Despite the increase in applications, the university allocates the same resources and time to the process it always does for screening and selecting PhD students. The seemingly ever-increasing number of applications is placing a strain on allocating the university's finite resources, such as finances (including scholarships) and human capital. The restrictions of resources and time, and the decentralised nature of the university, create a complex problem.

In this thesis, the complex problem of whether the PhD application process is effectively supporting the university achieve the strategic goals is viewed using a multi-framing methodology approach, thereby allowing multiple problem-solving tools to be utilised to represent and analyse the same problem. The use of multiple tools is expected not only to discover more issues/aspects within the complex problem than using any one tool alone, but also to produce more wide-ranging solutions than utilising only a single problem-solving method.

The thesis proceeds as follows. After establishing the subject of the research, the stakeholders of the university are identified. The importance of PhD students in the university's strategy is discussed and the data surrounding the problem of selecting the students that best support the achievement of that strategy is introduced. The faculty's problem is explained and the research questions for this research are set out.

Next, the literatures on multi-framing in theory and application, Theory of Constraints and System Dynamics are reviewed.

The next chapter outlines the methodological approach used for this research. The selection of participants and breakdown of responses approach is discussed. Then, the tools used at each step to analyse the data are outlined. The limitations and assumptions the research was conducted under are disclosed and explained.

The analysis of the data is done using each frame independently, starting with mapping out the process using Business Process Modelling & Notation (see). Then any relevant fail points in the process are identified.

For the Theory of Constraints, a Goal Tree is created to identify the necessary conditions expected to be seen from the data. Then Current Reality Branches are used to identify root causes of problems that would be stopping the achievement of the critical success factors from the Goal Tree.

With the Qualitative Systems Thinking frame, a problem statement is created from which Behaviour Over Time charts are created, followed by a Causal Loop Diagram. From the Causal Loop Diagram, points on the diagram are identified where the system could be leveraged.

Following on from the analysis, recommendations are made to address the fail points, root causes and leverage points identified from the respective frames.

Lastly, the research questions are addressed using the results of the analysis. A reflection on the use of using multi-framing is offered, as well as suggestions for further research.

This research contributes to the field of the application of multi-framing and adopting such an approach to problem-solving. This research also tackles a real issue within a real organisation, that should be generalisable not only across other processes or academic institutions, but to other types of organisations as well. The decision-making tools being used in the multi-framing framework are Business Process Modelling & Notation, Theory of Constraints and Qualitative Systems Thinking.

Chapter 2. Background

In this chapter, the background of the research is established, introducing the organisation involved to gain an idea of the nature and size of the organisation. Firstly, the strategic goals of the organisation are stated and discussed in relation to the stakeholders involved. Secondly, the issue and impact of an increasing number of PhD applications is outlined as a problem worthy of examination. The complex problem is then put into perspective with the research questions the study aims to answer established. The broader purpose of this study is introduced as a need to address the problem, and specific research questions are then developed to guide the research.

Victoria University of Wellington, founded in 1897, is one of New Zealand's oldest and most prestigious tertiary institutions and claims a proud tradition of academic excellence. Currently Victoria is New Zealand's top ranked university for research quality (2012 Performance-Based Research Fund), with more than 1,390 publications resulting from researchers' work published in 2015 (Victoria University of Wellington, 2016d) (2016b).

Victoria University has around 21,000 students, including over 3,000 international students from more than 100 countries. In 2015, Victoria University awarded 5,652 qualifications at graduation ceremonies. Victoria University has three main campuses in Wellington, while also having premises in Auckland and teaching from a campus in Ho Chi Minh City, Viet Nam (Victoria University of Wellington, 2016b).

Victoria University has a strong commitment to international development and capacity-building in ways that contribute to enduring New Zealand connections with key parts of the Asia-Pacific region. Examples include the Greater Mekong Subregion Tertiary Education Consortium (GMSTEC), and the ELTO (English Language Training for Officials) Programme that has provided English language training for several hundred officials in Southeast Asia since the early 1990s (Victoria University of Wellington, 2016a). Victoria University's strong connections to the international community help explain why continuing to develop those ties and influences features in the university's strategic plan.

The Faculty of Commerce (now known as the Victoria Business School) was established within Victoria University in 1939. Since its inception, the Victoria Business School has grown from just offering economics and accounting to being a comprehensive business school with constituent schools in.

- Accounting and Commercial Law,
- Economics and Finance,
- Government,
- Information Management,
- Management, and
- Marketing and International Business.

The above schools offer a wide range of subjects from undergraduate level to postgraduate level. As of July 2016, Victoria Business School was among just 76 business schools worldwide that hold the 'Triple Crown' of international accreditations: European Quality Improvement System (EQUIS), Association to Advance Collegiate Schools of Business (AACSB) (in business and accounting), and Association of MBAs (AMBA) (Victoria University of Wellington, 2016c).

2.1 Strategies

In 2014 Victoria University agreed on its strategic plan for the period 2015 till 2019 (Victoria, 2014). The university's strategies were broken up into six primary strategies and five enabling strategies, focused on creating the capability, scale, organisational excellence, facilities, resources and reputation that are critical for the success of the primary strategies and university in general. The strategies are listed below:

Six Primary Strategies:

1. Adopt a distinctive academic emphasis

2. Enhance research quality, quantity and impact

3. Provide a holistic learning, teaching and student experience that is second to none

4. Secure the intellectual potential put at risk through experience of disadvantage

5. Deepen engagement with alumni, benefactors and communities

6. Deepen Victoria University's intellectual influence in the Asia-Pacific region

Five Enabling Strategies:

1. Double the community of world-class scholars choosing Victoria

2. Attain the scale, quality and academic profile of leading public universities

3. Optimise the university's organisation, processes, facilities and use of resources

4. Increase and diversify sustainable revenue

5. Communicate the quality, values and distinctiveness that define Victoria

Taking Marx's (1991) view of strategic planning, one would expect all the university's resources to be integrated towards supporting the strategic plan of the university, including functions such as the PhD application process.

The strategies provide a key point of reference in relation to measuring the effectiveness of the PhD application process in supporting the university's strategic goals. By examining the PhD application process and forecasting what components would be necessary to support achieving the strategic goals outlined by the university, this research seeks to demonstrate the effectiveness of the PhD application process in supporting the university's strategy, given the context of implications of an unprecedented increase in application numbers on the PhD application process.

2.2 Stakeholders

In relation to the university's strategy there are a significant number of stakeholders both internal and external that have an interest in, influence or are impacted by the university's strategy. To get a better understanding of the stakeholders involved, a stakeholder map and specific stakeholder chart were developed based on the first two steps of Freeman's stakeholder analysis framework (1984).

As can be seen from the stakeholder map below (see Figure 1.0), in the context of the university's strategy, there are numerous stakeholders associated with the university.
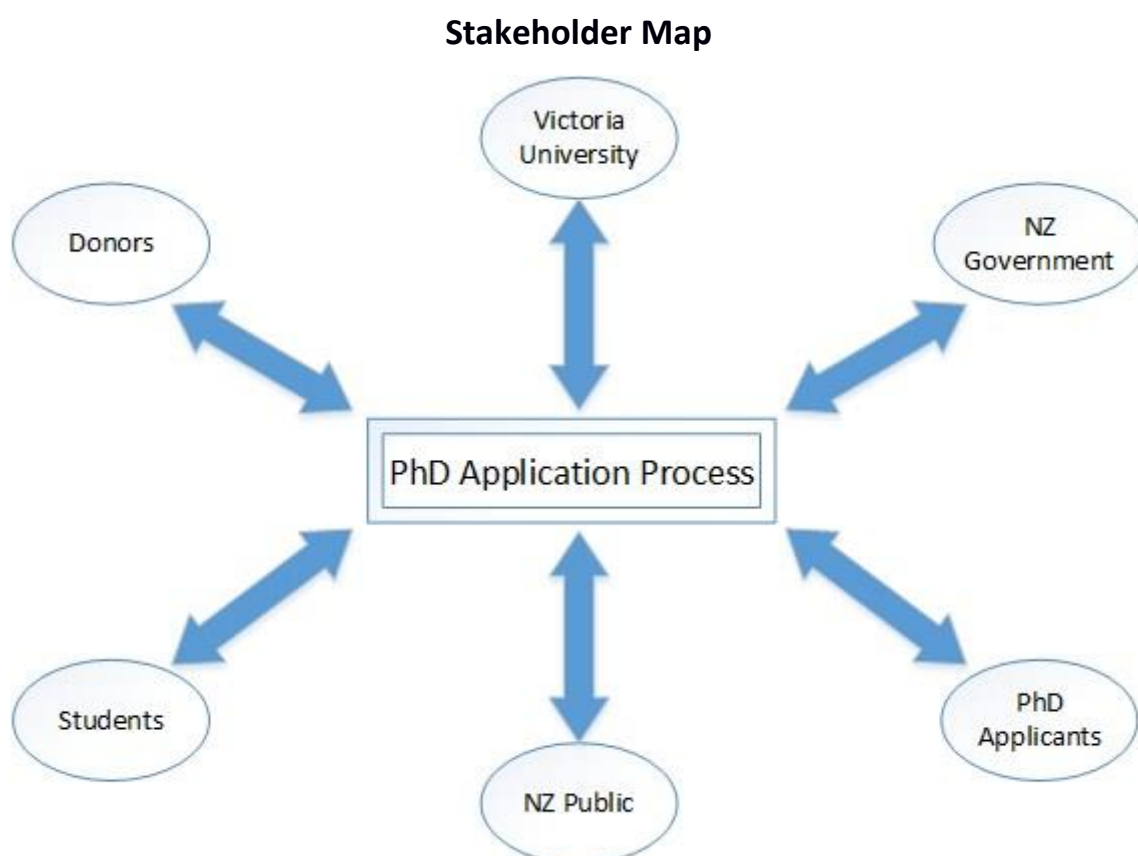
Stakeholder Map

Figure 1.0: Stakeholder Map

Categorising those groups within a specific stakeholder chart (see Figure 1.1), it can be seen how many different stakeholders there are with interests in the university's strategic plan.

Stakeholder Chart

Donors	Victoria University
Scholarship donors	Administrators
NZ Government	Facility of Graduate Research
Tertiary Education Committee	Schools
Ministry of Education	Faculties
NZ Immigration	Potential Supervisors
PhD Applicants	Scholarship Committee
Foreign Applicants	**Students**
Domestic Applicants	Current Students
NZ Public	Future Students
Tax-paying public	

Figure 1.1: Stakeholder Chart

Like most organisations, growth is part of the strategic plan for the university, with the university wanting to grow its student numbers, not only in the undergraduate level (bachelor's degrees), but at the postgraduate level (master's and doctoral degrees) as well. This would enable the university to benefit from economies of scale, to help generate additional revenue.

Doctoral degrees (PhDs) represent the highest level of achievement within the New Zealand Qualifications Framework (NZQF) (as seen in Figure 2.0). PhD research is a core function of the university and something that separates universities from other tertiary education providers in New Zealand. Therefore, effective management of the PhD Application Process is expected to be an important component of the university's activities, to grow research via doctoral study.

The New Zealand Qualifications Framework

Qualification	NZQF level	Knowledge, skills and application at different levels
Doctoral degree	10	All qualifications on the NZQF are assigned one of ten levels and each level has its own learning outcomes – the level of knowledge the graduate has acquired, the skills gained, and the situations in which the knowledge and skills could be expected to be applied.
Master's degree	9	
Postgraduate diplomas and certificates, bachelor's honours degree	8	
Bachelor's degree, graduate diplomas and certificates	7	For example, **at level 1** graduates will have:
Diplomas	6	• Knowledge – basic general and/or foundation knowledge.
	5	• Skills – basic skills required to carry out simple tasks and apply basic solutions to simple problems
	4	
Certificates	3	• Application – be able to apply knowledge and skills in highly structured contexts, take some responsibility for their own learning and be able to interact with others.
NCEA	2	
	1	

Source: Adapted from NZQA, n.d.

Figure 2.0: New Zealand Qualifications Framework

2.3 PhD Application Rates

In the years leading to 2016, concern has been expressed by one or more of the Victoria Business School's PhD Directors, about the number of PhD applications the school had to process and the time frame in which the schools had to make decisions. The increase in the number of applications to VBS were unexpected and prompted further understanding into the phenomenon.

Faculty of Graduate Research (FGR) data show the increase in the number of applications is university wide. The number of PhD applications has increased approximately 345% across the university over the eight years from 2007 to 2015 (see Figure 3.0).

Figure 3.0: University Application Numbers

The Faculty of Commerce, Faculty of Humanities and Social Sciences and Faculty of Science received the largest number of applications across the university (see Figure 4.0).
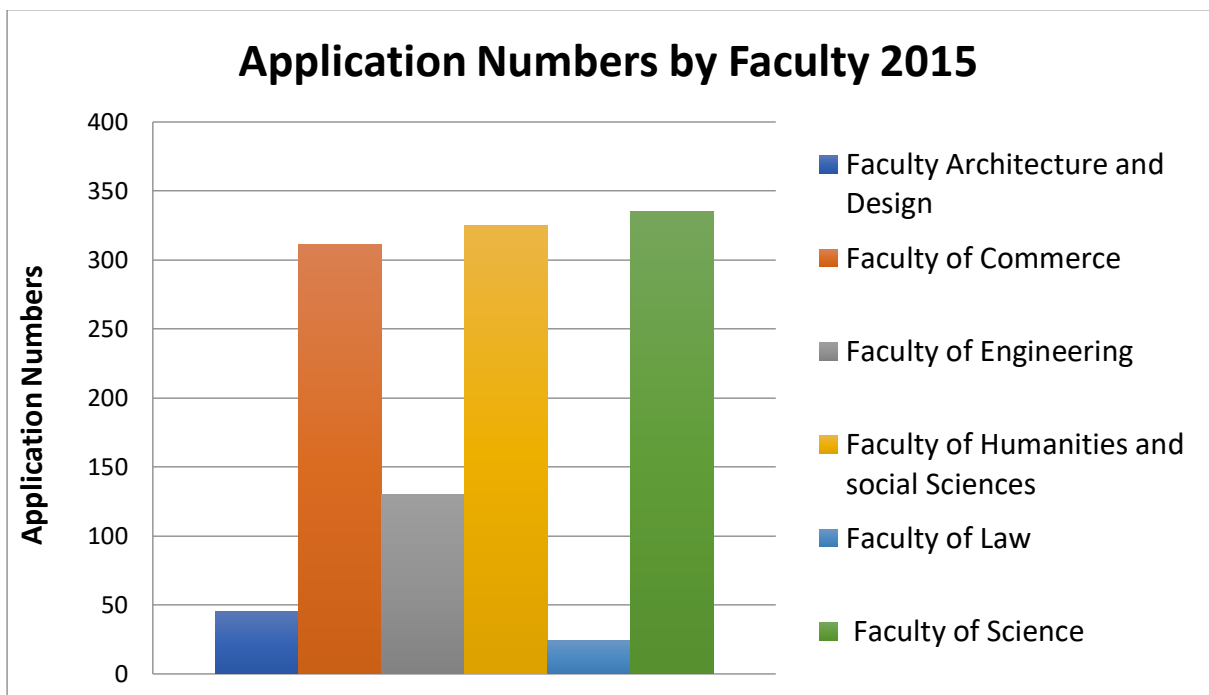
Figure 4.0: Applications by Faculty

The Victoria Business School alone has seen an increase of 658.5% in the eight years from 2007 to 2015 (see Figure 5.0).

Victoria Business School PhD Application Numbers
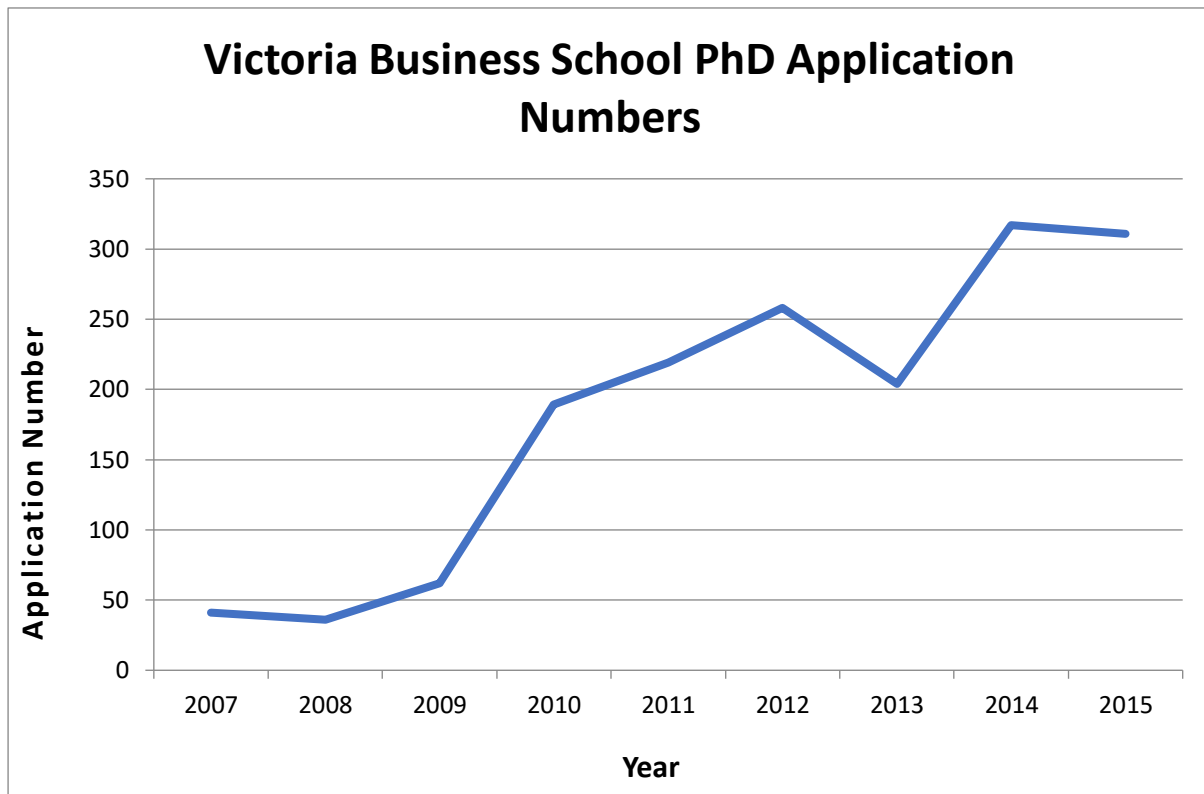
Figure 5.0: Faculty Application Numbers

Responses from a survey of potential supervisors (see Appendix 2, Q4.8) indicate the amount of time spent processing an application ranges from 15-45 minutes depending on the level of interest in the application, and then more time if the applicant has to be contacted and the documentation to be read further.

The New Zealand Productivity Commission (2016) has also commented on an increase in international PhD students over the last decade. The increase is possibly because international doctoral students pay the same fees as domestic students due to New Zealand Government subsidy policies. This raises the question whether the increase in application numbers is simply a natural part of the increasing global market for education, or whether the increase is being driven by some other elements of the university's own strategy.

In 2015, the Faculty of Commerce rejected 226 (72.67%) of all 311 applications. Whilst sixteen scholarship positions were offered during the year, only five had been accepted by the end of 2015. Similarly, whilst sixty nine "admission-only offers" (offering entry without financial assistance) of study were made, only 14 had been accepted by the end of 2015.

So, notwithstanding the considerable resources put into the PhD application process by the various stakeholders, only 19 students (22.35%) out of 311 applications had been enrolled by the end of the year.

In conclusion, Victoria University is a well-established university with many faculties and schools, including a triple-crown accredited business school. In 2014 the university signed off on its current strategic plan, of which there are many internal and external stakeholders. As part of the university's strategic plan, growth of student numbers at all levels is a strategic goal, a goal which reflects/encompasses doctoral research, and for which the number of PhD applications has already been steadily rising for the better part of the last decade. However, despite the increase in application numbers and the importance that universities attach to PhD research, the level and rate of growth in doctoral enrolments in impacted by the university's/VBS' high rejection rate and the low acceptance rates by applicants.

2.4 A Complex Problem

In 2009, the Faculty of Graduate Research was established at Victoria University in an effort to streamline and standardise the PhD Application Process across the university. The PhD application process now occurs three times a year over an eight week (40 day) period, and is comprised of many subprocesses with individual autonomous or semi-autonomous actors (e.g. FGR, administrators, PhD directors, potential supervisors, committees) across different schools and faculties. The overall outcome of the process is influenced by individual choices of the many autonomous or semi-autonomous actors, each currently driven by factors outside the control of any one participant in the process.

The decentralised nature of the PhD Application Process within a large, decentralised university, combined with some centralised decision-making, creates a unique problem environment.

Cole (2016) states that many organisations have moved towards the more flexible, decentralised structures over the larger, inflexible, more centralised organisations of the past. He suggests that, traditionally with decentralised organisations, authority and decision-making are placed closer to 'the action' to encourage fast decision-making in rapidly changing environments.

However, whilst being a decentralised organisation and process, much decision-making (particularly around scholarships) remains centralised, creating a tension between the school's desire for localised control to respond to its specific needs, and the university's desire for overall effectiveness and potential efficiencies that are believed to accompany centralisation.

Adding to the complexity are the many stakeholders involved, each potentially with their own interpretations of the aims of the overall application process and their part in it, with little to no particular guidance offered.

The increase in the volume of applications fits in with the desire of the university to increase student numbers, and research outputs and the chances of increasing revenues through the creation of new Intellectual Property (IP). However, the increase in the number of applications also creates a lot of pressure on the stakeholders, who work within unchanging time frames and resources to complete the process despite the noted increased number of applications - the outcomes of which, in terms of enrolment numbers within the year, seem disappointing for all the time and effort.

2.5 Problem Statement

Victoria University and its constituent faculties and schools, faces a problem of effectively maintaining a potentially overtaxed process with the volume of PhD applications made, while using a selection process featuring both decentralised and centralised elements. The university has a limited number of scarce resources to allocate to process activities, while trying to maintain the primary goal of the process, to select the best applicants. This is a problem of allocating resources that most organisations face at some time, one way or another. The status quo shows that the PhD Application Process and Victoria University have the following issues.

The university's strategy involves a goal increasing student numbers which, unless academic staffing numbers rise, will put an increasing demand on the time of academic staff who are required to teach, conduct their own research, and also supervise PhD students. Without increases in the number of academic staff, the supervisory capacity for PhD students remains the same and limits the overall number of PhD students that can be taken in by each school.

With an increasing number of applications being made, more pressure is placed on the effective allocation of scarce resources, and for stakeholders to contribute to the process on time more effectively and efficiently, reducing the amount of individual time spent on vetting/reviewing each application. However, with the increasing number of applications, the act of vetting each application becomes more important as well, especially when the university wants to maintain and, according to university strategy, increase the quality of its research outputs. If applications are not appropriately vetted, the likelihood of accepting someone who is not a "good fit" increases, leading to further university resources being needed to help the student complete their research, and potentially threatening the university's goal of increasing research quality.

At the same time, the increase in the number of applications creates more competition for available scholarships within the university. A high proportion of international students ask for scholarships, with some not able to attend without such financial assistance. However,

for every submission to the scholarship committee that does not yield a positive result, the frustration of schools and potential supervisors rises, and their 'buy-in' to the process diminishes. Less 'buy-in' to the process may then start to skew which types of applications are favoured by staff, as PhD Directors and potential supervisors may implicitly favour applications that do not require scholarships. Such adverse moral effects may also lead to suboptimal research outputs for both the university and individual stakeholders within the university, undermining the spirit of the process.

Finally, with the number of applications increasing and with such a low number of registrations generated (22.35% as at the end of 2015) by the cumbersome process; for all the additional workload and stress it places on staff, the PhD application process is potentially not very cost-effective in terms of New Zealand's Performance Based Research Funding (PBRF) model. The PBRF funding model contributes funding from the government to tertiary institutions for research conducted. Included in that funding model are contributions for PhD teaching and degree completion.

With the conflicts and flow on effects described, the question may be posed of whether the PhD application process able to effectively support the university's strategic goals?

2.6 Research Question

The key research question of this thesis is:

How effective is the PhD Application Process in the Victoria Business School in supporting the university and the realisation of its strategic goals?

In order to successfully answer the research question above, the following questions will first need to be answered too:

- What process(es) are used?

- How efficient is the current process?
- Does the PhD application process support achievement of the university's strategic goals?
- If not, how should the process be improved?

2.7 Purpose of the Study

This research examines the effectiveness of the PhD application process which occurs three times a year across Victoria University. To keep the study manageable, the study focuses on the Victoria Business School, and effectiveness is measured against how well the process supports three relevant key University research-aligned strategies, out of the six primary strategies outlined in the strategic plan.

Though the focus is only on the Victoria Business School, the study and its results could be extended to the faculty, and could generalisable to each faculty of the university.

Through the use of a multi-framing methodology, this study will look at the PhD application process using frames from two decision-making tools: Theory of Constraints (TOC) Thinking Processes (TP); and Systems Thinking; to analyse the process.

The methodology of using multiple frames to examine the same problem should increase the understanding of the problem by viewing it from different frames of reference, and provide different and complimentary perspectives, that are reinforcing, and perspectives that provide different emphasis on key variables and relationships.

The research aims to objectively and qualitatively measure how well-geared the process is in helping the university achieve its strategic goals, and to make recommendations to address any issues uncovered, based on analysis of multiple frames.

In this chapter, the organisation and its strategic goals were introduced. The stakeholders involved were identified and the issue around the rise in PhD number was introduced. From

there, how the increase in PhD applications creates a complex problem was explained and the research question the research attempts to answer was established. Finally, in this chapter the purpose of the study was introduced.

Chapter 3. Literature Review

In this chapter, the academic literature on multi-framing, Theory of Constraints and Systems Thinking is reviewed. The reviewed literature was found through the Victoria University Library and ProQuest databases by using the search terms: 'Theory of Constraints', 'multi-framing', 'System Dynamics' and 'PhD', along with the terms: 'university', 'strategy' and 'process'; including abbreviations, e.g. 'TOC', as well as other names the disciplines may be known as, e.g. 'Systems Thinking' and 'multiframing'. Once all the possible combinations were completed, it was repeated with any synonym used to substitute the terms 'university', 'strategy' and 'process', e.g. 'higher education'.

Further searches were done using the terms: 'Theory of Constraints', 'multi-framing', and 'System Dynamics', along with the terms: 'application selection' and 'student selection'; including abbreviations, e.g. 'TOC', as well as other names the disciplines may be known as, e.g. 'Systems Thinking' and 'multiframing'.

For the literature review, academic (theory-based) and practical (application-based) literature were examined, to help show existing gaps in the research fields and to demonstrate how this research is unique.

3.1 Multi-Framing Theory

"The early development of Operational Research/Management Science (OR/MS) was characterised by the deliberate use of multi-disciplinary project teams, whose composite strengths, creativity and problem solving abilities were enhanced by the complementarity of the different approaches and perspectives that were brought to bear on a problem" (Davies & Mabin, 2001). Relatedly, according to Franco & Lord (2011), multi-methodology is one of the most significant developments to emerge in the management science literature in recent years.

Mingers & Brocklesby (1997) argue that the highly complex and multi-dimensional nature of real-world problems makes multi-methodology a necessary development. The very 'phased-

ness' of a project (e.g. appreciation, analysis, evaluation, action) leads to a realisation that individual methodologies could be more useful in relation to some phases than others. Mabin & Davies (2004) similarly state that "Most real problems involve many issues that could be examined using different methods or approached from different angles developing different perspectives. It is thus rather problematic for teachers when asked, as we frequently are at the end of a course on Operations Research, modelling or decision-making, 'How do I know what method I should use in a particular situation?'

We could seek to focus on one characteristic that seems most salient or constraining, but often we may not know in advance what that is. Indeed, in most situations there will be more than one valid method to use, each perhaps more or less appropriate in dealing with a different subset of issues in the problem. If this is so, then this leads to a second issue: that the single-frame approach will often address only part of the problem." (Mabin & Davies, 2004).

Mingers (2001) has defined a 'method' within the multi-methodology literature as a set of ''well-defined sequences of operations that, if carried out proficiently, yield predictable results'' (p. 307). Multi-methodology is largely viewed as a necessity for dealing with complex problems where multiple approaches are required, a mixture of hard and soft systems perhaps, or two or more methods with different strengths to overcome the problem.

Multi-framing is different from Mingers' definition of multi-methodology in that multiple methods are not necessarily required to solve the problem. Multi-framing is more of an inquisitive investigation of viewing the same problem through different frames, changing the frame of reference to see what those frames reveal. The goal of using multiple frames is to hopefully offer a broader array of solutions to solve the problem.

Davies & Mabin (2001) state that much of the existing work on framing has given rise to the use of metaphor, in examination of management, organisations and organisational activities. Through the use of metaphor it is believed that insights will be developed into organisations, the unfamiliar and complex, by thinking of them as though they were

something else that is more simplistic and familiar. The concept of framing makes explicit the idea that any circumstance can be viewed or explored from a variety of perspectives. Framing provides a cognitive structure that may be used to build understanding of problems or problem structure, and to simplify complexity. Of this, Pidd (2004) had to say: "Davies & Mabin is one of the few papers that discuss how metaphor can be used in OR/MS to help people to frame problems. Davies & Mabin suggest how the use of multiple frames can open up new possibilities. Davies & Mabin regard such metaphors as devices for problem structuring that avoids early closure and ensures a divergent phase in problem solving before moving on to consider convergent selection of options. In essence, seeking to employ a different metaphor enables people to see things that are hidden by the blinkers of their unexpressed metaphors in use. It seems that this may be a fertile area for research and action." (p. 798).

Mabin & Davies (2004) demonstrate how a multi-framing approach is well suited to complex problems and that there is no one correct way to represent most real (as opposed to textbook) problems. Their paper argues that there is an advantage in using more than one frame to address most problems, and that our 'solutions' would be more robust if we sought to apply multiple frames more routinely and more explicitly, which embraces what the authors regard as multi-framing. This seems like a logical evolutionary step in the field of decision-making.

While there is a debate in the background with papers like "Mixing methodologies and paradigmatic commensurability" by Syntetos & Harwood (2011), with replies from Jackson (2011) and Mingers (2011) being played out in The Journal of the Operational Research Society, this research does not address the philosophical questions asked and debated therein, but rather in the practical application of multi-framing and its ability to solve problems better than using single-framed approaches.

3.2 Multi-Framing Application

Moore & Mabin (2014) have demonstrated the effectiveness of using multi-framing to solve practical problems in their research, by using the combined decision-making approaches of the Theory of Constraints (TOC), Stakeholder Analysis and System Dynamics to great success, helping find a consensus between multiple stakeholders in the issue of water reforms in the Kapiti Region of New Zealand; a real-world problem with genuine consequences.

Clark & Mabin (2011) further exemplify the use of multi-framing in their use of TOC and Multi-Criteria Decision Analysis (MCDA) to work out the best solution for a family dealing with an ageing elderly relative. The paper illustrated using the tools of the Theory of Constraints (TOC) to help create criteria to use in the MCDA model, using Belton's Visual Interactive Sensitivity Analysis (VISA) software.

Pongsart's (2015) research used multiple decision-making tools, Theory of Constraints and Appreciative Inquiry, to look at the tools' effectiveness in improving master's thesis students' performance.

3.3 Theory of Constraints

One of the proposed decision-making tools (frames) for this study is TOC's Thinking Processes. Kim, Mabin, & Davies (2008) conducted a review of the peer-reviewed literature in the public domain from 1994 until early 2006. TOC's five focusing steps and Thinking Process (TP) tools - Current Reality Tree (CRT), Evaporating Cloud (EC), Future Reality Tree (FRT), Prerequisite Tree (PRT), and Goal Tree (GT) - provide a systematic approach to organisational problem-solving.

Robbins (2011) and Reid (2007) both used TOC's five focusing steps to improve processes; Reid to improve a service process in a bank, and Robbins to find the constraints in the delivery of social goods in the public sector. Robbins used the five focusing steps from TOC and not the other thinking processes. TOC's five focusing steps have been used to improve

processes in the manufacturing of goods for years. Another example is Kohli & Gupta (2010), who applied TOC to improving operations strategy through the application of TOC's five focusing steps. Their research examined the production of pizza in a small family-owned pizza restaurant. The application of TOC explored ways to improve the `throughput' of pizzas and did not look at other areas of the business such as strategy. The research focused mainly on the five focusing steps and not the Thinking Processes, and no multi-framing approach was used.

Taylor & Thomas (2008) applied the TOC thinking processes to the invoicing process/system of a consulting firm. The authors used TOC for the structured cause and effect logic it brings to problems. Using just the TOC Thinking Processes, the authors were able to address the three main questions of TOC: 1) what to change; 2) what to change to; 3) how to cause the change. However due to restrictions, this research is focused on the first two questions of TOC.

Rahman (2002) used TOC to take a qualitative approach to analysing supply chains, an area usually dominated with quantitative statistical analysis. Using TOC TPs, undesirable effects and critical success factors were identified, and causal relationships were created to better understand the relationships between those factors. Dalci & Kosan (2012) demonstrated the TP's effectiveness in analysing and improving operations in the hospitality industry to improve customer satisfaction.

Lin, Chi & Wang (2012) applied the TOC Thinking Processes to improve the logistics management processes within the national research institutions. The systems were large, and involved many operational processes; thus, many constraints were established in order to avoid malpractice. In actual execution, operational flexibility was low due to the constraints; thus, excessive operation costs were bound. The authors' research did use the Thinking Processes similar to this research, but was not a multi-framing exercise. However, a Analytic Hierarchy Process (AHP) was also used to evaluate the weightings of the issues affecting factors for analysis, making the authors' work a bit more unique.

Li, Hamada & Shimozori (2010) researched the development of a TOC-based scheduling system for ship piping production. The idea of a TOC-based scheduling system could have held useful insights into the PhD application process. However, this will have to be categorised as future research as a copy of their research was not available.

Kimani (2015) researched higher education, looking at improving the quality of learning and teaching experiences. While Kimani used a Theory of Constraints approach, the research looked at the learning experience itself and not the process behind admissions into said learning experience.

Pongsart (2015) also wrote on improving the performance of higher education students, but at the master's degree level. While Pongsart used a multi-framing approach, with one of the tools being TOC, the other was not systems thinking or BPMN.

Librelato, Lacerda, Rodrigues & Veit (2014) used TOC Thinking Processes to help improve processes at a Brazilian automotive company. Rather than using TOC as a stand-alone tool or in a multi-framing model, whereby both tools are used to evaluate the same problem, the authors instead used TOC to complement the Value Stream Mapping (VSM) by using TOC to help examine the problems (undesirable effect) through the sole use of a CRT. For the implementation of solutions the authors returned to using VSM.

Lacerda, Cassel & Rodrigues (2010) presented a case for the integration of TOC Thinking Processes and process engineering by looking into the complementary aspects between the two. For their research, the authors compared an institute of higher education and a process using the process engineering approach. A Current Reality Tree (CRT) was then used to analyse the process, and Evaporating Clouds (EC) were used to resolve any issues. The process was then re-engineered using the process engineering tools based on the results of using the TOC tools. The authors' work contributes towards understanding and identifying the causes of problems in a studied process. The paper proposes an approach that enables a systematic and systemic analysis of organisations' processes through the use of process engineering and TOC's TP.

All such research demonstrates the strengths of TOC for helping organisations attend to or solve a range of different problems. The research also demonstrates how well TOC can work alongside other methodologies or decision-making tools. However, most of the above research does not take a multi-framing viewpoint whereby each tool's analysis of the entire problem could stand alone. Rather, they focus on a multi-methodology approach using the strengths of each analytical frame to complement, rather than using the two tools separately to see what differences, similarities and insights are revealed by using multiple tools (frames) separately, as this research proposes to do.

3.4 System Dynamics Theory

Another methodology (frame) being used in this research is Qualitative System Dynamics, which uses Causal Loop Diagrams (CLDs) as models to represent complex causal relationships between variables and show the effects on the variables' relationships as circumstances change. The fundamental ideas of system dynamics were developed by Jay Forrester at MIT in the 1960s. "Forrester (1961) was interested in modelling the dynamic behaviour of systems like populations in cities and industrial supply chains. Forrester argued that behaviour of such systems, at whatever level, resulted from underlying structures of flows, delays, information and feedback relations" (Mingers & White, 2010).

Mingers & White (2010) reviewed the literature for contributions of various systems thinking approaches to operational research and management science. They reviewed the history of systems approaches, including complexity theory, cybernetics, system dynamics, soft OR and PSMs, critical systems and multimethodology.

According to Mingers & White (2010), what is meant by 'systems approaches' generally includes the following:

- Viewing the situation holistically, as opposed to reductionistically, as a set of diverse interacting elements within an environment.

- Recognising that the relationships or interactions between elements are more important than the elements themselves in determining the behaviour of the system.

- Recognising a hierarchy of levels of systems and the consequent ideas of properties emerging at different levels, and mutual causality both within and between levels.

- Accepting, especially in social systems, that people will act in accordance with differing purposes or rationalities.

Mingers & White (2010) further state that system dynamics provides a powerful set of concepts for understanding and modelling complex systemic behaviours, which have a wide range of application areas. At its heart system dynamics focuses on the results of the interplay of two forms of feedback loop – positive (or reinforcing) loops that lead to continual growth or decay, and negative (balancing) loops that lead to stability. The positive and negative loops, and the patterns of behaviour positive and negative loops generate, can be found in systems of all types; hence the wide range of applicability.

System dynamics encompasses the notion that there are particular patterns of interconnected feedback that occur in many situations and generate particular patterns of observed behaviour. Forrester maintained there may be around 20 such generic structures. Forrester's idea was reinterpreted by Senge (1990) in terms of introducing 'systems archetypes' which often describe and explain organisational problems. Examples quoted from Mingers & White are: " 'success to the successful' in which reinforcing loops differentiate between competing organisations so that one becomes ever more successful at the expense of the other; or a 'fix that fails', where a short-term fix generates new and unforeseen problems that require even more of the fix" (Mingers & White, 2010).

Gary, Kunc, Morecroft & Rockart (2008) wrote about system dynamics and strategy, making claims that system dynamics has already made large contributions to a range of management subfields, including operations, organisational behaviour, marketing and behavioural decision-making; and insisting that system dynamics still has a lot to offer in the field of strategy.

3.5 System Dynamics Application

Weil (2007) examined corporate strategy, looking at a large Canadian food manufacturer and retailer, focusing on the dynamic interactions of multiple conflicting performance objectives. In vertically integrated companies such as the Canadian food company one is more likely to find the opportunity for conflicts such as: 1) conflicting performance measures, not only at the individual level, but at the interdivisional level as well; 2) manufacturing often modifying retail orders to increase its income contribution, as by shipping 5-10% more it could offer lower transfer prices; 3) management's attempts to increase sales conflicting with its efforts to increase gross margin.

Their analysis showed the continual oscillations among conflicting performance objectives were causing the company to fall short of all of its targets. Weil's research captured the dynamic tensions among conflicting performance objectives and shows how the conflicts impacted mid-term company performance. The company could not sell more than it produced. Rapid growth would require simultaneously stimulating demand and increasing output while maintaining a satisfactory margin, e.g., through economies of scale. It is a very difficult balance to achieve and sustain. The need for alignment among strategic objectives and operating performance measures is a recurring theme in the literature.

Weil (2007) also recites further research done in the area of strategy, looking into a major IT systems supplier. The project focused on R & D management at the strategic level. His analysis highlighted the causes and implications of 'workflow bunching', a common pattern of oscillating and maldistributed workload experienced by many R & D organisations. The dynamics produce periodic bulges in workload at various stages of the R & D process, shortages of new product candidates, waves of new products entering the market, insufficient mastery of new technologies and unanticipated product performance problems.

Workflow bunching is caused by the combination of dysfunctional resource management policies, over-optimistic commitments, and changing corporate-level pressures for diversification. Limiting growth in overall headcount and also allowing rapid reallocation

from one technical activity to another amplify the problem. Over-optimistic commitments lead to initially unrecognised additional real workload. Both of Weil's works contain similar issues that are evident in the PhD Application Process within the university.

Snabe & Größler (2006) investigated how system dynamics modelling can be supportive for strategy implementation in organisations. The authors acknowledge that in many organisations, decentralisation and empowerment have resulted in increased challenges for implementing strategic decisions for a range of reasons. Snabe & Größler argue the use of system dynamic models in strategy will help to communicate the decisions made, involve stakeholders in the implementation, and finally, provide a means for optimisation within the given decision frame. The authors claim that "because the case study describes a longitudinal, real-time single site case, with no test group for comparison, even in the light of good organisational results, it is impossible to know if other intervention mechanisms would have yielded better results." (Snabe & Größler, 2006). However, in the eyes of the client the modelling was a success and the participants saw the modelling and simulations as useful. Similarly Ghaffarzadegan, Lyneis, & Richardson (2011) demonstrated how using small system dynamic models could improve the public policy creation process, by creating small models to represent the complexity of the environment.

Asl & Zendeh (2014) used system dynamics to potentially help university strategy. The authors used systems dynamics modelling to create a simulation to help predict the likely numbers of bachelor's degree, master's degree and PhD students. By creating such a model the authors could help the university create/change strategy accordingly, and better still, be able to forecast the likely affect of introducing policy changes.

Rahmandad (2015) wrote an article using system dynamics to examine the trade-offs that managers face in allocating organisational effort and resources. Rahmandad's conceptualisation ties in with the resource-based view of the firm in the field of strategy. The models produced could be used to help find the best balance of resources for improving performance, both in the short and long term. The model was robust enough to enable other firms (competition) to compete for market share and show the outcomes under different circumstances.

While Rahmandad's research demonstrates that system dynamics can be used to help in the allocation of resources, the research looks only at whether a company should invest in long-term (dynamic) capabilities or short-term (operational) capabilities. Rahmandad's research, however, does not look at department or process level allocation of resources.

Galanakis (2006) uses systems thinking to create a high-level CLD that describes the innovation process and helps managers understand the relationship between all the different factors. However, the author notes that because the model alone does not illustrate the effects and changes over time, a model alone can make it difficult for managers to understand the long-term effects of their decisions. However, in future research it could prove interesting for the model be turned into a simulation where it would be possible to give insights into the effects on factors including sales, profits and shareholder satisfaction. While the author's work shows how a process can be graphically represented using systems thinking tools such as a CLD, demonstrating how a model can be created to encompass aspects of several already existing frameworks consolidated into a singular model, it does model the cause-effect relationships of a problem within an already present process similar to the research at hand.

Morrison (2012) developed a system dynamics model to assist with the problems of managing process improvement when resources are constrained, modelling the critical interactions between first and second order improvements as options for governing production. Going a step further to produce a stock flow diagram, akin to a CLD and running simulations provided greater insights into whatever effects changes had within the system. The authors can create simulations by using quantifiable variables, something which this research in its qualitative approach cannot do.

While all the above examples relate to higher-level strategic or operational concepts, Zhu, Zhang & Zhang (2016) used system dynamics modelling to simulate a coagulation-ultrafiltration process. A system dynamics approach was used to improve the basic parameters and the operational instructions of the process. By running different simulations under changing conditions the authors helped understand dynamic behaviours in the

coagulation–UF processes. Ultimately the water treatment process was optimised through the use of system dynamics, and showed how system dynamics can help in process optimisation. However, Zhu, Zhang & Zhang's research was very dependent on quantifiable factors.

Xu, Meng, Yao, & Jing (2014) used system dynamics to map out the original process and then an improved process for the polysilicon production trust in China. This was accomplished after researching the detailed problems in the industry and finding ways to optimise the process. Liu, Xie, Sun, & Chen (2015) used system dynamics to show the interactions on iron-flow in the sintering process, accurately modelling how changing different inputs to the process affect the outputs. Both of the above research cases are similar in intent to this project.

The above literature not only shows how system dynamics can add a lot to the area of strategy, but also how its ability to simulate and graphically represent models/systems helps improve people's understanding and decision-making around those systems. Furthermore, it illustrates that system dynamics can be used to represent and improve processes. While the literature/research reviewed relate mainly to manufacturing-based as opposed to administrative systems., System dynamics can still prove beneficial in this research, examining the PhD application process in its entirety, as it pertains to the Victoria Business School and the issues therein.

In this chapter, a brief overview of some of the existing relevant literature was presented, looking at the nature of the alternative frames, tools, methods etc, as well as the theory behind the various tools used in this research as well as practical examples of the tools being used as well.

The chapter initially examined notions of multi-framing and multi-methodology, and the difference between the two.

Next, it looked at the Theory of Constraints and identified the various Thinking Process tools that are offered by TOC. A wide variety of applications were provided to demonstrate the versatility of the tools in a wide range of areas.

Finally, system dynamics was examined: starting with a brief history of its foundations and what constitutes a systems approach, and commenting on the more recent introduction of Senge's (1990) system archetypes. Following that, a range of practical applications of system dynamics were presented.

Chapter 4. Research Methodology

In this chapter, the phases of the research are laid out and the methodological steps taken for each frame are explained. This research demonstrates the benefits of using a multi-framing approach to analysis and problem-solving applied to an organisational process. The problem being examined in this study is analysing the effectiveness of the PhD application process in supporting the strategic goals of Victoria University. To measure the effectiveness of the process there are a number of research questions that relate to the PhD application process, as stated in the background chapter 2.6.

The frames used to do the analysis in this study are the Thinking Processes of the Theory of Constraints, process mapping and qualitative system dynamics.

The chapter is organised into four sections: frame selection; selection of participants and data collection; methodology; and methodology summary.

4.1 Frame Selection

Drawing from the literature reviewed in chapter 3, the following sections explains the selection of the frames used in this research.

Theory of Constraints

Blackstone (2001) stated that one of the merits of TOC's tools is that the tools can be applied to any problem situation where performance is constrained or suboptimal, in order to identify and address core problems and resolve underlying issues; exactly what this research is examining.

Robbins (2011), Reid (2007) and Kohli & Gupta (2010) did research using the five focusing steps. For Kohli & Gupta (2010) the application of TOC was looking at ways to improve the `throughput' of pizzas and did not look at other areas of the business such as strategy. The research focused mainly on the five focusing steps and not the Thinking Processes, and no multi-framing approach was used.

The reason the five focusing steps are not used in this research is because although the PhD application process can be viewed as a system of inputs and outputs, the PhD application process has such a decentralised nature, with no particular way the process is done at each level. The five focusing steps would therefore have to be applied to each school within each faculty to apply the steps to the way each individual school do their own part of the process. Add to that the restrictions this research had on access, using the five focusing steps was impractical and near impossible.

Taylor & Thomas (2008) applied the Thinking Processes (TPs) to an invoicing process/system, demonstrating the efficacy of the Thinking Process works for administrative systems.

Rahman (2002) applied TOC's TPs in a qualitative approach, and Dalci & Kosan (2012) demonstrated the TPs improving operations within the hospitality industry. Both research articles are similar to the approach and style of what this research intends to do. However, neither research combined the Thinking Processes in a multi-framing approach.

Kimani (2015) and Pongsart's (2015) research only focused on people already in the learning environment and not those applying or the application process itself. The research demonstrates how TOC's thinking processes can be applied in the general area of higher education.

TOC's TPs have been proven effective in a wide variety of processes. However, they have not been used to examine the admissions process in a higher learning (tertiary) institution, and especially not doing so through the application of multi-framing; hence, why the TPs alone were selected for this research. Based on the information above, using the five focusing steps is impractical for this research.

Qualitative System Dynamics

System dynamics is a well-known methodology approach for dealing with complex problems, created for the specific purpose of dealing with complex matters and identifying their cause-and-effect relationships; which makes it eminently suitable for such a study as this one.

Weil (2007) examined corporate strategy, focusing on the dynamic interactions of multiple conflicting performance objectives. The need for alignment among strategic objectives and operating performance measures is a recurring theme in the literature. Snabe & Größler (2006) investigated how system dynamics modelling can be supportive for strategy implementation in organisations. The authors acknowledge in many organisations, decentralisation and empowerment have resulted in increased challenges for implementing strategic decisions for a range of reasons; demonstrating how system dynamics is a good tool for tackling such research.

Asl & Zendeh (2014) used system dynamics to help university strategy. The authors used systems dynamics modelling to create a simulation to help predict the likely numbers of bachelor's degree, master's degree and PhD students. By creating such a model the authors could help the university create/change strategy accordingly, and better still, be able to forecast the likely affect of introducing policy changes. While Asl & Zendeh's research is excellent in helping strategy formation, it is not as useful in measuring the effectiveness of existing processes in supporting existing strategy.

Zhu, Zhang & Zhang (2016), Xu, Meng, Yao, & Jing (2014), and Liu, Xie, Sun, & Chen (2015) all used system dynamics to improve processes. However, their studies were quantitative in nature.

The above literature demonstrates that systems dynamics is versatile enough to be used in measuring strategy and performance, while at the same time is also used for process improvement. However, unlike some of the process improvement research mentioned

above using quantitative system dynamics, this research will use qualitative system dynamics.

4.2 Selection of Participants and Data Collection

To understand who the faculties are that receive the highest numbers of applications per year, the Faculty of Graduate Research was approached to provide the numbers for the previous year (2015) as the figures stand at that moment in time.

To keep the study manageable, one faculty with a high number of annual incoming PhD applications was chosen to focus on, in this case the Victoria Business School.

A stakeholder map and specific stakeholder chart were developed based on the first two steps of Freeman (1984). From there it is possible to identify the parties to interview from within the Victoria Business School. For the purposes of this research, the key stakeholders for interviews were administrators, directors and potential supervisors, which is because those stakeholders are all directly involved in the PhD application process and may also represent different viewpoints.

In order to understand what was thought to be a PhD process fully supporting the strategies of the university would look like, the university's strategic goals were read through carefully to extract what parts could and should impact the PhD process and in what way the PhD process could support those goals. A Theory of Constraints Goal Tree was created using Dettmer's (2007) version of the model to see what features a fully supporting PhD application process might contain.

After identifying the actors/stakeholders involved in the process, interview questions were developed to find out how much stakeholders knew about certain areas and to get their overall thoughts relating to areas of the process, which would provide key evidence into the existence of the components expected to find from the creation of the Goal Tree.

With the intended stakeholders identified and the interview questions created, the next step was to apply for human ethics approval through the university. After submitting the details of the research and the research questions to ensure no unintentional distress would be caused, and upon satisfying the human ethics committee's needs, an approval number (#22879) was given and the research could commence.

A two-stage approach was taken with the interviews. Firstly, the administrators and PhD directors from the schools within the Victoria Business School were invited via letter to participate in an unstructured interview. For the administrators and PhD directors, at the end of the interview, each participant was asked to provide the names of 5-10 potential supervisors from within their school that might be interested in assisting with this research.

Asking the administrators and PhD directors seemed the most practical method as both groups knew the academic staff best, and which of all would be more likely to assist with such research. To approach all the academic staff within the Victoria Business School meant contacting some 100+ people out of the blue.

Secondly, an email was sent to all of the names of potential supervisors provided by the first group, asking the potential supervisors to participate in the research.

An additional section to the original interview questions was added for the potential supervisors, with questions enquiring about how the potential supervisors personally evaluate applications and what each considered before agreeing or declining to supervise a PhD student.

The table below (see Figure 6.0 below) shows the breakdown of the participation numbers for the study.

Participation Breakdown

	Participants	Number Invited	Number Participated	Number of Schools represented	Response rate
Stage 1	Administrators	6	2	2	33%
	Directors	6	5	5	83%
	Total	**12**	**7**	**6**	**58%**
Stage 2	Potential Supervisors	26	6	4	23%

Figure 6.0: Participation Breakdown

Once the interviews with the potential supervisors were completed, it ended the official data collection portion of this research.

4.3 Mapping the Process

From the data received (Appendices 1 & 2 - Q3.2), it was possible to see that different schools executed the process slightly differently, the main variation being whether or not potential supervisors got to see the applications before the research committee met.

Both variations of the PhD application process were mapped out using BPMN. Mapping out the process enables showing the sequence of events and flows of information, based on data collected.

From there, following through the process and checking against data collected, possible 'fail points' were identified. 'Fail points' indicate parts of the process that may delay, prevent, distort or otherwise cause the process to be suboptimal.

Next, a second process map was developed for each variation displaying the different '*fail points*' for each variation. A detailed description of each fail point was then written up.

4.4 Theory of Constraints

Following Dettmer's (2007, p. 30) diagram of how TOC's six logic trees can fit together as an integrated Thinking Process, this research will use the Goal Tree (GT) (I/O Map)[1]; and the CRT. According to Dettmer (2007, p. 29) the Goal Tree and Current Reality Tree steps alone will answer the two 'States of Change' questions:

1. What's the desired standard?
2. What to change?

4.4.1 Goal Tree

By creating a Goal Tree showing what a desired PhD application process fully supporting the university's goals would look like. Having the strategic goals at the top of the tree, with the critical success factors and necessary conditions below to make it all possible; it will then be possible to search for evidence (through interviews and documentation) of the necessary conditions and see if such conditions exist. If there is no evidence of the necessary conditions existing, then it is unlikely the CSFs will be achieved and the strategic goal met.

4.4.2 Current Reality Branches (CRB)

To develop a CRB logic tree, we use the non-achievement of the strategic goals as the '*undesirable effects*' (UDE). Then placing the UDE at the top of the tree and the information gathered earlier, the intermediate effects and root causes of issues can be filled in.

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[1] Goal Trees were formally known as I/O Maps.

Using TOC's sufficiency logic (If .. then…) to show the effects of the root causes from the bottom of the tree to the top, it is possible to see the cause and effect relationships between the issues coming up in the process.

The process was repeated for all the strategic goals being investigated, plus the additional undesired effects the data collection identified; for example, frustration.

Once the undesired effects were traced back down to their root causes, recommendations were able to be made to resolve the root causes of the problems.

4.5 Qualitative System Dynamics

Following the dynamic modelling process from Maani & Cavana (2007, p. 61) (see Figure 7.0 below), the first two phases of the process are used.

Dynamic Modelling Process

Phases	Steps
1 Problem structuring	1 Identify problems or issues of concern to management and main stakeholders 2 Collect preliminary information and data 3 Conduct group sessions for creative problem structuring
2 Causal loop modelling	1 Identify main variables 2 Prepare behaviour over time graphs (reference mode) 3 Develop causal loop diagram (influence diagram) 4 Analyse loop behaviour over time 5 Identify system archetypes 6 Identify key leverage points 7 Develop intervention strategies

Figure 7.0: System Dynamics Modelling Process

4.5.1 Phase 1: Problem Structuring

With the main stakeholders identified, interviews were conducted and information on the PhD application process and issues surrounding it were gathered. Rather than conducting

group sessions for creative problem structuring (step 3) which would compromise people's anonymity, a problem statement was created using the information gathered.

4.5.2 Phase 2: Causal Loop Modelling

From the problem statement, a list of main variables was created, and from the list of variables a Behaviour Over Time (BOT) chart was created to show the behaviour of some of the key variables over time. Using the variables identified, a Causal Loop Diagram (CLD) was created, showing the effects and interconnections of the variables with each other. The loop behaviour for any loops will be explained and any system archetypes identified. From the causal loop, a list of *'leverage points'* will be identified from which recommendations (intervention strategies) can be made to change the effects on the Causal Loop Diagram.

4.6 Limitations

The Victoria Business School Faculty has its own Annual Plan (Strategic Plan in all but name), which is written in terms of how the Business School contributes to the achievement of the goals in the university's Strategic Plan. However, the faculty's own plan is not a public document and was therefore not accessible for the purposes of this research. Furthermore, it is unlikely that document deals with issues at the process level such as the PhD application process.

The boundaries of this research were limited to those within the current Victoria Business School. Therefore, some options that might have been highly beneficial to the study, such as interviewing scholarship committee members or staff at the Faculty of Graduate Research or other faculties, was not possible.

Furthermore, with regards to international students, their ability to obtain a visa is a big part of their ability to attend the university. However, obtaining visas is also outside of the boundaries placed on this research.

4.7 Assumptions

This research was carried out under one important underpinning assumption: that all the information received via documents, interviews and feedback was completely honest and not tainted by any individual's personal views or internal politics.

4.8 Methodology Summary

This chapter explained the steps taken to conduct this research so that the research could be duplicated by another at a later date. This chapter looked at each of the frames selected and why each frame was deemed appropriate for this research. Then the steps taken within this research were separately laid out to help the reader understand the research process. Finally, in this chapter were outlined the limitations and assumptions under which the research was conducted.

Chapter 5. Analysis

In this chapter, the frames chosen are applied to the data collected. An analysis is carried out using each frame, and the results are shown and explained. Initially BPMN was used to map out the process; then TOC tools were used to identify issues that were brought up during data collection; finally, the process of qualitative system dynamics are used to examine how everything is interrelated and connected.

5.1 Business Process Modelling and Notation

The PhD application process can be regarded as a highly decentralised process involving multiple faculties, schools and groups within the university.
Whilst applications are directed to the Faculty of Graduate Research (FGR), once the cut-off date is reached, the process starts with applications being distributed within the university with the goal of having all applicants receiving a response at the end of eight weeks (40 business days), from respective Faculties.

Data collected shows (see Appendix 2, Q3.4) that PhD applications can be assessed using many criteria: Grade Point Average (GPA), English language skills, quality of referee reports, previous publications, having a research methods background, and more. Furthermore, some schools have their own internal mechanisms and criteria which may be used: for example, video conferencing each applicant (i.e. Skype); forming a research team; individual motivations for study etc. and discussion about the merits to the field of research for staff & the school, to name a few.

Once the FGR releases the applications to the various schools, each school conducts its part of the process as it deems best. However, despite a reasonable degree of freedom, there only seem to be two main differences in the way the process is completed.

In this section, the process has been mapped out based on the information gathered from the Interviews, and fail points have been identified. Mapping out the process helps to give a clearer picture and another perspective on what exactly the focus of this research is. The

information gathered reveals that there are two predominant ways for the process within the Victoria Business School. Both variations were mapped to examine the differences between them and to look at the potential fail points of both process variations.

In the field of business process modelling there are currently two predominant methods: Shostack's (1984) (1987) Service Blueprinting; and OMG's (2011) Business Process Model and Notation (BPMN). A key difference between the two, according to Milton & Johnson (2012), is that service blueprinting takes the viewpoint of the customer and not the organisation. Blueprinting is built around customer actions, along with 'onstage' or visible employee actions seen by the customer. There are also 'backstage' or invisible employee actions and support processes that the customer cannot see, behind what is called the 'line of visibility'.

BPMN, however, takes a more organisational view of business processes. "The primary goal of BPMN is to provide a notation that is readily understandable by business users, ranging from the business analysts who sketch the initial drafts of the processes to the technical developers responsible for actually implementing them, and finally to the business staff deploying and monitoring such processes" (Chinosi & Trombetta, 2011). One of the strengths of BPMN is that business processes use swim-lanes. A 'swim-lane' separates actors. Each swim-lane shows the activities and tasks each actor does in the process from start to finish.

An 'activity' shows when an actor finishes some work. Activities are the core of describing the work completed. The work could be very basic, a 'task', or could be more complex comprising several tasks, called a 'subprocess' or just an 'activity'.

Arrows connecting events, tasks and activities show the process sequence, and are called 'flow'. There are three different types of flow that are used to:

(1) show the way a process is planned to execute, called 'sequence flow';
(2) show a flow of message, called 'message flow'; or

(3) show a logical link between activities, called 'association'.

Kazemzadeh, Milton & Johnson (2015) conclude that service blueprinting is an appropriate approach when the organisation has a customer-centric view towards its service delivery process. However, BPMN is perhaps more suited when there is a need to depict organisational departments, systems and roles that are involved in the process.

Because the PhD application process is decentralised, spanning across multiple schools and facilities, coupled with the fact that customer (candidate/applicant) involvement is minimal and the majority of the process happens behind what would be considered the 'line of visibility', BPMN was the more appropriate method to map out the PhD application process. BPMN also has the added benefit of being able to represent complex or ambiguous activities comprising several tasks, with a single representation in the form of a 'subprocess'. Furthermore, the multiple uses of flow will enable a more accurate depiction of the PhD application process as it has sequential message flows.

NB: *The processes below have been modelled to a high-level overview and there are certainly subprocesses and exceptions that are not captured in the below diagrams. The intention of the diagrams is to provide a visual representation of the overall activities and sequence of events in the process, and to provide a complete overview of the process as a system. The diagrams also serve to reinforce how decentralised the process is.*

5.2 Committee Method

One alternative example of the PhD application process, hereby called the 'committee method' (see Figure 8.0 below) is where the PhD director promptly calls the PhD/research committee together, after receiving the applications from the administrator and making notes on the respective applications, as the data collected shows (see Appendix 1, Q5.1 - Respondent 7, and Appendix 2, Q3.2 - Respondent 6).

The PhD/research committee vet all the applications and sort through the applications, finding the ones suitable for their school's research interests. The PhD director and/or possibly members of the committee then attempt to find colleagues to supervise the intended research of the applicant.

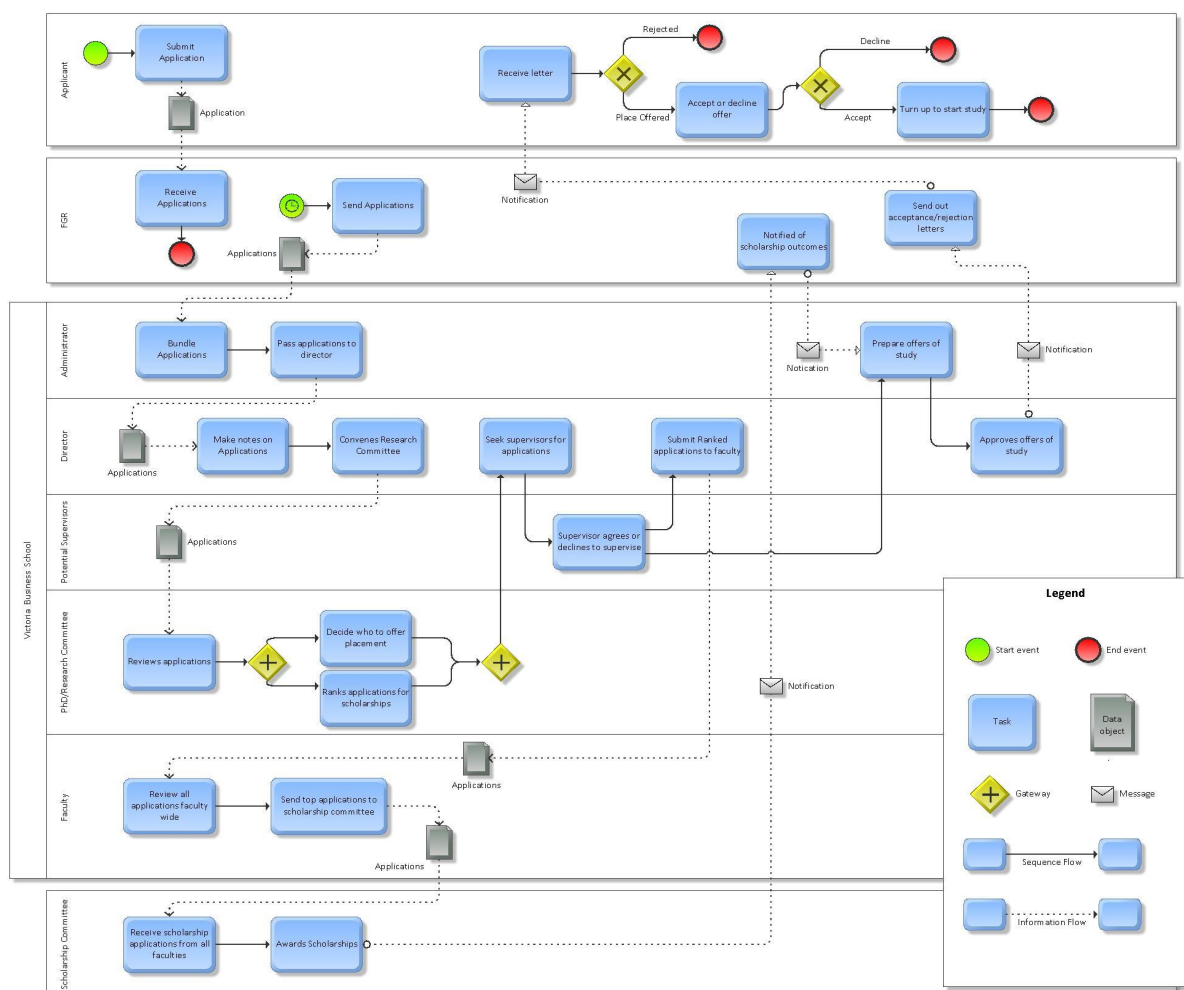## Committee Method Process

Figure 8.0: Committee Method Process

The above diagram (Figure 8.0) representing the committee method starts with the applicant submitting their application to the Faculty of Graduate Research. Once the close-off date is reached, represented as a 'time related event', the applications are sent to the administrator of the respective schools.

From here the administrator bundles the applications, which may involve printing them off and uploading of them to a shared computer drive. The printed applications are then passed to the PhD director, who reads through them and makes preliminary notes.

The PhD director then promptly arranges the PhD/research committee, which is the distinguishing feature and where the committee method gets its name from. The PhD/research committee meets and evaluates the applications. The PhD/research committee decides who to offer positions to, and ranks them in relation to scholarships.

Once the school has determined which applicants the school is prepared to take on as students, the PhD director (possibly with help of members on the PhD/research committee) approaches colleagues with the intention of finding a suitable supervisor for particular applications. Potential supervisors can agree to supervise or decline to, usually based upon their interest in the topic or their current workload and obligations.

Once applications have assigned supervisors, the applications are either sent to the faculty, if the application is seeking a scholarship and is ranked highly enough by the school to have potential for a scholarship award, or the application is sent back to the school's administrator who prepares offers of study or rejection letters.

The applications that are sent to the faculty are combined with all the other scholarship applicants from the other schools from within the faculty, and a select group of the faculty meet to discuss which of all the applications will be sent to the university scholarship committee.

Applications that are not fortunate enough to go on to the university scholarship committee go back to their respective schools' administrators for offers of study to be created. The

applications that are successful get sent to the University scholarship committee. The scholarship committee meets and decides who will get what scholarships. Once the scholarships have been awarded, the scholarship committee notifies the FGR.

Once the FGR has been notified of the scholarship committee's decisions, the FGR in turn notifies each school's administrator, who prepares offers of study letters. The offers of study are combined with all the others which are then sent to the PhD director for final approval. Once the offers of study have all been approved by the PhD director, the offers of study are all sent to the Faculty of Graduate Research who then notifies the applicants.

From there the university's part of the process has ended. It is now up to the applicant to accept or reject the offer of study and turn up at the appropriate time to commence their studies.

5.3 Committee Method Fail Points

After reviewing the `committee method' process and reviewing the information gathered, the following fail points were identified in the committee version of the process; fail points being potential problems or inefficiencies in the process. Figure 8.1 below shows where the fail points are located in the process, with the description of the problem below.

Committee Method Process Fail Points
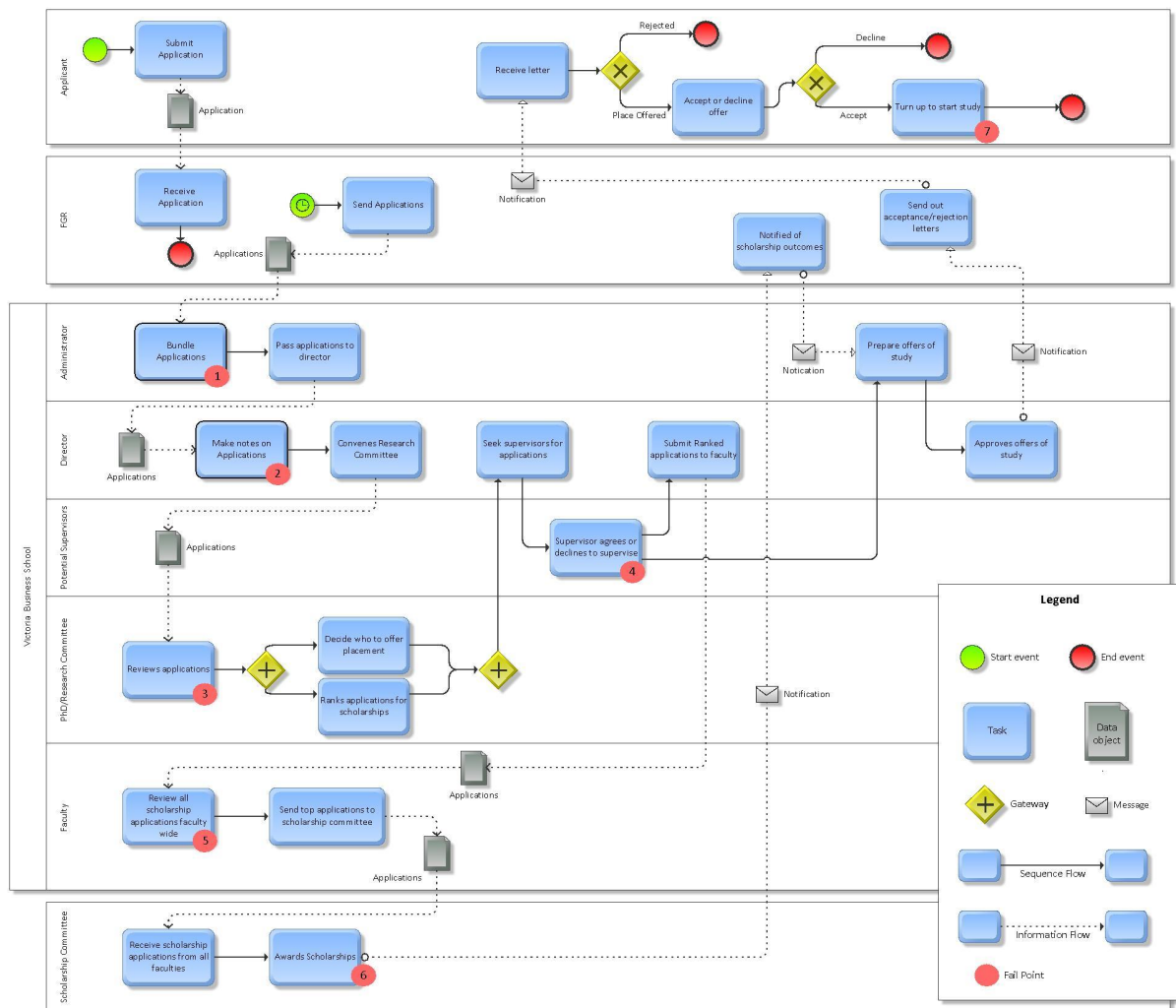
Figure 8.1: Committee Method Fail Points

5.3.1 Identified Fail Points in the Committee Method

1) Bundling applications

In the 'bundle applications' activity done by the respective school's administrator, there is the possibility of an application being incomplete and not having all the desired/requested information, resulting in delays and the applicant having to be contacted for missing information or documents. Incomplete applications will either lead to a hold-up at the time or, should the candidate not reply or be reachable, an incomplete application has to be

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dealt with. According to Appendix 1, Q3.2 - Respondent 2, bundling applications used to be done by the FGR, which would mean incomplete applications would be found before entering the school/faculty workflow.

2) Make notes on applications

According to Appendix 2, Q3.2 - Respondent 1, when the PhD director is making notes on the applications, there is the possibility the PhD director is not knowledgeable in all discipline areas. Not being knowledgeable in an area could again cause delays, as either the PhD director needs to seek out colleagues who are knowledgeable in that field, or alternatively the notes on that application are less detailed and therefore less useful for the next part of the process.

3) PhD/Research Committee - reviews applications

When the PhD/research committee meets to decide which applications are the strongest, in practice the PhD/research committee, as yet, may have no idea about supervisory interest or available capacity - based on the answers given in Appendix 1, Q5.1 - Respondent 7 and Appendix 2, Q3.2 - Respondents 5 & 6. So the PhD/research committee may spend valuable time vetting applications that no supervisors are interested in. In addition, applications that are favoured towards scholarships may actually have no interested supervisors either. Alternatively, applications that are not ranked highly in the eyes of the school may in fact be of high interest to a potential supervisor in that field; however, because the application is not ranked so highly, the potential supervisor may never see it.

4) Supervisor agrees or declines to supervise

Once the PhD/research committee has selected the applications that the committee thinks are worthy of admission, supervisors need to be found. However, each school seems to have a different way of monitoring and assessing supervisory capacity. See Appendix 2, Q3.2 - Respondents 3 & 6, where there is conflicting information about whether supervision is

included in a workload model; and also see Appendix 2, Q3.3 - Respondent 5, where the workload is captured on a document that is constantly changing and out-of-date. So after all the effort done vetting applications thus far by the PhD/research committee, supervisors may still be unavailable or decline to supervise some candidates.

5) Faculty - Review all scholarship applications faculty-wide

When all the schools in the faculty have identified their top applications to apply for a scholarship, the applications all go to the faculty level where the applications are all assessed on the same criteria and only a select few are then put forward to the scholarship committee. However, the issue arises that since different schools focus on different disciplines and research areas, how is the faculty supposed to compare applications across disciplines and research areas? According to Appendix 2, Q4.6 - Respondents 1, 2, 3, 4 & 6 there is reason to believe that using the same criteria to assess applications relating to different disciplines is less than ideal.

6) Scholarship Committee - awards scholarships

A contentious matter surfaced relating to the perceived unfair distribution of scholarships. Appendix 1, Q3.14 - Respondent 2 points out there is a very real feeling that VBS gets a disproportionately low number of the scholarships, for two main factors.. First is the fact that the scholarship committee may not be knowledgeable in all knowledge areas, and therefore can't possibly understand the significance of potential research in a given field or discipline. Second is that GPA scores are tested as absolute measures, and that there is avert means of comparing what a GPA in a management course means relative to a GPA in a biology course (see Appendix 2, Q4.6 - respondent 1). It has even come out through interviews carried out that there have been instances where the GPAs have been calculated differently one year to the next (see Appendix 2, Q3.14 - Respondent 1).

7) Turn up to start study

The last fail point in the committee method process is that even though applicants may accept their offer of study and enrol into the system, they may not register, i.e. pay fees. There seems to be little communication with them after the PhD Application Process is completed, save for when the supervisor receives an email saying the student is on their way or the student turns up at the door. Making matters worse is when the student never turns up at all and all the effort and precious research space has been given up for naught: see Appendix 2, Q2.9 - Respondent 5, Q3.2 - Respondent 3. Enrolled students registering and not turning up can be due to many things: issues with getting a visa; personal situation changing; financial difficulties; receiving a better offer; and more; see Appendix 2, Q 3.11 - Respondent 3.

5.4 Colleague Method

Another Variant of the PhD application process is hereby called the 'colleague method' (see Figure 9.0 below). The PhD director makes their notes on all the applications, and then disseminates them around colleagues to evaluate. Colleagues can then discuss the intended research of the applications, sharing opinions and suggestions about the research or the application as a whole. Willing supervisors come forth and are thereby found for applications before the PhD/research committee meets.
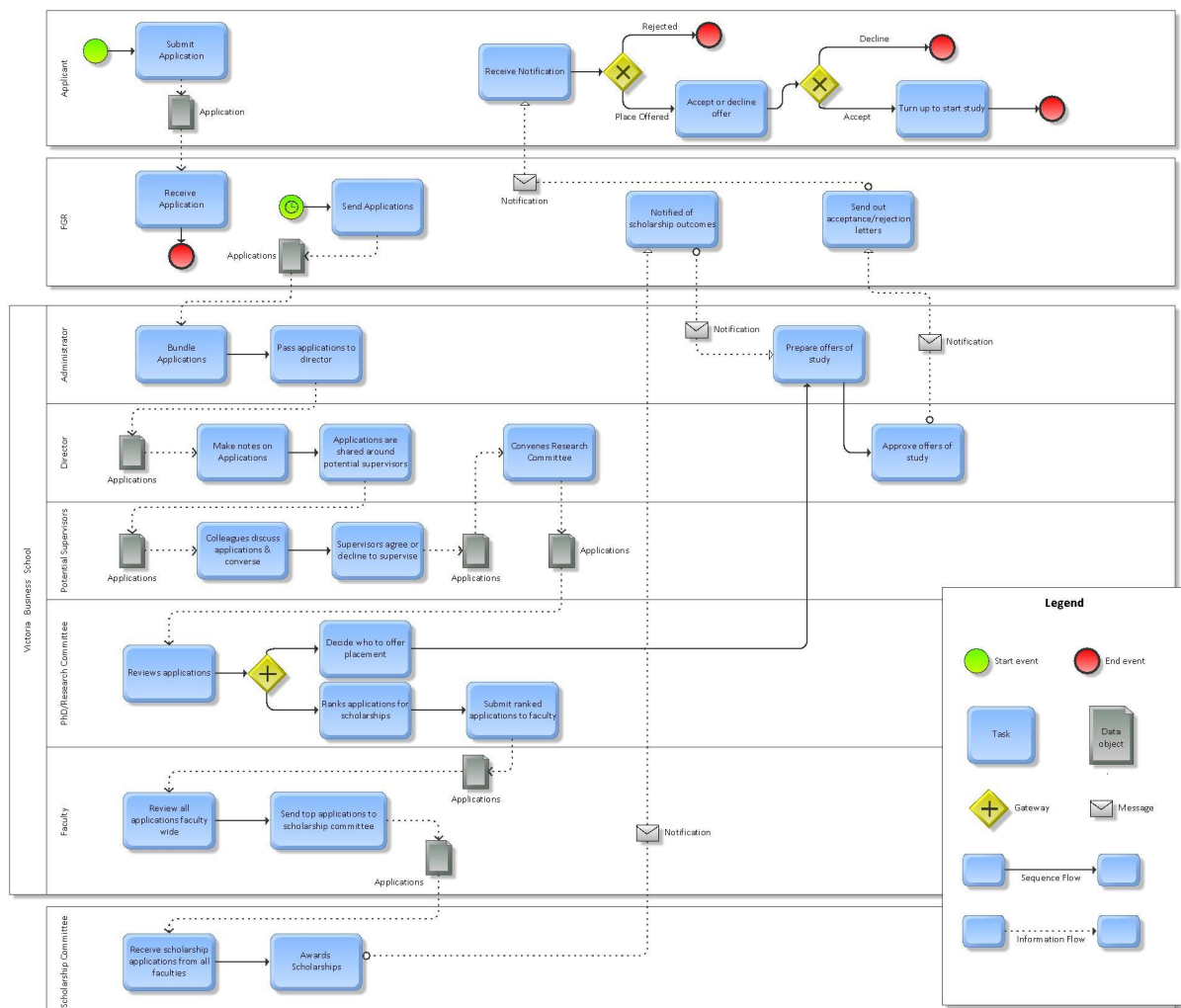

Figure 9.0: Colleague Method Process

The above diagram (Figure 9.0) representing the colleague method starts with the applicant submitting their application to the Faculty of Graduate Research. Once the close-off date is reached, represented as a 'time-related event', the applications are sent to the administrator of the respective schools.

From here the administrator bundles the applications, which may involve printing them off and uploading of them to a shared computer drive. The printed applications are then passed to the PhD director, who reads through them and makes preliminary notes.

The PhD Director then disseminates the applications around potential supervisors of the school (in line with their respective research interests). The potential supervisors can assess the applications on their own, or discuss the applications with their peers. Once discussions have been had and notes exchanged, potential supervisors see if a supervisory team can be put together for applications the potential supervisor is interested in. Once potential supervisors are found, the applications go back to the PhD director who arranges a meeting of the PhD/research committee.

The PhD/research committee meets and evaluates the applications. The PhD/research committee decides who to offer positions to and ranks applications in relation to scholarships. Knowing which applications have interested supervisors means the PhD/research committee can focus on vetting only those applications.

Once applications have supervisors, the applications are either sent to the faculty if the application is seeking a scholarship and is ranked highly enough by the school to get a scholarship, or the applications are sent back to the school's administrator who prepares offers of study or rejection letters.

The applications that are sent to the faculty are combined with all the other scholarship applications from the other schools from within the faculty, and a select group of the faculty meet to discuss which of all the applications will be sent to the university's scholarship committee.

Applications which are not fortunate enough to be chosen for forwarding on to the university's scholarship committee go back to their respective schools' administrators for offers of study to be created. The applications that are successful get sent to the aforementioned scholarship committee. The scholarship committee meets and decides who will get what scholarships. Once the scholarships have been awarded the scholarship committee notifies the FGR.

Once the FGR has been notified of the scholarship committee's decisions, FGR in turn notify each school's administrator, who prepares offers of study letters. The offers of study are combined with all the others, which are then sent to the PhD director for final approval. Once the offers of study have all been approved by the PhD director, the offers of study are all sent to the Faculty of Graduate Research who then notifies the applicants.

From there the university's part of the process has ended. It is now up to the applicant to accept or reject the offer of study and turn up at the appropriate time to commence their studies.

5.5 Colleague Method Fail Points

After reviewing the `colleague method' process and reviewing the information gathered the following fail points were identified in the colleague version of the process. Figure 9.1 below shows where the fail points are located in the process, with the description of the problem below.

Colleague Method Process Fail Points
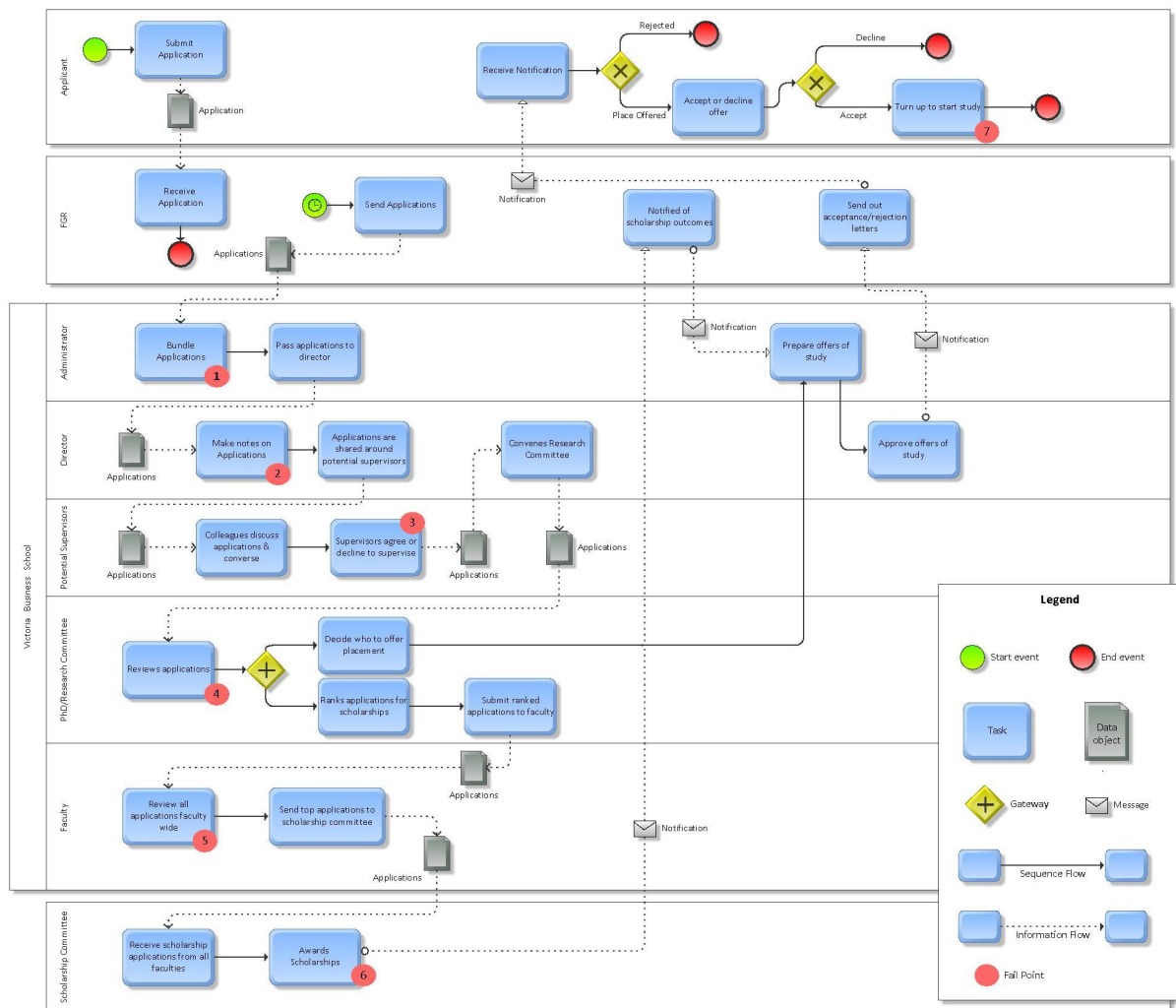
Figure 9.1: Colleague Method Fail Points

5.5.1 Identified Fail Points in Colleague Method

1) Bundling applications

In the 'bundle applications' activity done by the process administrator there is the possibility of an application being incomplete and not having all the desired/requested information, resulting in delays and the applicant having to be contacted for missing information or documents. Incomplete applications will either lead to a hold-up at the time or, should the

candidate not reply or be reachable, an incomplete application has to be dealt with. According to Appendix 1, Q3.2 - Respondent 2, bundling applications used to be done by the Faculty of Graduate Research, which would mean incomplete applications would be found before entering the school/faculty workflow.

2) Make notes on applications

According to Appendix 2, Q3.2 - Respondent 1, when the PhD director is making notes on the applications, there is the possibility the PhD director is not knowledgeable in all discipline areas. Not being knowledgeable in an area could again cause delays, as either the PhD director needs to seek out colleagues who are knowledgeable in that field, or alternatively the notes on that application are less detailed and therefore less useful for the next part of the process.

3) Supervisor agrees or declines to supervise

When potential supervisors agree to supervise a candidate, the potential supervisor will not be aware of how strongly their chosen application stacks up against other applications. Not knowing could affect whether an offer of study is ever extended or if the application is likely to be put forward for a scholarship.

4) PhD/Research Committee - reviews applications

The research/PhD committee meets and potentially only needs to vet the applications that have supervisors arranged already, meaning that some potentially stronger applications may not be getting vetted at all, and therefore the overall quality of research outcomes is reduced.

5) Faculty - review all scholarship applications faculty wide

When all the schools in the faculty have identified their top applications to apply for a scholarship, the applications all go to the faculty level where the applications are all assessed on the same criteria and only a select few are then put forward to the scholarship committee. However, the issue arises that since different schools focus on different disciplines and research areas, how is the faculty supposed to compare applications across disciplines and research areas? According to Appendix 2, Q4.6 - Respondents 1, 2, 3, 4 & 6 there is reason to believe that using the same criteria to assess applications relating to different disciplines is less than ideal.

6) Scholarship Committee - awards scholarships

A contentious matter surfaced relating to the perceived unfair distribution of scholarships. Appendix 1, Q3.14 - Respondent 2 points out there is a very real feeling that VBS gets a disproportionately low number of the scholarships, for two main factors.. First is the fact that the scholarship committee may not be knowledgeable in all knowledge areas, and therefore can't possibly understand the significance of potential research in a given field or discipline. Second is that GPA scores are tested as absolute measures, and that there is avert means of comparing what a GPA in a management course means relative to a GPA in a biology course (see Appendix 2, Q4.6 - respondent 1). It has even come out through interviews carried out that there have been instances where the GPAs have been calculated differently one year to the next (see Appendix 2, Q3.14 - Respondent 1).

7) Turn up to start study

The last fail point in the committee method process is that even though applicants may accept their offer of study and enrol into the system, they may not register, i.e. pay fees. There seems to be little communication with them after the PhD Application Process is completed, save for when the supervisor receives an email saying the student is on their way or the student turns up at the door. Making matters worse is when the student never

turns up at all and all the effort and precious research space has been given up for naught: see Appendix 2, Q2.9 - Respondent 5, Q3.2 - Respondent 3. Enrolled students registering and not turning up can be due to many things: issues with getting a visa; personal situation changing; financial difficulties; receiving a better offer; and more; see Appendix 2, Q 3.11 - Respondent 3.

5.6 Theory of Constraints

After mapping out the process and identifying fail points within the process itself, the next frame can be applied. The second framed used is the Theory of Constraints, in particular the Goal Tree[2] (GT) and Current Reality Branches (CRBs). The GT will show us what is needed to achieve the goal/s and the CRBs will examine the current state.

First we must examine the strategic goals and to identify which ones have any relevance to the PhD application process. As will be described below, not all the strategic goals do relate to the PhD Application process because some involve people already matriculated or the goal relates to the university's relationship with parties outside the university. The following lists show the primary strategies that do and do not have relevance with regards to the PhD application process.

VUW Primary Strategies that have relevance to the PhD Application Process:

1. Adopt a distinctive academic emphasis
2. Enhance research quality, quantity and impact
3. Secure the intellectual potential put at risk through experience of disadvantage

The strategic goals above do relate the PhD application process, as either having to do with the academic focus of the university, the research outputs of the university, or increasing the number of Maori and Pasifika students enrolled.

However, the strategic goal of "Secure the intellectual potential put at risk through experience of disadvantage" is not used in this research due to a lack of available information and the aforementioned limitations put on this research.

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[2] Goal Trees were formally known as I/O Maps

VUW Primary Strategies that do not have relevance to the PhD Application Process:

1. Provide a holistic learning, teaching and student experience that is second to none

2. Deepen engagement with alumni, benefactors and communities

3. Deepen Victoria University's intellectual influence in the Asia-Pacific region

The above strategic goals do not have much to do with the PhD application process as the goal has to do with either people already enrolled, people/groups and their relationship with the university, or the university's relationship with other countries.

5.6.1 Goal Tree

To create a Goal Tree (see Figure 10 below) with the three relevant strategic goals. The strategic goals can be regarded as the critical success factors underpinning the achievement of the university's strategic plan.

Now, to identify what necessary conditions one would expect to see in the process to make the critical success factors possible. Identifying the necessary conditions will also help in shaping the questions of the unstructured interviews to help find signs of the identified necessary conditions.
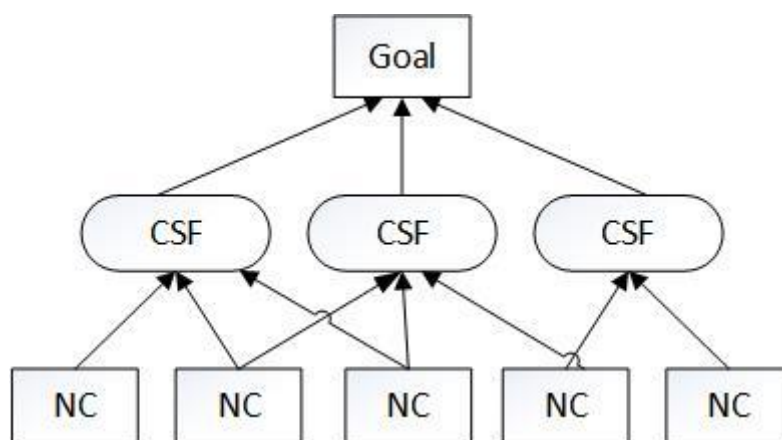

Figure 10: Simplified Goal Tree

When reading the Goal Tree (as depicted above in figure 10), start at the top at the overarching goal. In striving to attain the overarching goal there will be certain high-level requirements, which we deem to be the critical success factors. There are commonly no more than about three to five critical success factors, and the critical success factors are high level when taking a systems perspective. The critical success factors might even be considered terminal outcomes in attaining the overarching goal. Underpinning them, in turn, are necessary conditions to make those critical success factors happen.

Each critical success factor will usually have a number of necessary conditions that are prerequisites to its accomplishment. According to Dettmer (2007), the only real difference between a critical success factor and a necessary condition is their degree of specificity.

The relationship between the overarching system goal, critical success factors, and the supporting necessary condition hierarchy can be represented in a single logic tree called a Goal Tree (see Figure 10). The Goal Tree is a cascading structure of requirements, from general at the upper level to more specific at the lower level. In its entirety, it represents what ought to be happening.

The information necessary for constructing the goal tree comes from the Universities strategic goals and themes coming out of the semi-structured interviews done. From interviewing staff we get a picture of what necessary conditions would need to be present to achieve the CSFs.
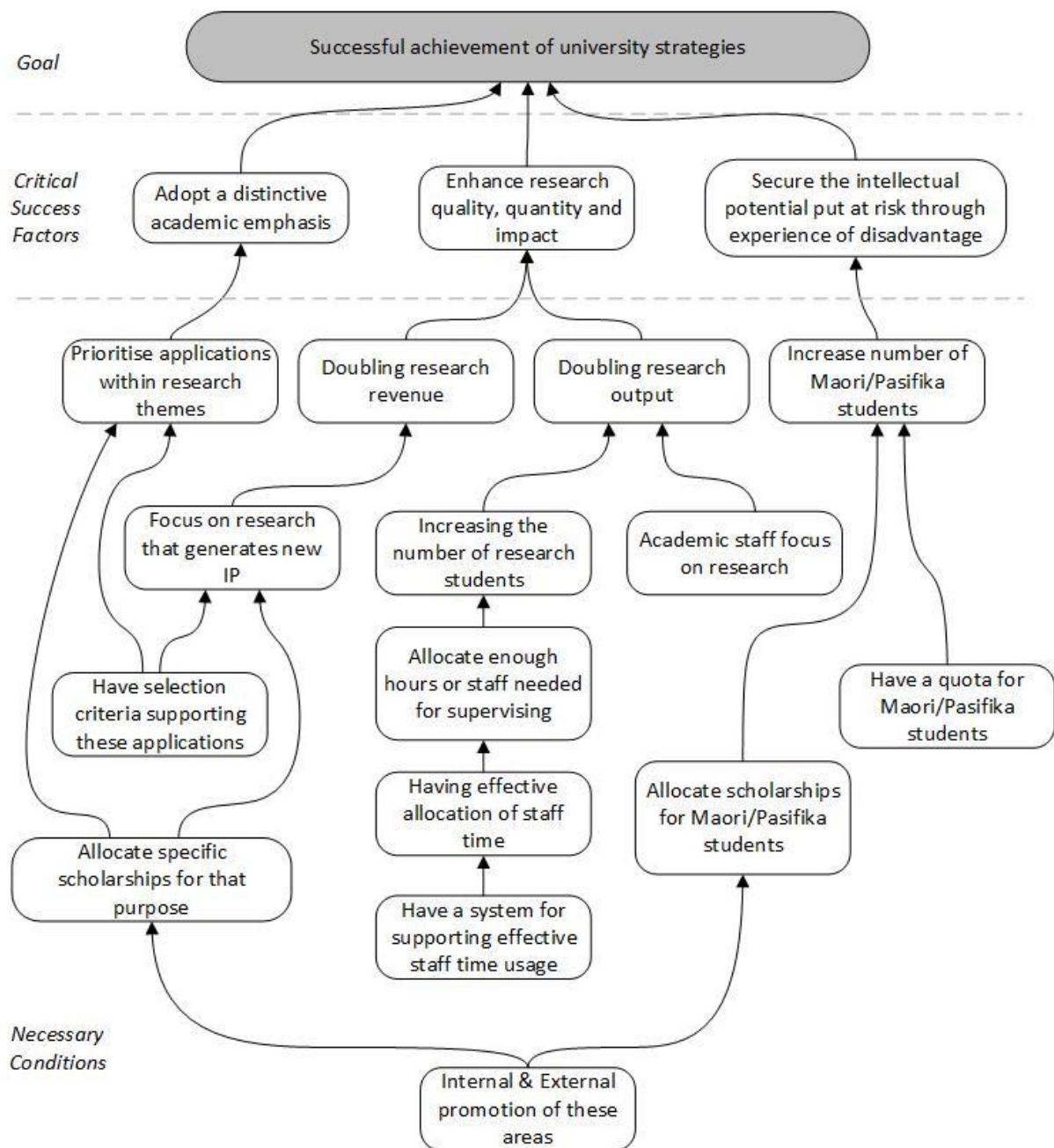
Goal Tree

Figure 11: Goal Tree

From the Goal Tree above the achievement of strategic goals are clearly at the top of the tree. Underpinning that are the critical success factors the university has identified. Underpinning them are the necessary conditions that are believed to be required to achieve the critical success factors, and therefore the university's strategic goals.

For example, for the university to achieve the CSF of adopting a distinctive academic emphasis, a necessary condition would be for the university to prioritise PhD applications aligning with the university's research themes.

The necessary condition for that would be, selection criteria that support the process of applications, and specific scholarships aligning to those research themes as well.

5.7 Current Reality Branches

With the data collected from the interviews it was possible to create logic tree representations, known as Current Reality Branches, linking the non-achievement of the critical success factors from the Goal Tree (see Figure 11) as the undesirable effects, to causes of why the critical success factors might not be realised. An extra Current Reality Branch was also created for the undesired effects of feelings of frustration/depression that people seemed to express with the PhD application process (see Appendix 1, Q3.2 - Respondent 1 and Appendix 2, Q3.11 - Respondent 3). This seemed necessary as it was a clear theme that came out of the data collected. The underlying feelings discovered during the data collection phase are grouped together under the feeling of frustration.

In general, Current Reality Branches below (see Figures 12.0 - 12.2) show the root causes of problems in the system and the resulting intermediate effects that occur because of them.

Here the Current Reality Branches show the root causes of problematic issues present in the PhD application process that would explain why the critical success factors are not being met. The analysis, therefore, may lead to suggestions that can be made to fix the root causes of problems within the system.

Logic Tree Protocols

As with the Goal Tree above, Current Reality Branches (and trees) use sufficient cause thinking following the logic: "If _____, then _____" or "If _____, and if _____, then_____".

It is called sufficient cause logic because it is stating that the cause(s) is/are sufficient to cause the effect. Sometimes Causes A and B are sufficient to cause effect C only if A and B occur together. You can check this by asking whether A causes C on its own or whether it only happens if B exists. Or, "If A then C because of B". Other times A and B both independently cause C and their individual effects add together (in this case called additional causes as the effect on C is additive). The below symbols are used to read a Current Reality Branch.

Logical Statements

UDE

Undesirable Effect
(Cause, Effect)

Entity
(Cause, Effect)

Connection Devices

Causality Arrow
(Causal relationship)
Tail = Cause
Head = Effect

Ellipse
(Cause sufficiency)

MAG

Magnitudinal "AND"
(Multiple independent
causes, additive effect)
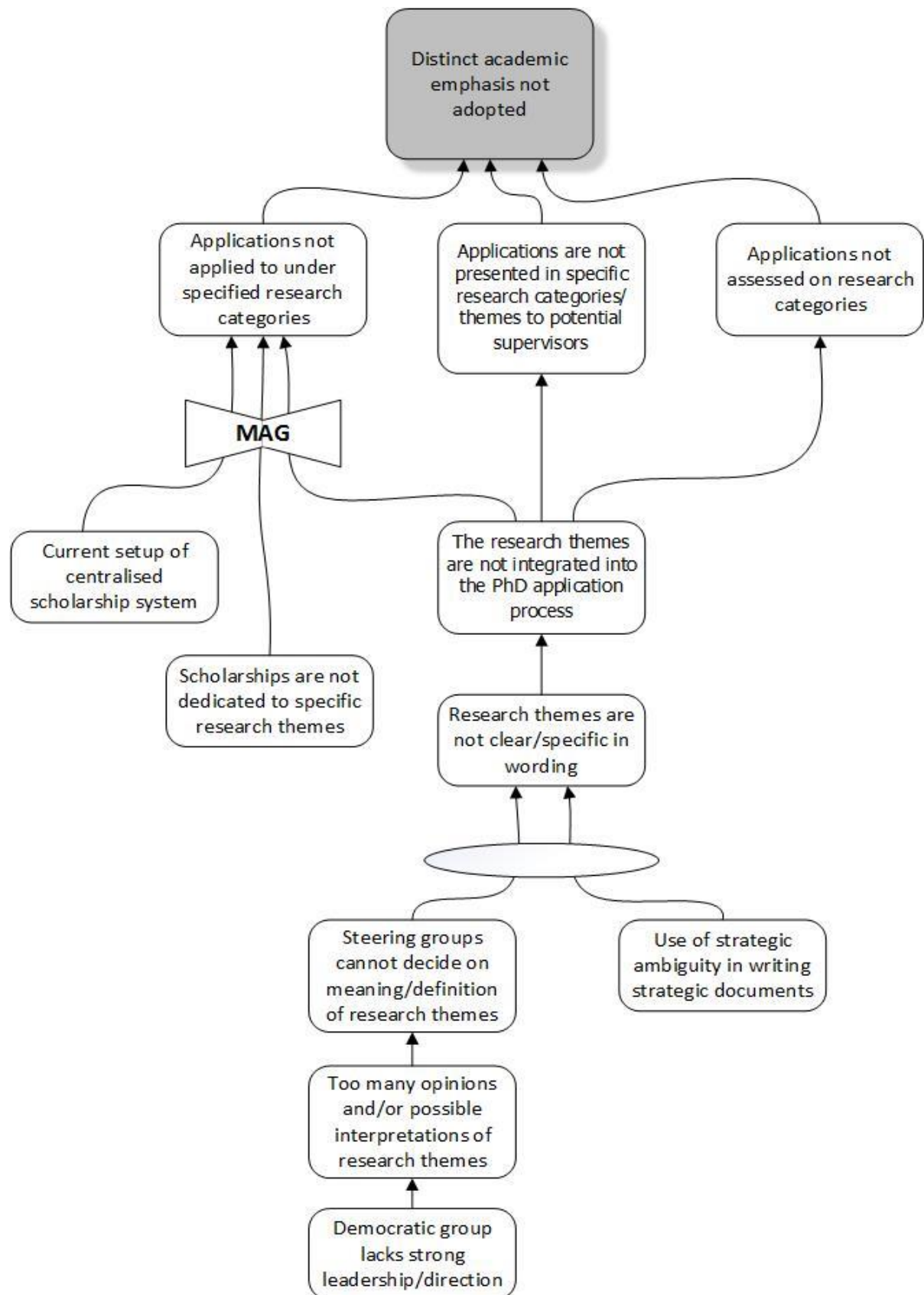
5.7.1 Academic Emphasis CRB

Figure 12: Academic Emphasis CRB

Analysis leading to the development of the Academic Emphasis CRB identifies the root causes of the problems are:

- Democratic group lacks strong leadership/direction
- Use of strategic ambiguity in writing strategic documents
- Current setup of centralised scholarship system
- Scholarships are not dedicated to specific research themes

These items are discussed below:

Democratic group lacks strong leadership/direction

Because the steering group is a group of willing academics, it was expressed that without consensus there is little progress on matters. Consensus within such a group is usually not quick, especially when defining the vague terms laid out in the strategic plan. Without adopting stronger leadership, perhaps a singular individual in charge that can make final decisions. The group is left to debate and change/broaden ideas until a consensus is reached; which takes time, as evidenced by Appendix 2, Q4.1 - Respondent 5.

Use of strategic ambiguity in writing strategic documents

By using what Eisenberg (1984) called strategic ambiguity in their strategic plan, the university has facilitated a catholic interpretation of possible meanings. The use of such ambiguity is slowing down progress within steering groups. As the group tries to decipher and define terms like 'design-led', and 'region'. What region? Wellington, the lower North Island, New Zealand or Asia-Pacific? The debate takes time and can delay meaningful progress, in any decision making.

Current setup of Centralised scholarship system

The fact that all scholarships are decided by a central authority is a point of great contention in the PhD application process, as evidenced by Appendix 1, Q2.9 - Respondent 1, Q3.14 -

Respondents 1, 2, 3 & 5, Appendix 2, Q3.11 - Respondent 3. The Academic Emphasis CRB, reflects the fact that the scholarships are not advertised or allocated for particular areas of study (as outlined in the strategic plan) means that the academic emphasis goal of the strategy is less likely to be achieved.

Scholarships are not dedicated to specific research themes

By not reserving and promoting available scholarships for allocation for the university's desired research themes, the university cannot efficiently focus on its research themes as outlined in the strategic plan.
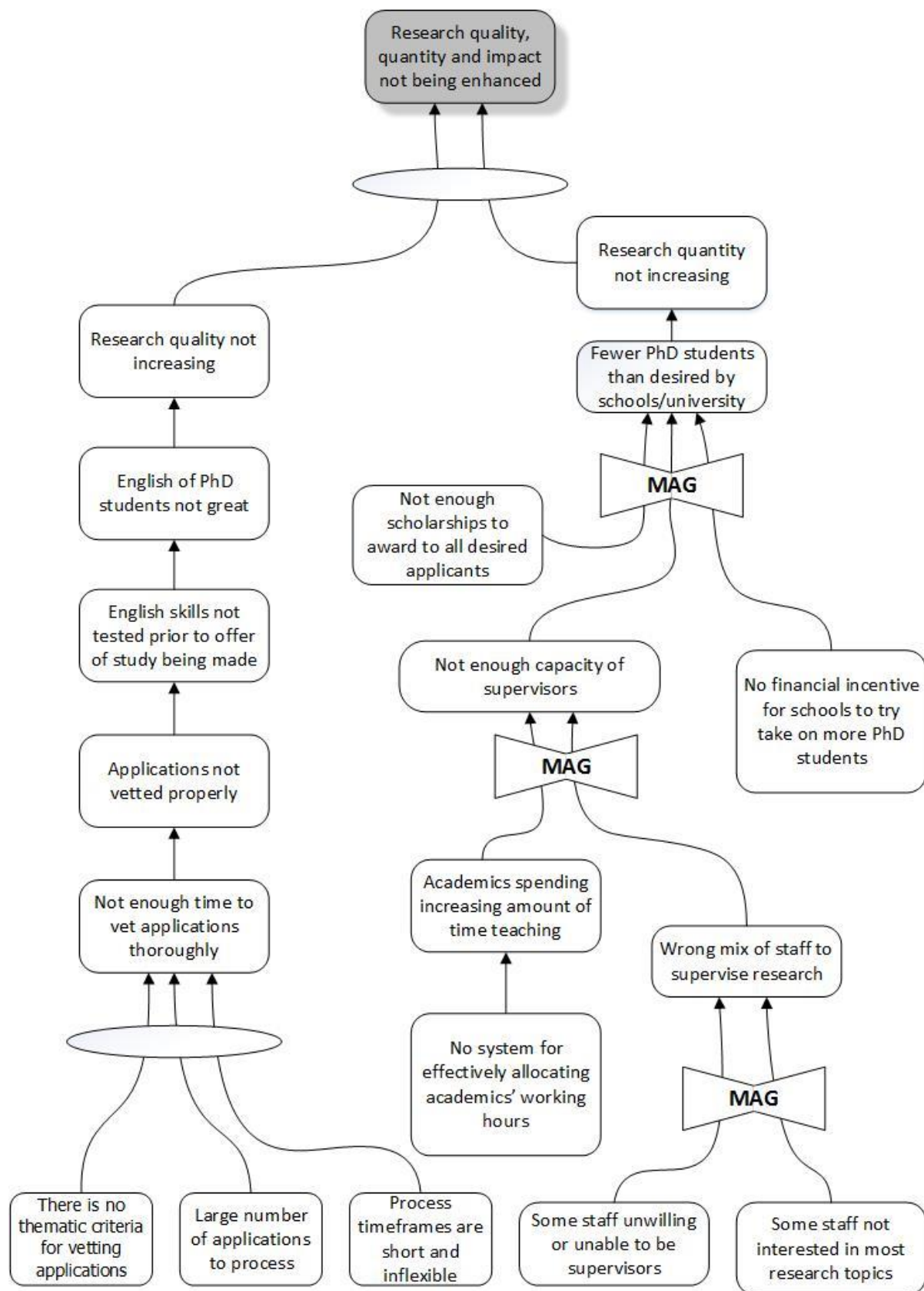
5.7.2 Research Outputs CRB

Figure 12.1: Research Outputs CRB

From the above Research Outputs CRB (Figure 12.1), as presented, identifies root causes of the problems are:

- No financial incentive for schools to try to take on more PhD students
- Not enough scholarships to award to all desired applicants
- No system for effectively allocating academics' working hours
- There are no thematic criteria for vetting applications
- Large number of applications to process
- Process time frames are short and inflexible
- Some staff unwilling or unable to be supervisors
- Some staff not interested in most research topics

No financial incentive for schools to try to take on more PhD students

A result of the interview process revealed that there is little or no financial incentive for schools to take on more PhD students (see Appendix 2, Q3.9 - Respondent 5). So some schools may put less focus on increasing or even maintaining a number of PhD students. The lack of incentive to take on more students certainly goes against the idea of increasing the research outputs of the university as outlined in the strategic plan.

Not enough scholarships to award to all desired applicants

Every academic institution would argue there are not enough scholarships. However, new scholarships could be created to increase the overall number of scholarships.

No system for effectively allocating academics' working hours

Identified in the Goal Tree was a faculty-wide system for effectively tracking academic staff hours, to be able to work out a school's capacity for supervising. However, such a system doesn't seem to exist. There is evidence that points to spreadsheets or records crudely being kept in a workload model (see Appendix 2 , Q3.2 - Respondent 6 and Q.3.3 -

Respondent 5), but no more advanced system than that. Without a good system to track a school's teaching, research, supervisory hours and other duties, it is only an estimate on either a personal or school level what a school's supervisory capacity might be, or if the potential supervisor has a sustainable balance over everything.

There are no thematic criteria for vetting applications

Tying back into the idea of applications being applied for under specific research categories. If such themed criteria could be introduced then it would make the time vetting applications shorter.

Large number of applications to process

Too many applications to process relative to the time available is one of the key root causes of issues within the system; see Appendix 1, Q2.9 - Respondent 4.

Process time frames are short and inflexible

With so many more applications to process each year, keeping the eight week process turnaround time is putting increasing pressure on the process: as evidenced by Appendix 1, Q3.7 - Respondents 1 & 2 and Appendix 2, Q3.7 - Respondents 1, 2, 3 & 4.

Some staff unwilling or unable to be supervisors

One Interviewee who wished to be anonymous, and for it to be left off any official notes, discussed how big a role personality and personality conflicts can impact on whether academic staff are good matches to be supervisors. To avoid such mismatches institutes' are using guides such as 'Tracking Postgraduate Supervision Role Perception Rating Scale' found here http://www.mn.uio.no/astro/english/research/news-and-events/events/conferences/supervisionpresentations/rprs_revised.pdf

Some staff not interested in most research topics

There may also be some staff who are unwilling to look at PhD applications outside a very narrow focus of research - as evidenced by Appendix 2, Q3.2 - Respondent 5 - despite PhD applications being within their chosen discipline or field. Interviews suggest some staff could be stubborn and not receptive to the idea of broadening their research horizons. Alternatively, the academic might not have any interest in any research other than their own specific field. Either way, the result is one of reducing the potential supervisory capacity of the school and reducing the potential research outputs of the university overall.
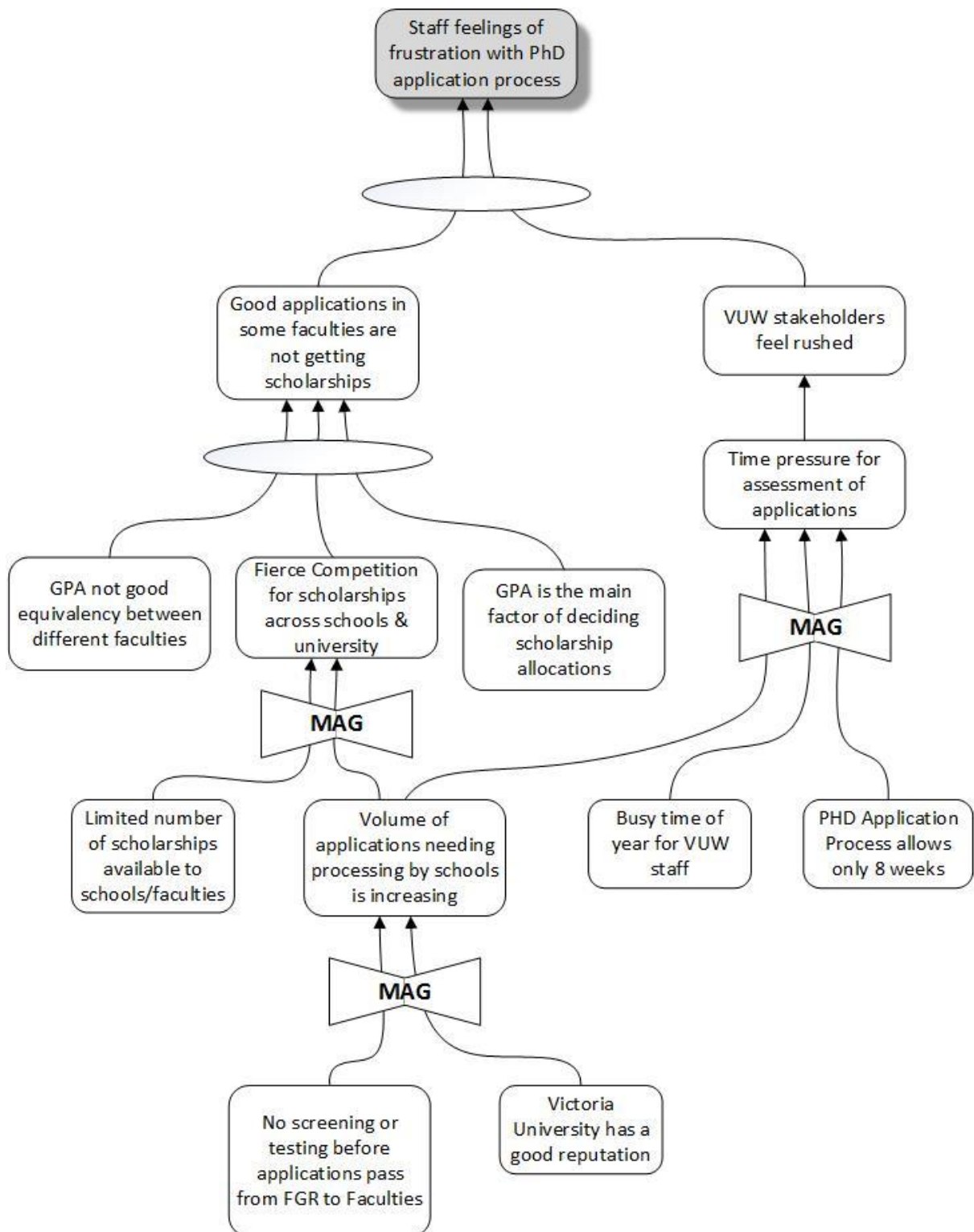
5.7.3 Frustration CRB

Figure 12.2: Frustration CRB

From the above Frustration CRB (Figure 12.2), as presented, identifies root causes of the problems are:

- GPA is not a good equivalency between different faculties
- GPA is the main factor of deciding scholarship allocations
- Limited number of scholarships available to schools/faculties
- Busy time of year for VUW staff
- PHA Application Process allows only eight weeks
- No screening or testing before applications pass from Faculty of Graduate Research to faculties
- Victoria University has a good reputation

GPA is not a good equivalency between different faculties

GPA appears to be one of the pre-emptive criteria when it comes to the process of awarding scholarships. However, different views exist about how fair the process really is; whether grades of one discipline really are commensurable to grades of another (e.g. Law vs Humanities, Commerce vs Science, Design vs Teaching).

It is perceived the relative standards of the institute that awards a grade also has an impact on how much standing that grade holds. Where the institutes are ranked globally is a key factor, which leaves the university to perform an equation in the background to try to standardise the GPA grades.

Using an equation in an attempt to equalise GPAs is not perfect as evidenced by the fact there are noted cases where the same application came out with different scores when calculated in different years; see Appendix 2, Q3.14 - Respondent 1.

GPA is the main factor of deciding scholarship allocations

The GPA rating appears to be the key variable used in deciding scholarships outcomes. However, The GPA grade might not be a fair equivalency across disciplines as mentioned previously.

Limited number of scholarships available to schools/faculties

Every academic institution would argue there are not enough scholarships. However, new scholarships could be created to increase the overall number of scholarships.

Busy time of year for VUW staff

When the application collection phase is occurring it is a busy time for staff (see Appendix 1, Q3.8 - Respondents 1 & 2). The process started on July 1st, but Trimester one for the university finished on June 29th and Trimester two starts on July 11th, meaning that academic staff are dealing with assignments and exams from Trimester one and having to prepare for Trimester two as well, on top of the other tasks/duties academic staff carry out. So the PhD application process comes at a particularly busy time for all, including administrators.

PHD Application Process allows only eight weeks

Similar to "Process time frames are short and inflexible" above; with an increasing number of applications to process each year keeping the eight week process turnaround time is putting increasing pressure on the process, especially if applicants need to be contacted or research topics negotiated; as evidenced by Appendix 2, Q3.7 - Respondent 3.

No screening or testing before applications pass from Faculty of Graduate Research to faculties

Respondent comments suggest there is no checking that applications contain all the necessary documents/attachments (at the university level) before applications are forwarded to each faculty/school, leaving a school's administrator to determine if applications are complete or not, and to remedy the matter, even when the process is already under way.

Further to that, testing of English skills could also be done prior to the process starting, taking some of the strain of vetting applications off of the schools.

Victoria University has a good reputation

Victoria has a good international reputation and ranking. It is one of only 76 institutions worldwide that hold the 'Triple Crown' of international accreditations: European Quality Improvement System (EQUIS); Association to Advance Collegiate Schools of Business (AACSB) (in business and accounting); and Association of MBAs; refer chapter 2.

Having a good reputation and being internationally accredited is going to increase demand for an education from Victoria University.

To look at the effects of an increasing demand for education and application numbers the next frame used is Qualitative Systems Thinking.

5.8 Qualitative Systems Thinking

Systems thinking is an approach to examine nonlinear behaviour of complex systems over time. There are a range of tools available to help understand these behaviours and relationships. Maani & Cavana (2007) lay out phases and steps to systematically apply the methods and tools used. In this chapter the first two phases are used up to the point of creating leverage points to show how qualitative systems thinking can also be used in the area of problem solving.

Phases	Steps
1 Problem structuring	1 Identify problems or issues of concern to management and main stakeholders 2 Collect preliminary information and data 3 Conduct group sessions for creative problem structuring
2 Causal loop modelling	1 Identify main variables 2 Prepare behaviour over time graphs (reference mode) 3 Develop causal loop diagram (influence diagram) 4 Analyse loop behaviour over time 5 Identify system archetypes 6 Identify key leverage points 7 Develop intervention strategies

Figure 13:

Phase 1: Problem Structuring

Following phase one (problem structuring) and two (causal loop modelling) from the dynamic modelling process by Maani & Cavana (2007) from chapter 4: problem structuring's steps one and two have been taken care of through the understanding of the complex problem the Victoria Business School faces and by interviewing staff across different schools and positions.

Phase 2: Conduct Group Sessions

The next step is "Conduct group sessions for creative problem structuring"; however, because group sessions would remove the anonymity of interviewees, a problem statement

based on the information gathered was created instead, based on the information from Appendices 1 & 2, Q3.7, Appendix 2, Appendix 1, Q3.2 - Respondent 1, Q3.11 - Respondent 3, Appendix 2 Q3.11 - Respondent 3, Appendix 1, Q3.14 - Respondent 2, Appendix 2, Q3.4 - Respondent 2, Appendix 2, Q.2.9 - Respondent 5, Appendix 2, Q.3.3 - Respondent 5.

After reviewing and compiling the information the resulting problem statement is:

With an increase in the global demand for education,
the number of PhD applications increases and the time available to process each application decreases.
The decrease in the time to process applications means the time pressures of the process increases,
which in turn adds to the staff frustration with the process.

However, the increasing time pressure of the process leaves less time to contact applicants,
which increases the number of suboptimal applicants selected, which in turn leads to unsatisfactory outcomes.
The unsatisfactory outcomes increase the demand for more time to be spent on vetting applications,
which further decreases the time available to process each application.
Because the institutional time frames remain the same.

The number of incoming applications increases; so does the number of applications applying for scholarships,
which also increases the number of applications put forward for scholarships by Victoria Business School,
which lowers the percentage of scholarships awarded to the faculty.

The low percentage of awarded scholarships leads to an increase in frustration with the process,
which in turn decreases the feelings of fairness with the process,
leading to less staff participation in the process,
which may lower the quality of the research the university puts out over time.
Less staff participation in the process will reduce the number of scholarship applications put forward by the business school, as less staff are willing to supervise.

Unable to get scholarships, students are less likely to accept offers of study. Furthermore, if the enrolled student cannot secure enough funding, the student will not be able to turn up when expected, causing further frustration to staff.

Now that the information gathered from the interviews has been consolidated into an ordered paragraph (problem statement), the effects on of key variables that are increasing or decreasing are more clearly visible, and we can see what variables are affected by or affecting other variables. The variables from the above problem statement are explained in the variables definition table below in Figure 13.1.

Variable Definition Table

Variable	Definition	Unit of Measure
Global demand for education	People seeking tertiary education worldwide	The total number of people seeking tertiary education worldwide
Number of applications	The number of applications the university receives	The number of PhD applications received by the university per intake.
Time given to process each application	The time on hand to process each application	The average time spent processing an application given the time allowed by the process
Time pressures of the process	The feeling of pressure to get things done within the process time frames	Average of results from staff surveys on a scale of one to ten
Time to contact applicants	The available time to contact applicants via skype/phone etc.	The average time per application to contact applicants
Number of suboptimal applicants selected	The number of candidates that turn out to be less than ideal	The number of candidates that turn up that are less than satisfactory according to supervisor/s
Unsatisfactory outcomes	Outcomes where the student does not finish their studies, needs to be transferred to a different programme or needs more help than the school generally can provide	The number of cases where the outcomes were unsatisfactory
Demand for more time spent vetting applications	The demand/requests for more time to be spent vetting applications in future	The collective demand/requests for more thorough vetting of applications from staff
Number of applications applying for scholarships	The number of incoming applications requesting scholarships	The number of incoming applications requesting a scholarship
Number of scholarship applications put forward by VBS	Applications the VBS decides are worthy of being put forward for scholarships	The number of applications the VBS puts forward for scholarships
Percentage of scholarships awarded to VBS	The number of scholarships awarded to VBS out of all scholarships	The percentage of all scholarships awarded to VBS
Staff frustration with process	The feelings of frustration felt by staff towards the process	Average of results from staff surveys on a scale of one to ten
Feeling of fairness with the process	The feelings of fairness towards the outcomes of the process	Average of results from staff surveys on a scale of one to ten
Staff participation in the process	The number of staff willing to continue participating in the process	Number of staff who participate in the process
Potential quality of research outputs	The potential quality of the research outputs of the university	The number of PhD theses that pass examination
Percentage of applicants accepting offers of study	The number of applicants that accept offers of study out of all offers issued	The percentage of applicants accepting offers of studies
Number of enrolled students having enough funding	The number of students that accept offers of study that have sufficient funds to cover study costs	The number of enrolled students that have enough money to study without scholarships
Number of enrolled students turning up	The number of students without scholarships that turn up to commence their studies	The number of enrolled students that turn up to commence studies

Figure 13.1: Variable Definition Table

5.8.1 BOT Charts

An important part of QSD is the construction of BOT charts relating to key variables. From the list of variables some key variables can be selected and a BOT chart can be constructed. Developing BOT charts (see Figures 14-14.2 below) gives us a quick visual representation of what is currently happening to some of the key variables picked out from the problem statement over time.
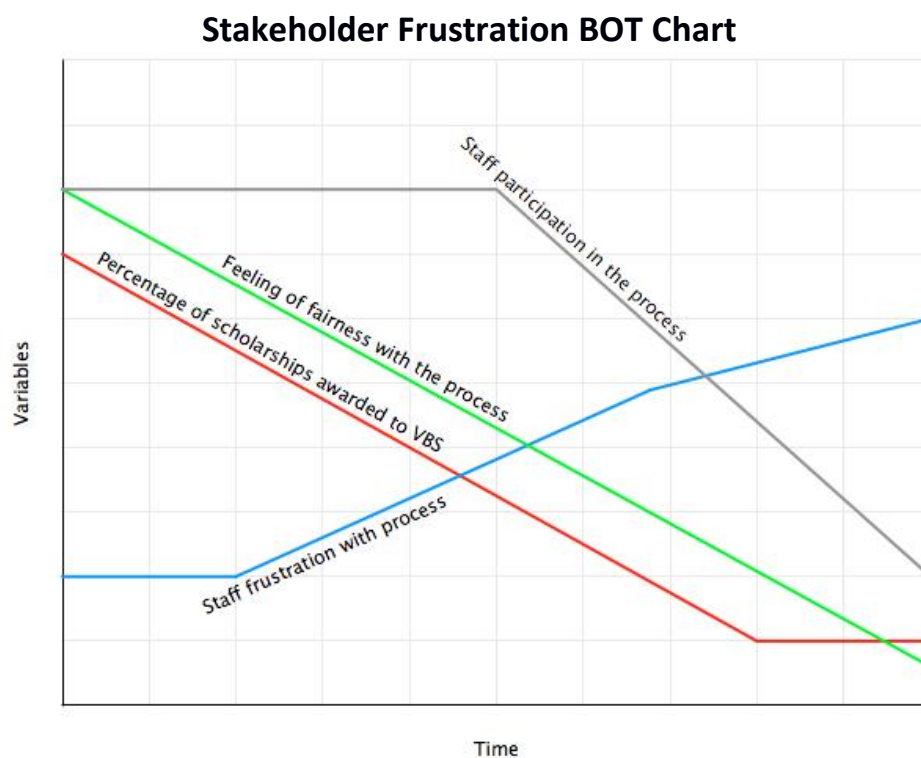

Figure 14: Frustration BOT

In Figure 14 it can be seen that as the percentage of scholarships awarded to Victoria Business School decreases, so does the feeling of fairness with the process. While both variables decrease, the level of staff frustration with the process conversely increases, which in turn means staff participation in the process decreases.
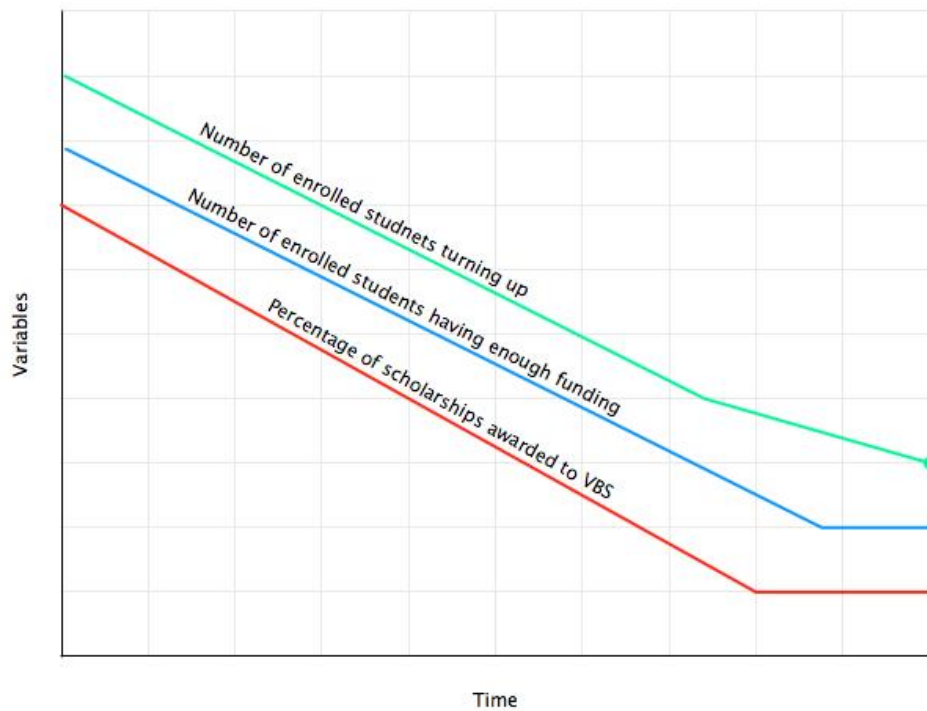
Student Registration BOT Chart

Figure 14.1: Students Turning UP BOT

In Figure 14.1 it can be seen that as the percentage of scholarships awarded to Victoria Business School decreases so do the number of enrolled students having enough funding and the number of enrolled students turning up.

Time Pressure BOT Chart
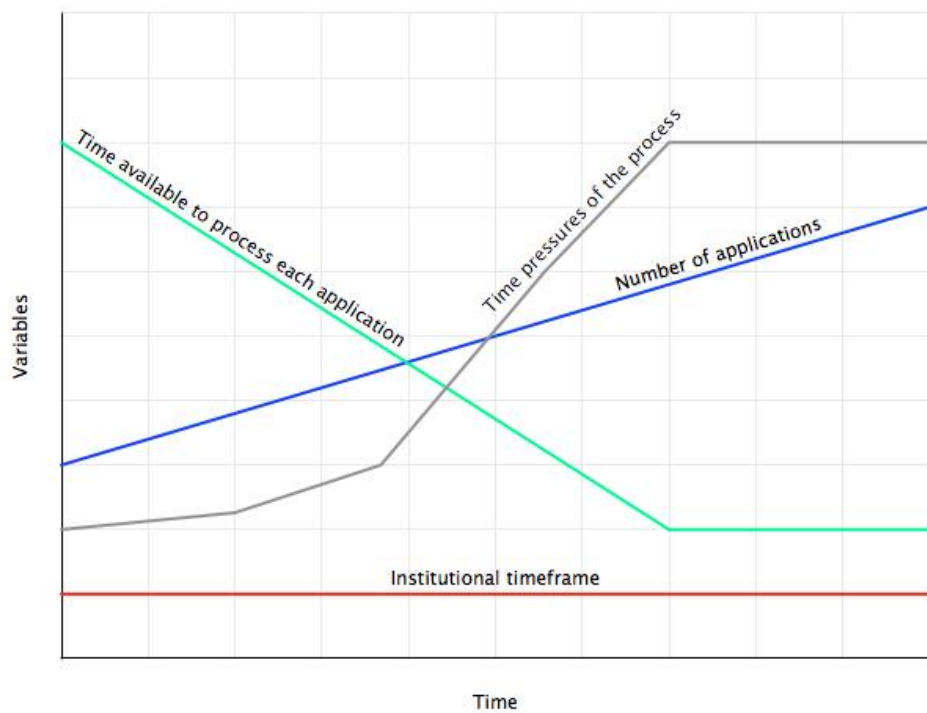
Figure 14.2: Time Pressure BOT

In Figure 14.2, it can be seen that institutional time frame remains a constant. However, as the number of applications increases the time available to process each application decreases and the time pressures of the process increase. Both the time available to process each application and the time pressures of the process variable eventually flatten out, showing there is a minimum amount of time spent on each application, and once a certain level of pressure is reached processing applications it doesn't get any higher either.

The next step (step 3) in the QSD process of phase two is to take the above problem statement, and the understanding gained in the development of the BOT charts and translate it into a Causal Loop Diagram (see Figure 15 below) to visually show what is happening with the PhD application process.

5.8.2 Casual Loop Diagram

Figure 15: Casual Loop Diagram

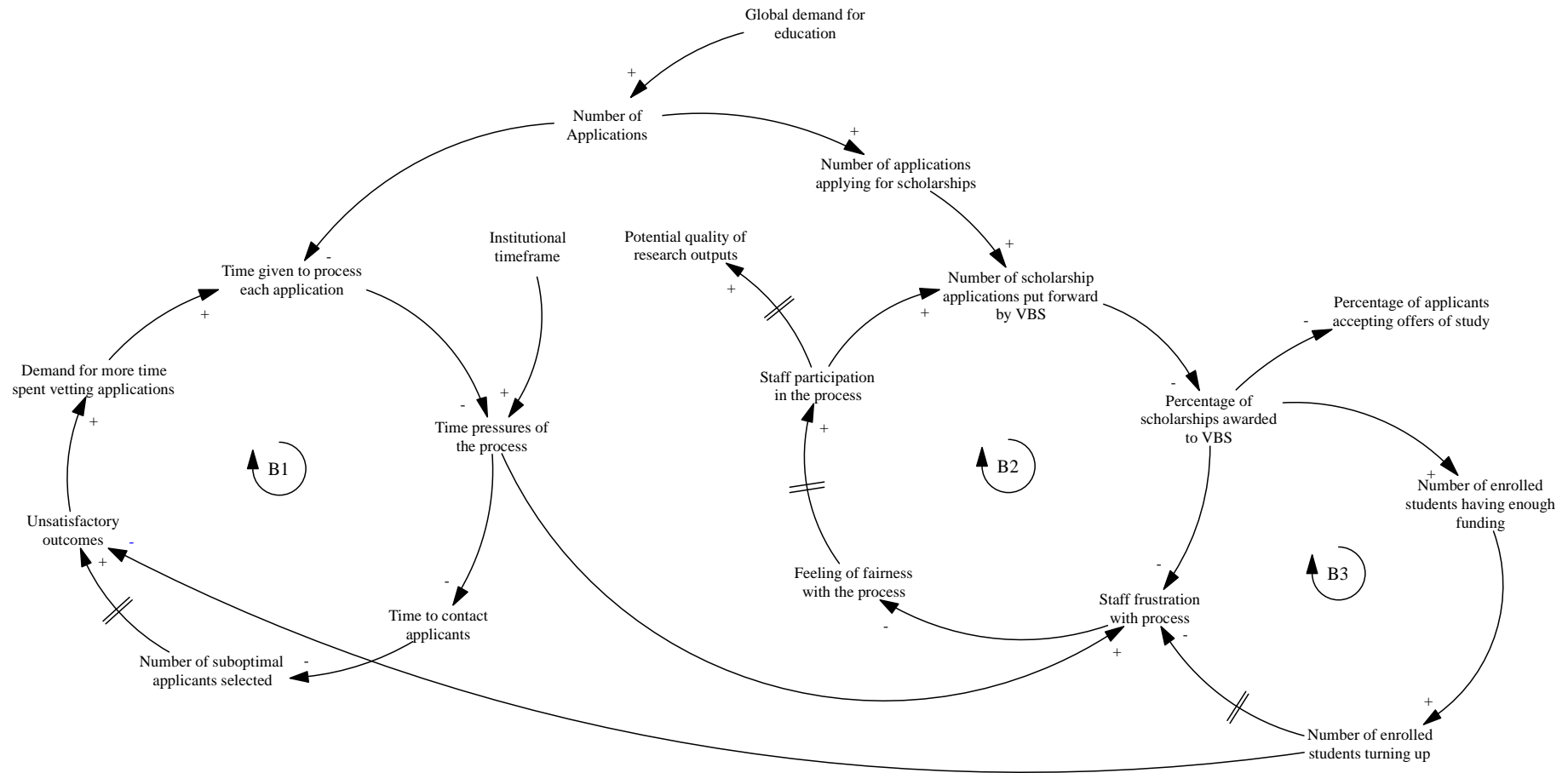The CLD (Figure 15 above) captures and emphasises interdependency of variables from the problem statement in a manner different to that of the TOC logic trees/branches. The CLD features the `Number of applications' variable at the top feeding into two distinct loops; B1, and B2, known as balancing loops. There is also a third loop B3 that stems off from the B2 loop.

The B1 loop describes the vetting of applications and can be narrated as follows:

- The number of applications (increasing) decreases the time available to process each application
- The decrease in the time given to process each application increases the time pressures of the process
- The time pressures of the process increasing reduces the time to contact applicants
- The decrease in the time to contact applicants increases the number of suboptimal applicants selected
- The increase in the number of suboptimal applicants selected over time increases the number of unsatisfactory outcomes
- The increase in unsatisfactory outcomes leads to an increase in the demand for more time spent vetting applications

The B2 loop describes the competition for scholarships and can be narrated as follows:

- The number of applications (increasing) increases the number of applications applying for scholarships
- The increase in the number of applications applying for scholarships in turn increases the number of applications put forward by Victoria Business School
- The increase in the number of applications put forward by Victoria Business School decreases the percentage of scholarships awarded to Victoria Business School
- The decrease in the percentage of scholarships awarded to Victoria Business School increases the staff frustration with the process

- The increase in frustration in the process decreases the feelings of fairness with the process
- The decrease in the feelings of fairness with the process over time will decrease staff participation in the process
- The decrease in staff participation in the process will over time decrease the potential quality of research outputs
- The decrease in staff participation in the process will also decrease the number of scholarship applications put forward by Victoria Business School

The B3 loop shows the effects on enrolled students not turning up:

- The decrease in the percentage of scholarships awarded to Victoria Business School decreases the percentage of applicants accepting offers of study
- The decrease in the percentage of scholarships awarded to Victoria Business School also decreases the number of enrolled students having enough funding
- The decrease in the number of enrolled students having enough funding decreases the number of enrolled students turning up
- The decrease in the number of enrolled students turning up also causes an increase in the staff frustration with the process

5.8.3 System Archetypes

Senge (1990) has identified several common systemic structures or relationships, capturing not only the interaction between variables, but also between causal loops.

The CLD in Figure 15 does not match any existing system archetypes created by Senge (1990). The loops B1 and B2 do not feed back into each other, with the exception of time pressures increasing staff frustration. Similarly loop B3 does not directly affect the same variable that started it: the "Percentage of scholarships awarded to Victoria Business School".

5.8.4 Leverage Points

Leverage points are variables that when/if manipulated can have a desired systemic effect on a system. Leverage points are the key tool by which in which system behaviours are changed.

Once the leverage points have been identified, intervention strategies can be made to take advantage of systemic relationships and to influence variables and relationships that have a desired systemic impact.

Figure 16 shows a table of the identified leverage points from the Causal Loop Diagram (Figure 15).

Leverage Points Table

Leverage point	Reasoning
Institutional time frame	By increasing or decreasing the time allowed for the process the amount of pressure felt by stakeholders changes.
Number of Applications	By limiting/changing the number of applications being received it affects the whole system
Number of enrolled students having enough funding	By changing the number of enrolled students having enough funding it can affect the number of enrolled students turning up

Figure 16: Leverage Points

Possible recommendations based on the above leverage points can be found in chapter 6.3.

Those ideas have be incorporated into the Causal Loop Diagram to see the affects on the system in Figure 17 below.

5.8.5 Causal Loop Diagrams Changes
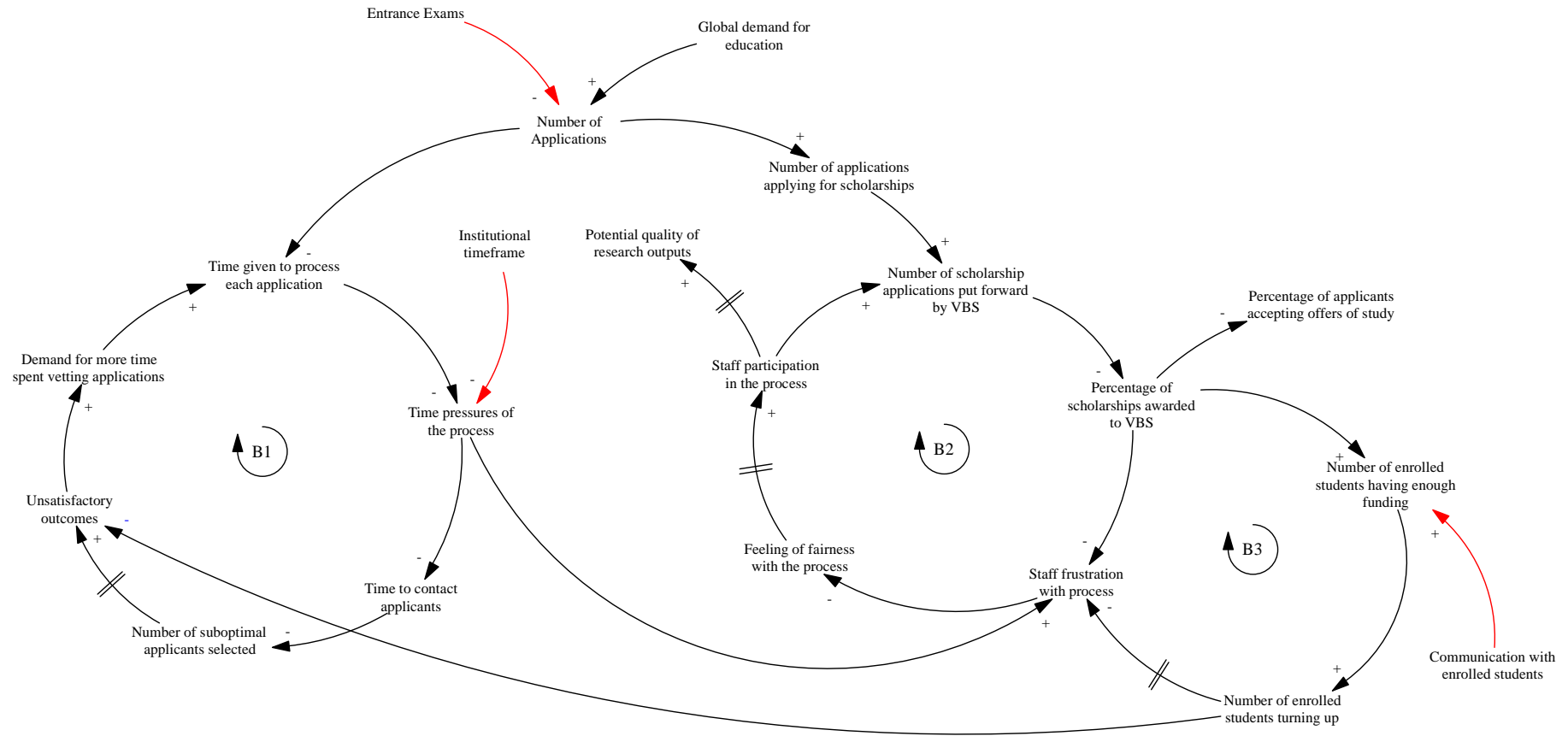
Figure 17: Causal Loop Diagram showing leverage point interventions

By influencing the leverage points from Figure 16 in the CLD above (Figure 17) the effect to the overall system can be seen.

From here, the changes on the leverage points in the CLD and how the change will affect the key variables over time are demonstrated in new BOT charts.

5.8.6 Modified Behaviour Over Time Charts

By adopting the changes recommended in chapter 6.3 and modifying the CLD in red as shown in Figure 17, the impact of the changes on our key variables over time can be described in the below Behaviour Over Time charts.

Modified Time pressure BOT Chart
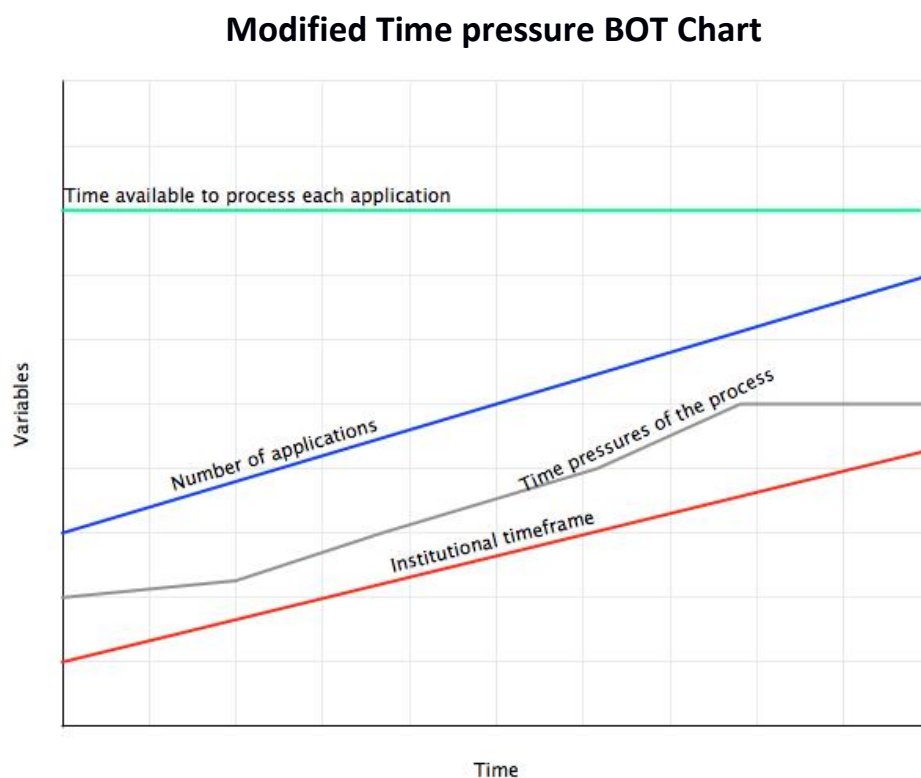
Figure 18: Modified Time Pressure BOT

By implementing entrance exams to the PhD application process, it has a decreasing effect on the number of applications. In Figure 18 above one can see that changing the institutional time frames to match the number of applications means each application

would have the same amount of time to be processed. Which in turns relieves a lot of the time pressures of the process, but the time pressures will not completely be removed.

Modified Student Registration BOT Chart
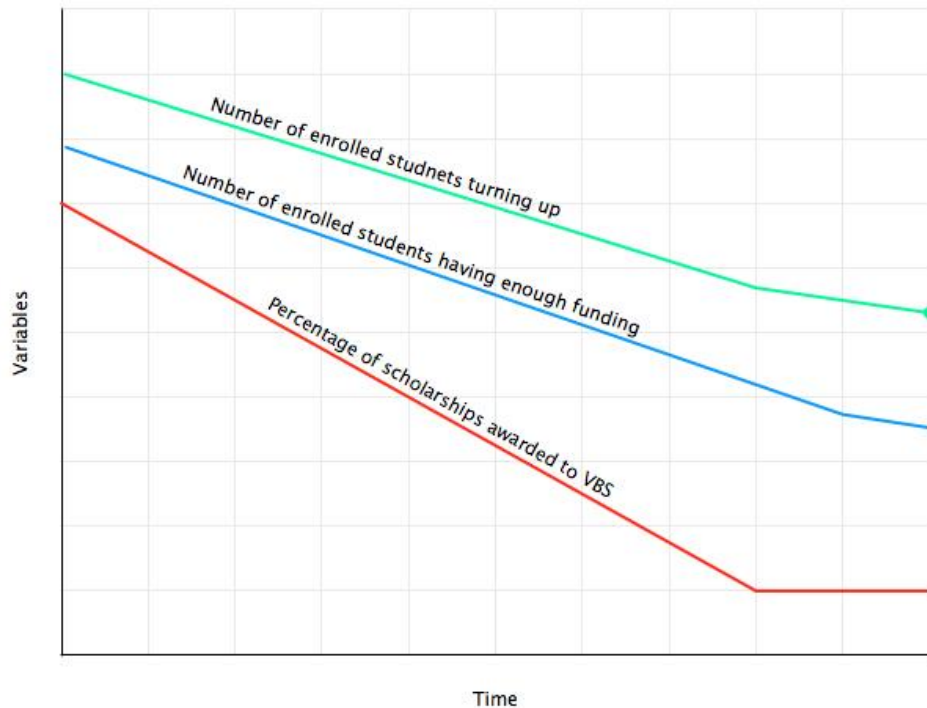
Figure 18.1: Modified Students Turning Up BOT

Figure 18.1 shows that with the implementation of an office keeping in touch with all enrolled students, the gradient of the number of enrolled students not having enough funding decreases and so does the number of students turning up.

Modified Frustration BOT Chart
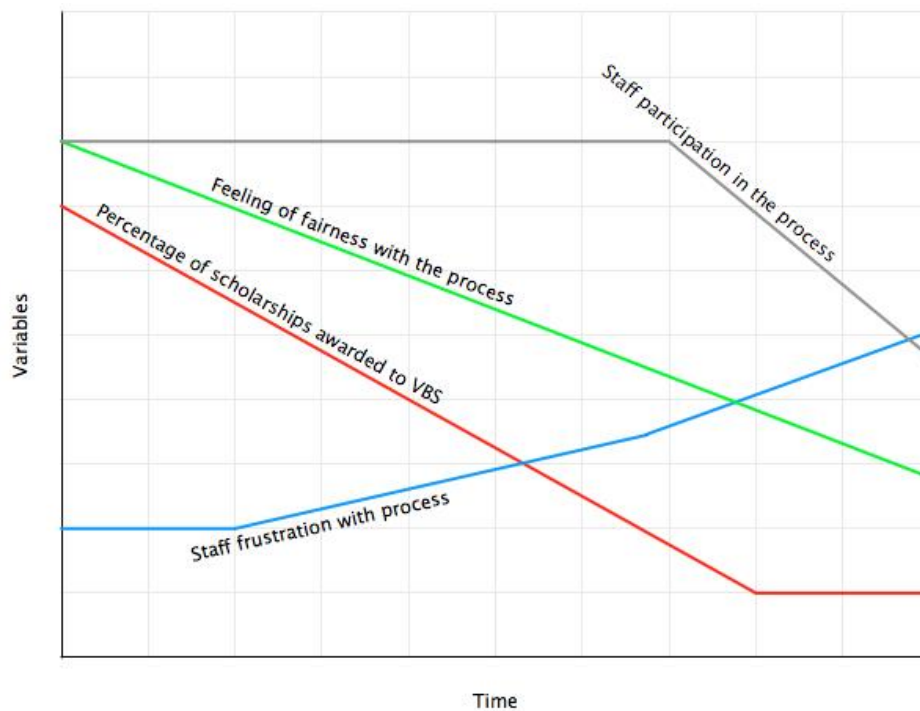
Figure 18.2: Modified Frustration BOT

Figure 18.2 above shows that with more enrolled students registering and turning up, the staff frustration with the process is lessened, and flowing on, so are the feelings of unfairness with the process, which further delays the effects of staff participation in the process.

In summary, alternative framing methods were used in this research to compare and explore the PhD Application process. Each frame revealing different aspects of the process and thus providing a wider picture of understanding and possible recommendations to improve the process.

The two predominant ways the PhD application process is conducted have been mapped out and explained using BPMN, providing a greater understanding of the roles and interactions between the various actors/stakeholders in the process, and providing a better understanding of how decentralised the process is across the university. In addition the fail points Identified through the interview process were mapped and explained as well.

Each of the two predominant processes share many common elements, and each has its own strengths and weaknesses. The strength of the 'Committee Method' process, which vets and ranks all the applications first, is that the supervisors only need to be found for the top applications as decided by the research committee. However, the committee version of the process makes no allowance for the interest from supervisors who may have to supervise the research, nor of their capacity to do so. During interviews conducted, very few staff suggested the school has a system for tracking the capacity of potential supervisors.

Alternative behaviours occur in the colleague method of the process. Because applications are shared around all colleagues and everyone can see and discuss the applications, interested supervisors step forward expressing their interest in supervising the research of certain applications. Therefore the research committee only need to thoroughly vet those applications that have willing supervisors. However, the downside is that supervisors make their decision to supervise based largely on their research interest, and not necessarily the overall quality of the candidate compared to all the others.

A second approach was used involving the methods and logic tools from the TOC. Initially, a Goal Tree was created to demonstrate what characteristics one would expect to see in a process that supports the strategic goals of the university. The university's strategic goals feature at the top of the tree, and critical success factors and necessary conditions fall underneath.

Secondly, a Current Reality Branch relating to each of the strategic goals was developed to link with the problems identified from the data collection process to the root causes of the problems, and to identify why the strategic goals were not being realised. The root causes then provide a place to start working on recommendations to remove them and remove obstacles in the way of the university achieving its strategic goals.

The third frame involved the use of Qualitative System Dynamics, and its CLD representational too, to reflect in diagrammatic form the problem statement previously captured as narrative. From the problem statement variables were identified and Behaviour Over Time graphs were created to show the effects on select key variables.

The CLD shows how the variables interact and relate with each as a whole. Leverage points were identified where later changes could be made to influence the individual and system behaviour. Some recommendations were made on how to utilise those leverage points and a second Causal Loop Diagram was created to show those changes. Furthermore, a second lot of Behaviour Over Time charts were created to show the estimated impact of the implemented changes on the key variables.

Chapter 6. Recommendations

In this chapter the results of the analysis from the different frames in chapter five are developed based on the outcomes of the findings. Recommendations made on the outcomes of the analysis to help fix any issues identified, and/or to move the process in a direction of more directly supporting the university's strategic goals.

6.1 Business Process Modelling & Notation

Mapping the two variants of the PhD application process identified a number of potential fail points. Addressing those identified 'fail points' lead to the development of recommendations, as follows.

The 'Fail points' were identified are:

	Committee Method	Colleague Method
Bundling Applications	✓	✓
Make Notes on Applications	✓	✓
PhD/Research Committee - reviews applications	✓	✓
Supervisor agrees or declines to supervise	✓	✓
Faculty review of scholarship applications	✓	✓
Scholarship Committee	✓	✓
Faculty - Review all scholarship applications faculty wide	✓	✓
Scholarship Committee - awards scholarships	✓	✓
Turn up to start study	✓	✓

Figure 19: Identified 'Fail Points'

Despite the two process variations being different they share the same 'fail points'.

6.1.1 Committee Method Fail Points Recommendations

Bundling applications

From the descriptions from Appendix 1, Q3.2, the bundling of applications is a time-consuming process of collating all the files/documents around a given application. It was once done by Faculty of Graduate Research and has been devolved the schools to do. However, if it were to return to Faculty of Graduate Research then no incomplete applications would make it into the school's work flow. Recentralising this one task would not affect the decentralised nature of the process either, because all decision making would still be done at the faculty and school levels.

Make notes on applications

Gaps in knowledge is a problem when dealing with a wide variety of academic disciplines. No one PhD director can know everything, so experience becomes the best factor in tackling this problem. As long as PhD directors have a large amount of academic experience, and focus their notes on the strengths or weaknesses of an application until the PhD/research committee reviews it and a potential supervisor/SME views the application. So, PhD directors need to have experience is PhD applications and not worry about the academic merits of proposed research, but rather on the quality of the application itself.

PhD/Research Committee - reviews applications

A better system for tracking supervisory capacity would save time. Knowing where there is supervisory capacity within a given school would allow the PhD/research committee to avoid wasting time on applications where there is no one to supervise. As mentioned in Appendix 2, Q3.2 - Respondent 5, some schools within VBS have started seeking out willing supervisors before their PhD/research committee meeting, bringing them closer to the colleague method of the process.

Supervisor agrees or declines to supervise

As mentioned previously, a more effective system for tracking supervisory capacity needs to be implemented. From Appendix 2, Q3.2 - Respondents 3 and 6, emerges conflicting information from two potential supervisors within the same school as to whether supervisory hours are even apart of the workload model currently being employed within VBS.

Faculty - Review all scholarship applications faculty wide

With all applications put forward for scholarships to the faculty from different schools within the VBS. We find another case of gaps in knowledge negatively affecting applications. An application's proposed research may be quite significant to the field, which no one other than the potential supervisor may understand. However, the faculty committee sitting on what applications continue on to apply for scholarships may not realise its significance. This issue is amplified if the GPA is perhaps lower than other applications, but the research outcome potentially more profound. Such cases are where having more criteria other than GPA for assessing applications in different fields would be of benefit.

Scholarship Committee - awards scholarships

There are two possible solutions to the scholarship committee issue: firstly, moving away from the existing centralised scholarship system of the university and distributing scholarships and decisions about scholarships across faculties; secondly, a movement away from a highly GPA-weighed comparison approach, to one that is more holistic in evaluating applications from faculties and disciplines as different as those that exist in VBS.

Turn up to start study

Communication would be the key to solving the problem of students not turning up to study. After accepting offers of studies, international students' personal situations seem prone to change, including potentially being offered a place (and possibly scholarship) at

another institution. To keep abreast of changing situations and avoid the frustration and issues around students who simply never turn up, Victoria University could establish a dedicated person who is responsible for keeping in touch with all registered PhD students (especially international ones). The university can be kept informed about changing circumstances and possibly assist international students who are struggling financially to get to Victoria University.

6.1.2 Colleague Method Fail Points Recommendations

The issued raised in the Colleague method listed below are similar, if not exactly the same to the ones for the Committee Method above.

- **Bundling applications**
- **Make notes on applications**
- **Supervisor agrees or declines to supervise**
- **PhD/Research Committee - reviews applications**
- **Faculty - review all scholarship applications faculty wide**
- **Scholarship Committee - awards scholarships**
- **Turn up to start study**

6.2 Theory of Constraints

Construction of the Current Reality, lead to the identification of a number of root causes potentially leading to the undesirable effects. The root causes and subsequent problems are preventing the necessary conditions from existing and therefore critical success factors identified in the Goal Tree (Figure 10 in chapter 5.6.1) are not happening. By solving those root causes of the problems it should reduce or ideally stop those undesirable effects from ever eventuating.

6.2.1 Academic Emphasis Not Prioritised

The root causes of problems associated with the degree of academic emphasis were:

Democratic group not led by single leader

Because the steering group is a group of willing academics, it seems that without consensus there is no process. Consensus within such a group is usually not quick, especially when defining the vague terms laid out in the strategic plan. Without a method of settling disputes and making final decisions, the group is left to debate ideas until a consensus is reached, which takes time.

If the steering groups do not have a leader, then one needs to be elected. If/when someone is leading the steering groups, rather than seek consensus over the definition or meaning of academic emphasis, such a leader needs to seek acceptance of a definition to start working with that can be updated as time goes on. Some concessions may need to be made by people on the steering group to allow an initial working definition to get off the ground.

Use of Strategic Ambiguity

By using what Eisenberg (1984) called strategic ambiguity in their strategic plan, the university left a broad interpretation of possible meanings. The use of ambiguity is slowing down progress at the steering group level. As the group tries to decipher and define terms like 'design-led', and when the strategy talks about region - what region? Wellington, the lower North Island or New Zealand? - the debate within the steering groups takes time and delays any meaningful progress in the meantime.

Though the use of strategic ambiguity may be becoming more prevalent in strategic plans and may very well have its place, it has not helped in the case of Victoria University. By using such vague terms for the strategic plan, staff are at a loss as to how to deliver what the university really wants or intended. If the university were to clarify what it means now and

in the future (at least internally), then the steering groups would have an easier job of being able to promote the academic emphasis areas the university wanted.

Centralised scholarship system

The fact that all scholarship awards are decided by a central authority is a point of great contention within VBS and its constituent schools. For the Academic Emphasis Current Reality Branch, the fact that the scholarships are not advertised or allocated for particular areas of study as outlined in the strategic plan means that the academic emphasis portion of the strategy is less likely to be achieved. However, this would also remove some of the freedom around scholarship decisions.

A prevailing theme throughout the data collection was the dissatisfaction with the scholarship award system. With such a decentralised PhD application process, it seems pragmatic to have allocated scholarships to faculties and schools, meaning not only would it be fairer in terms of the number of scholarships awarded to each school or faculty, but each school could advertise those scholarships to attract the research the school specifically wants, and align them with the academic emphasis areas that the university's strategy addresses.

Scholarships not dedicated to specific research themes

By not reserving and promoting available scholarships for the university's desired research themes, the university or its schools cannot home in to focus on its research themes as outlined in the strategic plan.

A movement away from the current centralised scholarship model would allow faculties and schools to target their scholarships to identified research areas and themes. Another way to go would be to actually change the application process so applications are applied for under

such research categories, and to allocate a number of scholarships to each research category to be awarded.

6.2.2 Research Quality, Quantity and Impact not being Enhanced

The root causes of problems with the research outputs were:

No financial incentive for schools to try to take on more PhD students

A result of the interview process revealed that there is little or no financial incentive for schools to take on more PhD students (see Appendix 2, Q3.9 - Respondent 5), so some schools may put less focus on increasing or even maintaining a number of PhD students. Having no incentive to take on more students certainly goes against the idea of increasing the research outputs of the university as outlined in the strategic plan.

While the New Zealand tertiary education sector has Performance Based Research Funding (PBRF), the university receives an additional lump sum payment from the government on top of the fees the university receives for every doctoral (and even master's) thesis it puts out. Without further investigation, one can only make the assumption a lump sum payment is received by the university and added to the general funds of the University for budgeting etc. However, in order to incentivise schools to take on more PhD students and thereby help increasing the quantity and quality of research outputs, the university should track the doctoral thesis outputs and give a percentage of the funding received for each thesis back to the respective school it came from. Therefore, for each thesis a school generates, the more discretionary funding the school would receive the next year.

Not enough scholarships

Every academic institution would argue there are not enough scholarships. However, new scholarships can be created and new benefactors found to increase the overall number of scholarships.

One would think that part of the department's role that deals with scholarships is to try create new scholarships through partnerships, benefactors or other means, increasing the number of scholarships available over time.

No system for effectively allocating academics' working hours

Identified in the Goal Tree was a faculty-wide system for effectively tracking academic staff hours, to be able to work out a school's capacity for supervising. However, such a system doesn't seem to exist. There is evidence that points to spreadsheets or records crudely being kept in a workload model (see Appendix 2 , Q3.2 - Respondent 6 and Q.3.3 - Respondent 5), but no more advanced system than that. Without a good system to track a school's teaching, research, supervisory hours and other duties, it is only an estimate on either a personal or school level what a school's supervisory capacity might be, or if the potential supervisor has a sustainable balance over everything.

For the university to be able to increase research outputs, either by academics or postgraduate students (or both), and increase the number of students in its undergraduate programmes, the university will need a reliable system to track the allocation and total number of hours its academic staff are doing; if not from a teaching and supervisory capacity standpoint, then certainly from a human resources standpoint to avoid staff burnout, or the pool of potential supervisors shrinking as academic staff feel they cannot take on more work.

By utilising a system better allocating staff hours/workload and incorporating the idea of schools controlling their own scholarships, then each school would be in a much better place to advertise the number of student vacancies and scholarships available.

Large number of applications to process

Too many applications to process is one of the key root causes of issues within the system. See Appendix 1, Q2.9 - Respondent 4.

The issue of having too many applications to process can be handled a number of ways.

Firstly, with the huge influx of applications some simple screening could be done up front by implementing some English and/or math internationally-recognised testing, such as the GRE Test (https://www.ets.org/gre) or GMAT Exam (http://www.mba.com/global/the-gmat-exam.aspx). The current university policy is only to do English tests against non-English-speaking countries. Making it a requirement for all international students would also help reduce the number of applications at the same time.

Not only will entrance exams help determine candidates' abilities, but it also sends a signal of quality out to the world. By implementing such testing it may deter those who send applications to every university possible, not only reducing the overall number of applications received by Victoria University, but also helping speed up the vetting of applications later on in the process as well.

Secondly, If the university were to make changes that place scholarships and advertising of places in the hands of the faculties and schools, then theoretically each school could place a cap on the number of applications for research in a given area of academic emphasis. Not only would testing reduce the number of applications overall, but it would mean the process could start sooner if the number of applications reached its cap before the shut-off date, allowing more time to process the applications that came in early.

Process time frames are short and inflexible

With so many more applications to process each year, keeping the eight week process turnaround time is putting increasing pressure on the process; as evidenced by Appendix 1, Q3.7 - Respondents 1 & 2, and Appendix 2, Q3.7 - Respondents 1, 2, 3 & 4.

With the current number of applications coming in each round, the Faculty of Graduate Research could perhaps consider scaling the amount of time of the process dependent on the number of applications, to allow each stakeholder time to do their part.

An alternative is changing the number of application rounds per year and/or moving them to a less busy time of the year; for example, adopting a North American approach where there is only one PhD application round done early in the year. Successful applicants expect to turn up for class on a specific day around September/October for their first class.

The added bonus of adopting an approach like the North American style is that stakeholders only have to go through the process once per year and students have a clear start date as opposed to multiple possible start dates. Should an enrolled student miss that date, then their offer of study is withdrawn and the student is free to apply in the next year's round. While such an approach may seem harsh, it stops the possibility of applicants that have accepted their offer of study from turning up late and having to wait around for the next research methodology course to start (should the student need to take one). Having to wait around obviously negatively impacts on the student's experience, and potentially means scholarship money is being paid out to students who are just waiting around for a new term of courses to start.

Some staff unwilling or unable to be supervisors

One Interviewee who wished to be anonymous, and for it to be left off any official notes, discussed how big a role personality and personality conflicts can impact on whether academic staff are good matches to be supervisors. To avoid such mismatches institutes' are using guides such as 'Tracking Postgraduate Supervision Role Perception Rating Scale'[3].

While being a more difficult issue to tackle and more of a human resources issue, the fact that schools may have staff that cannot fulfil every aspect of the role that academic staff are expected to, means that any particular school cannot possibly be optimally using their human resources, or generating research outputs as desired. If the university wants to expand, taking on more undergraduate and postgraduate students, then each school will need to have staff with skills that can work across the range of teaching to supervising.

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[3] http://www.mn.uio.no/astro/english/research/news-and-events/events/conferences/supervisionpresentations/rprs_revised.pdf

Some staff not interested in most research topics

There may also be some staff who are unwilling to look at PhD applications outside a very narrow focus of research - as evidenced by Appendix 2, Q3.2 - Respondent 5 - despite PhD applications being within their chosen discipline or field. Interviews suggest some staff could be stubborn and not receptive to the idea of broadening their research horizons. Alternatively, the academic might not have any interest in any research other than their own specific field. Either way, the result is one of reducing the potential supervisory capacity of the school and reducing the potential research outputs of the university overall.

Again, more of a human resources issue, but for the same reasons as outlined above, as the university grows, schools might not be able to have or tolerate academic staff that have such narrow or singular research interests; at least not ones that aren't willing to be supervisors in closely related or parallel areas of research. So, going forward, any new academic staff brought in may have to have cross-disciplinary research interests.

6.2.3 Feelings of Frustration with PhD Application Process

From the frustration Current Reality Branch the root causes of the problems are:

GPA not good equivalency between different faculties

GPA appears to be one of the pre-emptive criteria when it comes to the process of awarding scholarships. However, different views exist about how fair the process really is; whether grades of one discipline really are commensurable to grades of another (e.g. Law vs Humanities, Commerce vs Science, Design vs Teaching).

It is perceived the relative standards of the institute that awards a grade also has an impact on how much standing that grade holds. Where the institutes are ranked globally is a key factor, which leaves the university to perform an equation in the background to try to standardise the GPA grades.

Using an equation in an attempt to equalise GPAs is not perfect as evidenced by the fact there are noted cases where the same application came out with different scores when calculated in different years; see Appendix 2, Q3.14 - Respondent 1.

Should the university not want to adopt a more decentralised scholarship approach as recommended earlier, then another option might be to change the weighting the GPA contributes to scholarship decisions. The schools and faculty themselves have sorted and ranked the applications using GPA as a criteria already. Academic staff have expressed concern about the equivalency of GPAs in Humanities studies vs Business Studies, for example; so maybe using other metrics and factors might help a more uniform distribution of scholarships throughout the university and remove some of the frustration with the process.

GPA is the main factor of deciding scholarship allocations

The GPA rating appears to be the key variable used in deciding scholarships outcomes. However, the GPA grade might not be a fair measure of equivalency between disciplines as mentioned previously. A more holistic view of applications or a better formula to work out the equivalencies of GPAs from different schools could lead to more satisfactory outcomes.

Limited number of scholarships available

Every academic institution would argue there are not enough scholarships. However, new scholarships could be created to increase the overall number of scholarships.

One would imagine that part of the scholarships office is to try to create new scholarships through partnerships, benefactors or other means, increasing the number of scholarships available over time.

Busy time of year

When the data collection phase for this research was occurring, it was a busy time for staff (see Appendix 1, Q3.8 - Respondents 1 & 2). The process started on July 1st, but Trimester one for the university finished on June 29th and Trimester two starts on July 11th, meaning that academic staff are dealing with assignments and exams from Trimester one and having to prepare for Trimester two as well, on top of the other tasks/duties academic staff carry out. So the PhD application process comes at a particularly busy time for all, including administrators.

As recommended earlier, dropping to only two intakes a year at less busy times or adopting a North American-style approach of only one big intake a year would help solve the issue.

Process allows only eight weeks

Similar to "Process time frames not long enough", with so many more applications to process each year, keeping the eight week process turnaround time is putting increasing pressure on the process, especially if applicants need to be contacted or research topics negotiated; as evidenced by Appendix 2, Q3.7 - Respondent 3.

Scaling the length of time of the process to the number of applications might help in the thoroughness and timelines of processing so many applications. However, that would not be necessary with a recommendation that would curb the number of applications coming in at each round.

No screening or testing before applications pass from Faculty of Graduate Research to faculties

There seems to be no checking that applications contain all the necessary documents/attachments before applications are forwarded to each faculty/school, leaving the school's administrator to find out if applications are complete or not once the process is already under way.

Further to that, testing of English skills could also be done prior to the process starting, taking some of the strain away from schools.

As mentioned previously, by implementing some English and/or math internationally-recognised testing, such as the GRE Test (https://www.ets.org/gre) or GMAT Exam (http://www.mba.com/global/the-gmat-exam.aspx), implementing such a standard may discourage applications that would be screened out by the process anyway, so that a smaller pool of applications going through the process would by de facto, have a high likelihood of being offered a position. Implementing such standards would also help with the vetting of applications as well, in terms of measuring English and maths skills and mental acuity.

Victoria University has a good reputation

Victoria has a good international reputation and ranking. It is one of only 76 institutions worldwide that hold the 'Triple Crown' of international accreditations: European Quality Improvement System (EQUIS); Association to Advance Collegiate Schools of Business (AACSB) (in business and accounting); and Association of MBAs; refer chapter 2.

Having a good reputation and being internationally accredited is going to increase demand for an education from Victoria University.

While Victoria University may have a good reputation as a tertiary institution, which no doubt is partly responsible for the increasing number of applications, there is no evidence to suggest it has cultivated a reputation of being difficult to get into. Such a reputation would potentially be a benefit to reduce the number of applications, much in the same way that introducing the GMAT exams would send a signal.

6.3 Qualitative System Dynamics

Using the leverage points identified from Figure 16 in chapter 5, strategies can be made to effect changes in the system. Based on the following leverage points, recommendations have been made on how to use them to make changes in the system.

- Institutional time frames
- Number of applications
- Number of enrolled students having enough funding

Institutional time frames recommendations

The time frame of the application process can be altered to accommodate the increase in applications. The imposed rigid time frame is one of the key factors causing pressure on stakeholders to complete the process. By extending the time frames it provides more time for research committees or potential supervisors to contact applicants, thus reducing the likelihood of poor applicant selection and unsatisfactory outcomes.

Number of applications recommendations

Applying a strategy that helps control the number of applications received seems necessary. Taking up the recommendation to implement the mandatory requirement of the GRE Test (https://www.ets.org/gre) or GMAT Exam (http://www.mba.com/global/the-gmat-exam.aspx) for all international students should reduce the number of overall applications.

A further way of possibly reducing the number of overall applications could be aligning applications to the research themes as laid out in the strategic plan, and then aligning the available scholarships to those research themes, which would help reduce the number of applications by enabling the university to cap the number of applications for each research theme. This could be able to be done at the university level in terms of overall application

numbers; or at the school level, letting the school decide on the number of applications the school is prepared to receive, which each school could decide on based upon their respective workloads and supervisory capacity.

Number of enrolled students having enough funding recommendations

By having a department keep in touch with all international students who accept their offer of study, the university can be kept more informed of their changing situation. Students that did not receive a scholarship and are struggling to find the finances to study may be able to be helped by the university. Furthermore, if those students without scholarships who have enrolled later get an offer from another institution accompanied by a scholarship, the university would be more likely to know and could inform the supervisor not to expect them, preventing a surprise when registered students do not turn up. Ideally Vic International and/or the Scholarships Office would have resources dedicated to following up, in case there could be ways financial assistance could be provided to such students in need.

6.4 Recommendations Summary

In conclusion, this chapter took the results of the analysis from chapter five and made recommendations on ways to remove or mitigate issues identified in the PhD application process.

The issues from all the frames are shown in tables, Figure 20-20.2 below, to illustrate which stakeholders within the Victoria Business School the issues effect and whether issues are a process problem or a university problem.

BPMN Issue Table

Issue	Stakeholders			Origin of Problem	
	Administrators	PhD Directors	Potential Supervisors	Process	University
Bundling Application	✓			✓	
Make notes on applications		✓		✓	
PhD/Research Committee - Reviews Applications		✓		✓	
Supervisor Agrees or Declines to Supervise		✓	✓	✓	
Faculty - Review all scholarship applications faculty wide		✓	✓	✓	
Scholarship Committee - Awards Scholarships		✓	✓	✓	
Turn up to start study			✓	✓	✓

Figure 20: BPMN Issue Table

QSD Issue Table

Issue	Stakeholders			Origin of Problem	
	Administrators	PhD Directors	Potential Supervisors	Process	University
Institutional Timeframes	✓	✓	✓	✓	
Number of Applications	✓	✓		✓	
Number of enrolled students having enough funding	✓		✓		✓

Figure 20.1: QSD Issue Table

TOC Issue Table

Issue	Stakeholders			Origin of Problem	
	Administrators	PhD Directors	Potential Supervisors	Process	University
Democratic group not lead by single leader					✓
Use of Strategic Ambiguity					✓
Centralised scholarship system		✓	✓	✓	✓
Scholarships not dedicated to specific research themes				✓	✓
No financial incentive for schools to try take on more PhD students		✓	✓	✓	✓
Not enough scholarships		✓	✓		✓
No system for effectively allocating academics working hours		✓	✓	✓	✓
Large number of applications to process	✓	✓		✓	
Process timeframes are short and inflexible	✓	✓	✓	✓	
Some staff unwilling or unable to be supervisors		✓		✓	✓
Some staff not interested in most research topics		✓		✓	✓
GPA not good equivalency between different faculties		✓	✓	✓	
GPA is the main factor of deciding scholarship allocations		✓	✓	✓	
Limited number of scholarships available		✓	✓		✓
Busy time of year	✓	✓	✓	✓	✓
Process allows only 8 weeks	✓	✓	✓	✓	
No screening or testing before applications pass from Faculty of Graduate Research to faculties		✓	✓	✓	
Victoria University has a good reputation	✓	✓	✓	✓	✓

Figure 20.2: TOC Issue Table

Figures 20-20.2 show the impact of each issue brought out by each respective frame

analysis. Seeing how many stakeholders are affected by each issue, and whether or not the

issue is a process or a university level issue, also guides where the responsibility lies to deal

with the issue. Arguably, the more stakeholders within the business school the issues affect, the more important it is to resolve.

Recommendations for university level change would need a champion with greater authority than any stakeholder in this research. If addressed, the university level issues would have the biggest impact across all the stakeholders and to the PhD application outcomes. For example, they would include aligning scholarships to the research themes to achieve the 'Academic Emphasis' strategic goal; ensuring schools have more supervisory capacity and a financial incentive to use that capacity; and would lead to greater success towards the 'Research Outputs' strategic goal.

At a process level, the changes appear easier to implement. Individual schools or the owner for the process itself (the Faculty of Graduate Research), can implement such changes. Process changes could make a big difference to the time pressures felt by stakeholders and the time of the year the process occurs, so that it does compound other time pressured activities. While the university level changes focus more on the achievement of the strategic goals, the process level changes focus on improving the efficacy of the process for all stakeholders.

For the potential supervisors, the recommendations, if implemented, would change the outcomes of the process for them. Potential supervisors would know if an enrolled student is unlikely to register or to turn up to commence their studies. Furthermore, with the implementation of a decentralised scholarship system, or a move away from the GPA being a big deciding factor of scholarships, then potential supervisors will have a fairer chance of getting scholarships for their applicants.

For the PhD directors', implementing such recommendations makes the process better to manage. The number of applications coming in would be fewer, or if not fewer in number, then all the incoming applications would hopefully be higher quality. If the number of applications does stay the same, the time frame to process the applications would be flexible enough to accommodate such varying volumes of applications. With the changes previously discussed implemented, there would be more supervisory capacity to take on

new students, and the likelihood of an applicant getting a scholarship would increase, making not only the process more efficient for the PhD Director, but the outcomes better as well.

For the administrator stakeholders, the number of applications and the time frames to process them is key for busy administrators. The implementation of the recommendations also means fewer applications to process and less time pressure. Lowering the number of applications and/or having more flexible time frames would make all the difference.

In summary, the implementation of all or some of the recommendations made would improve the PhD application process for all the stakeholders.

Chapter 7. Conclusions

In conclusion of this research, the PhD application process within the Victoria Business School has been examined using multiple frames and generating reinforcing and complementary perspectives on the efficacy of the process. To answer the research question of "how efficient is the current process?", it must be said the process is not very efficient on the one hand; it involves a lot of stakeholders across different departments, making decentralised evaluations and recommendations. However, when it comes to decision-making around scholarships, the university uses a centralised method, instead of extending or adopting a localised approach which may be more effective or efficient. The fact that the time frame to complete evaluations does not change, regardless of the amount of applications, places pressure on stakeholders. Time pressures in turn mean less time is available to vet individual applications and/or make contact with the candidate. Respondent interviews suggest that most feel some level of frustration with the process in its current form and that is could be improved to be more effective/efficient. The FGR figures showing that 311 applications went through the process and VBS rejected 226 (72.67%) of them, for only 19 enrolments, suggest the process is currently time intensive for little return.

To answer the research question of "does the PhD application process support the achievement of the university's strategic goals?" - by using our Goal Tree as the measuring stick of what one would expect to see in a process fully supporting the strategic goals - then sadly no. The process is not supporting the strategic goals very well as few of the necessary conditions of the Goal Tree exist in the process in its current form. The analysis showed numerous necessary conditions that would need to exist to effectively align the process with the strategic goals to support the achievement of these goals.

To answer the research question "If not, how should the process be improved?" a list of possible recommendations was created from the results of the analysis of the different frames. The efficacy of the recommendations in turn demonstrate the efficacy of individual frames, and the multi-framing methodology.

If the university wants the Victoria Business School to carry out the PhD application process in a less perfunctory manner then changes to the process can be identified which can bring about desired outcomes.

7.1 Reflections

The use of multi-framing is a relatively new one, in using a multi-framing approach one seeks to gain multiple perspectives that aid understanding of phenomenon being studied. As compared to a multi-methodology approach, whereby one seeks to separate a complex problem into parts and use the strengths of a specific methodology on that part of the problem to solve it.

Each frame may identify some (if not all) different issues within the process that the other frames may not have revealed. From the different issues, recommendations could be made to address each issue and possibly others.

The different frames used in this research all examined the process in a different way and served to increase the understanding of the process. BPMN created a visual map of the process and allowed one to quickly understand the process and also where some areas of improvement may lie. Theory of Constraints resulted with a list of specific issues and root causes of problems. The Current Reality Branches showed the impact throughout the process and how it inhibited the achievement of the strategic goals. The use of Qualitative System Dynamics brought the element of time into the analysis, and what is happening over time to key variables.

While an application process might seem like a small phenomenon to study, I am still surprised by how many areas of this topic were out of scope. The unstructured interviews covered themes such as responsibility and use of technology. However, more themes could not fit into such a small thesis as this.

7.2 Further Studies

The applicability of the findings of this research should be generalisable enough to traverse not only faculties within the same university, but different universities as well. Most universities would have an application process, if not a PhD Application process. However, it would be interesting in further studies to do the same study across multiple faculties, to see if issues are shared across the university. In the interest of gaining a complete picture of the process it would be good to have access to special groups like the scholarship committee and Faculty of Graduate Research members to fill in gaps in the knowledge about the wider process.

Further exploration about the nature of 'conflict' and how it may be resolved, such as the idea of centralised vs. decentralised scholarships, might reveal additional insights to improve the process/system. Currently the system promotes centralised ideas and ignores local factors, as seen in Figure 21 below.

Central vs Local Scholarship Factors Table

Central Factors	Local Factors
Efficient	Fair division of outcomes
Easy oversight	Local control
Consistency	Support non-standard applications
Equal opportunity for applicants	Broaden criteria
	Target research

Figure 21: Scholarship Factors Table

The conflict between the idea of centralised vs decentralised scholarships could be expressed through the use of a Theory of Constraints Evaporating Cloud, e.g. Figure 22 below.

Centralised vs Decentralised Scholarship System
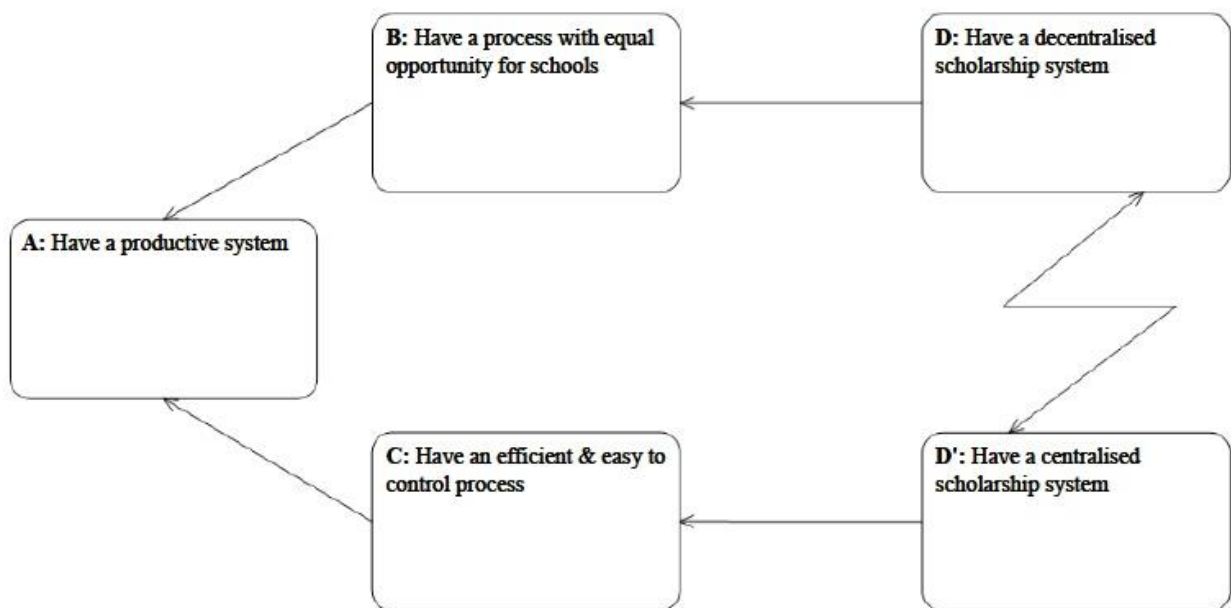
In order to *Have a productive system* I must *Have a process with equal opportunity for schools* and in order to *Have a process with equal opportunity for schools* I must *Have a decentralised scholarship system*. But, in order to *Have a productive system* I must also *Have an efficient & easy to control process* and in order to *Have an efficient & easy to control process* I must *Have a centralised scholarship system*. I can't both *Have a decentralised scholarship system* and *Have a centralised scholarship system*.

Figure 22: Scholarship Evaporating Cloud

The Evaporating Cloud shown in Figure 22 shows the conflict of opposing ideas. The top half of the cloud represents one viewpoint and the lower half represents a different viewpoint.

Future research could look into the better use of technology for the PhD Application Process. Even for such a complex process there should exist a form of workflow technology which could prove beneficial for such a process.

While TOC played a big part in this research, it only touched upon the two questions addressed by TOC methodology; "what to change" and "what to change to". A third question of "how to cause the change" remains unanswered, and could prove interesting future research.

Finally, in terms of future research it would be interesting to change from qualitative system dynamics to regular (quantitative) system dynamics. With data from FGR spanning more time it could be possible to create a model to run simulations reflecting changes to the

system, to assess the impact of such changes and then to conduct sensitivity analysis related to a suite of possible changes.

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Appendices

Appendix 1: Administrator and PhD Coordinator/Director Questions

Q1.2 Which school do you work in?

School of Accounting and Commercial Law

School of Information Management

School of Economics and Finance

School of Government

School of Marketing and international Business

School of Management

Q1.3 What is your job role?

Administrator

Coordinator/Director

Potential Supervisor

Other (Please specify) _____

Q2.1 Are you aware of any way the university promotes applications in the below fields of study, as outlined in the 2014 strategic plan?

- **Advancing better government**
- **Cultivating creative capital**
- **Spearheading our digital future**
- **Enabling our Asia-Pacific trading nation**
- **Stimulating a design-led, high-value manufacturing region**
- **Enhancing the resilience and sustainability of our natural heritage and capital**
- **Improving health and wellbeing in our communities**
- **Enriching national culture, civil society and global citizenship**
- **None of the above**

Q2.2 If so, how are they promoting applications in those research areas?

Q2.3 Are you aware of any way the university promotes applications that will generate any of the below, as outlined in the 2014 strategic plan?
- **Invention disclosures**
- **Patent applications**
- **Licences**
- **Technological innovations**
- **Research revenue**
- **None of the above**

Q2.4 If so, how are they promoting applications likely to produce those outcomes?

Q2.5 Are you aware of any quota for Maori and/or Pasifika student applications?

Q2.6 Are you aware of any dedicated scholarships designed to increase the number of Maori and/or Pasifika students at the PhD level?

Q2.7 Would you be in favour of a quota for Maori and/or Pasifika student applications?

Q2.8 Would you be in favour of dedicated scholarships designed to increase the number of Maori and/or Pasifika students at the PhD level?

Q2.9 Is there anything you'd like to say about PhD applications at this time?

Q3.1 How long have you been involved with the PhD application process? (Best estimate is fine)

Q3.2 Please describe your task/s (in order) in the PhD application process:

Q3.3 What outcomes are you seeking when you do those tasks?

Q3.4 What criteria do you use (if any) to help ensure those outcomes?

Q3.5 Do you use technology to make doing those tasks more efficient? (Please describe)

Q3.6 Can you see a way that technology could be used to make those tasks more efficient? (Please describe)

Q3.7 Do you think you are given enough time to do your part of the process?

Q3.8 If not, why not? Is something getting in the way?

Q3.9 What do you think is the aim of the overall process? (Please describe)

Q3.10 Who do you think is currently responsible for the process and why? (Please describe)

Q3.11 Who do you think should be responsible for the process and why? (Please describe)

Q3.12 Who do you think is currently responsible for the outcomes of the process? (Please describe)

Q3.13 Who do you think should be responsible for the outcomes of the process? (Please describe)

Q3.14 Is there anything you'd like to say about the PhD application process at this time?

Q4.1 Are you familiar with the university's strategic goals?

Q4.2 Do you feel the PhD process supports these strategic goals?

Q4.3 Do you think the university can successfully double its student numbers and research without sacrificing quality?

Q4.4 Do you think there are other conflicts between the strategic goals of the university?

Q4.5 Is there anything you'd like to say about the university's strategic goals at this time?

Q5.1 - The second part of this research involves how potential supervisors sort through PhD applications. Can you please suggest the names of 6-10 potential supervisors you feel might be receptive to helping this research.

Appendix 2: Potential Supervisor Questions

Q1.2 Which school do you work in?

- School of Accounting and Commercial Law
- School of Information Management
- School of Economics and Finance
- School of Government
- School of Marketing and international Business
- School of Management

Q1.3 What is your job role?

- Administrator
- Coordinator/Director
- Potential Supervisor
- Other (Please specify) _____

Q2.1 Are you aware of any way the university promotes applications in the below fields of study, as outlined in the 2014 strategic plan?

- **Advancing better government**
- **Cultivating creative capital**
- **Spearheading our digital future**
- **Enabling our Asia-Pacific trading nation**
- **Stimulating a design-led, high-value manufacturing region**
- **Enhancing the resilience and sustainability of our natural heritage and capital**
- **Improving health and wellbeing in our communities**
- **Enriching national culture, civil society and global citizenship**
- **None of the above**

Q2.2 If so, how are they promoting applications in those research areas?

Q2.3 Are you aware of any way the university promotes applications that will generate any of the below, as outlined in the 2014 strategic plan?

- **Invention disclosures**
- **Patent applications**
- **Licences**
- **Technological innovations**
- **Research revenue**
- **None of the above**

Q2.4 If so, how are they promoting applications likely to produce those outcomes?

Q2.5 Are you aware of any quota for Maori and/or Pasifika student applications?

Q2.6 Are you aware of any dedicated scholarships designed to increase the number of Maori and/or Pasifika students at the PhD level?

Q2.7 Would you be in favour of a quota for Maori and/or Pasifika student applications?

Q2.8 Would you be in favour of dedicated scholarships designed to increase the number of Maori and/or Pasifika students at the PhD level?

Q2.9 Is there anything you'd like to say about PhD applications at this time?

Q3.1 How long have you been involved with the PhD application process? (Best estimate is fine)

Q3.2 Please describe your task/s (in order) in the PhD application process:

Q3.3 What outcomes are you seeking when you do those tasks?

Q3.4 What criteria do you use (if any) to help ensure those outcomes?

Q3.5 Do you use technology to make doing those tasks more efficient? (Please describe)

Q3.6 Can you see a way that technology could be used to make those tasks more efficient? (Please describe)

Q3.7 Do you think you are given enough time to do your part of the process?

Q3.8 If not, why not? Is something getting in the way?

Q3.9 What do you think is the aim of the overall process? (Please describe)

Q3.10 Who do you think is currently responsible for the process and why? (Please describe)

Q3.11 Who do you think should be responsible for the process and why? (Please describe)

Q3.12 Who do you think is currently responsible for the outcomes of the process? (Please describe)

Q3.13 Who do you think should be responsible for the outcomes of the process? (Please describe)

Q3.14 Is there anything you'd like to say about the PhD application process at this time?

Q4.1 Do you prioritise PhD applications that fall within one of the following fields of study as outlined in the 2014 strategic plan?
Advancing better government; Cultivating creative capital; Stimulating a design-led, high-value manufacturing region; Spearheading our digital future; Improving health and wellbeing in our communities; Enriching national culture, civil society and global citizenship; Enabling our Asia-Pacific trading nation; Enhancing the resilience and sustainability of our natural heritage and capital.

Q4.2 Do you prioritise PhD applications that are likely to generate any of the following as outlined in the 2014 strategic plan?
Invention disclosures; Patent applications; Licences; Technological innovations; Research revenue.

Q4.3 Do you prioritise PhD applications from within the Asia-Pacific region?

Q4.4 If the applicant has papers published are you more likely to favour that application?

Q4.5 Would you be in favour of having scholarships set aside for particular areas of study important to the university?

Q4.6 Would you be in favour of having set criteria to help sort and prioritise applications?

Q4.7 Do you find the outcome worth the time you put into the process?

Q4.8 How long would you spend on any given application? (Best estimate is fine)

Q4.9 Is there anything you'd like to say about selecting PhD applications at this time?

Q5.1 Are you familiar with the university's strategic goals?

Q5.2 Do you feel the PhD process supports these strategic goals?

Q5.3 Do you think the university can successfully double its student numbers and research without sacrificing quality?

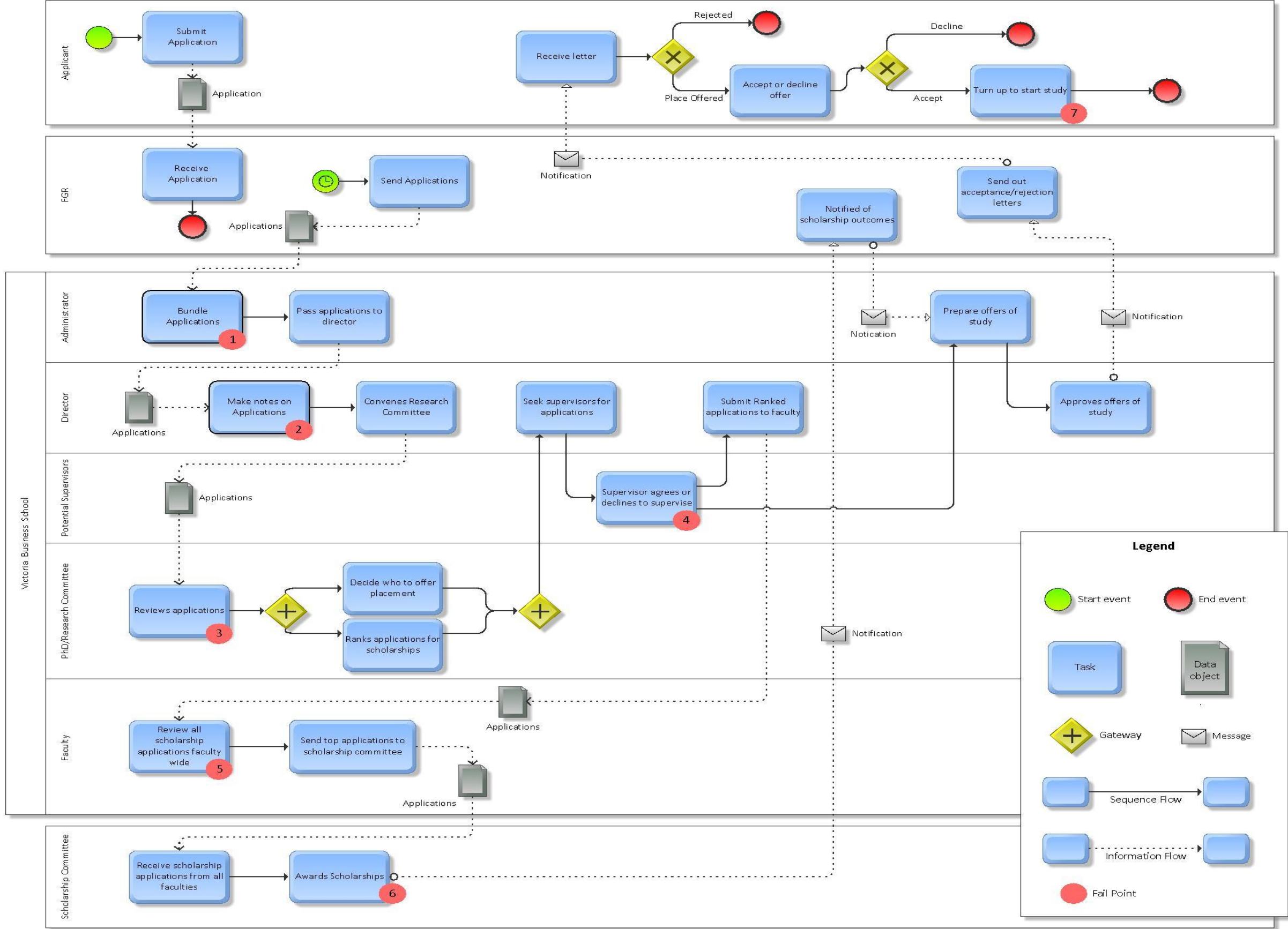**Q5.4 Do you think there are other conflicts between the strategic goals of the university?**

Q5.5 If you answered yes above please explain.

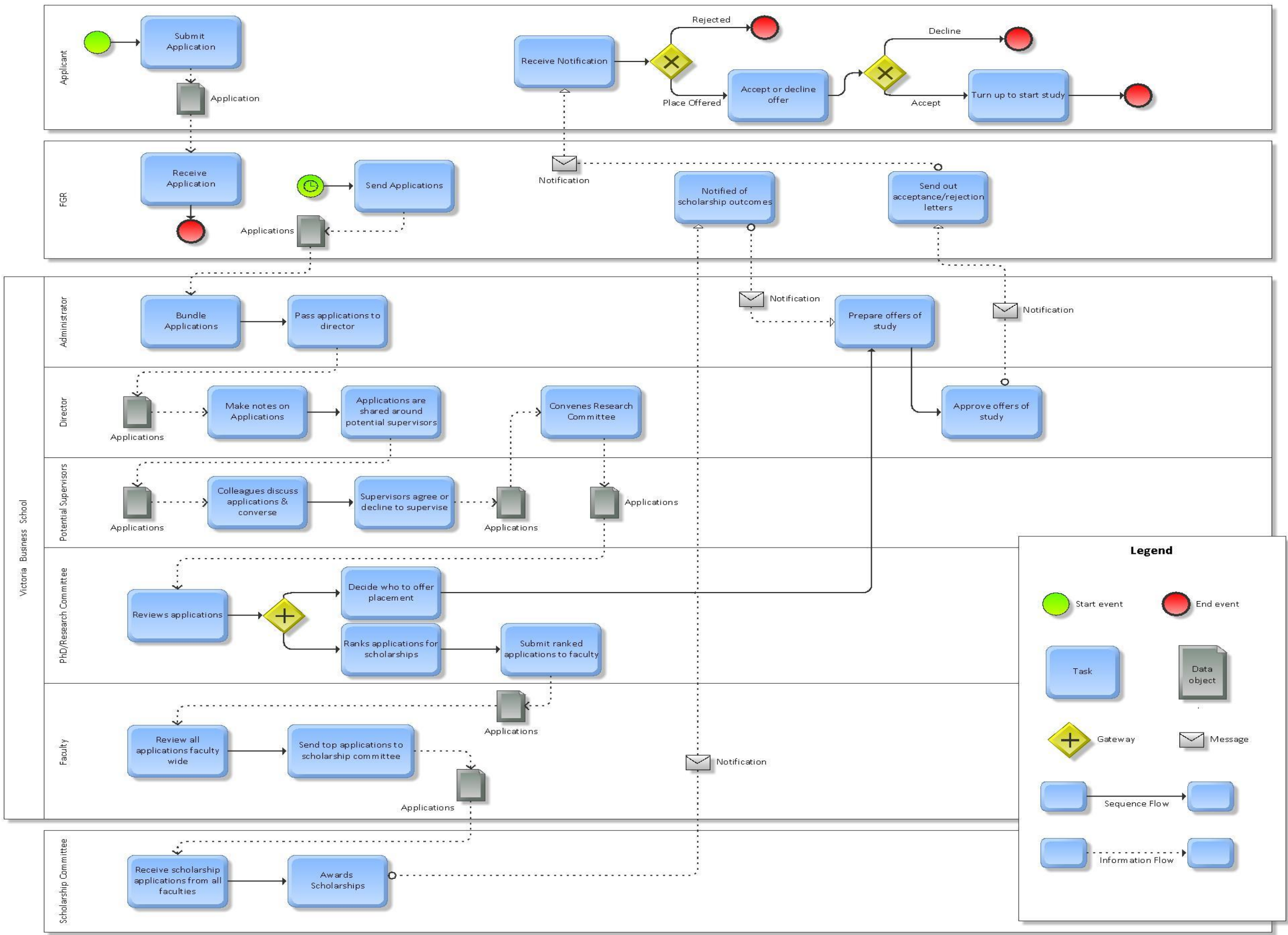**Q5.6 Is there anything you'd like to say about the university's strategic goals at this time?**
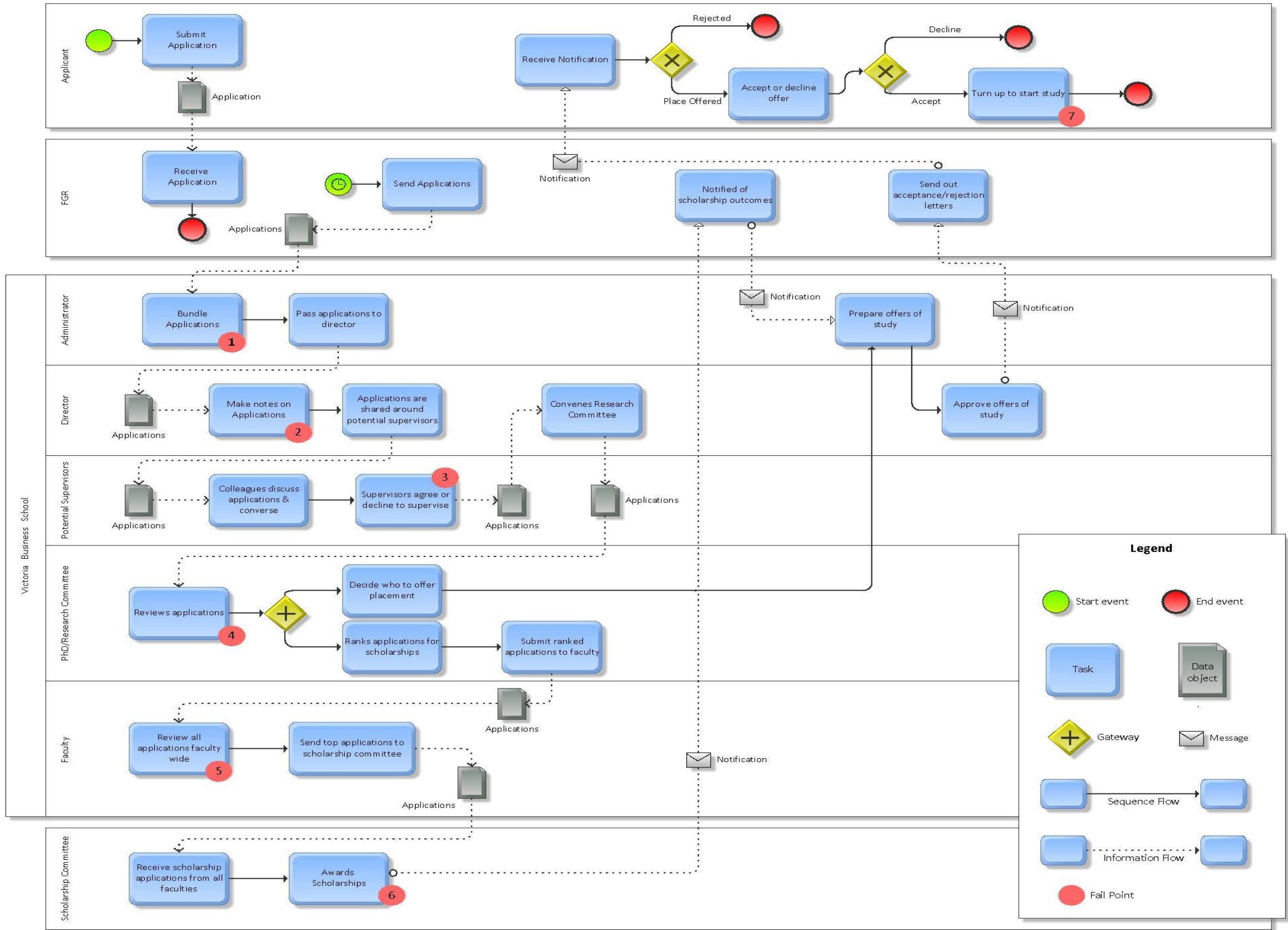
Appendix 3: Committee Method Enlarged
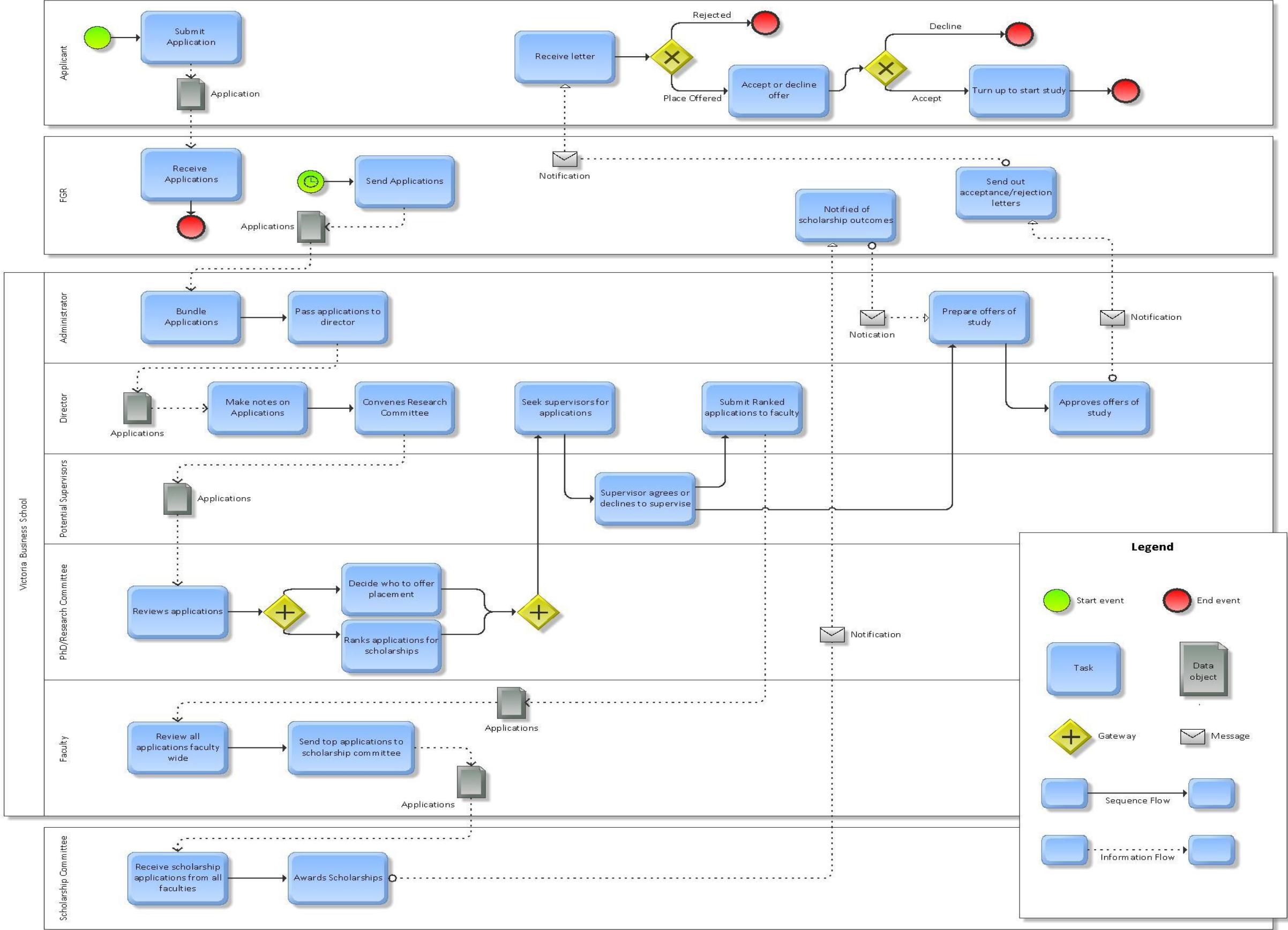
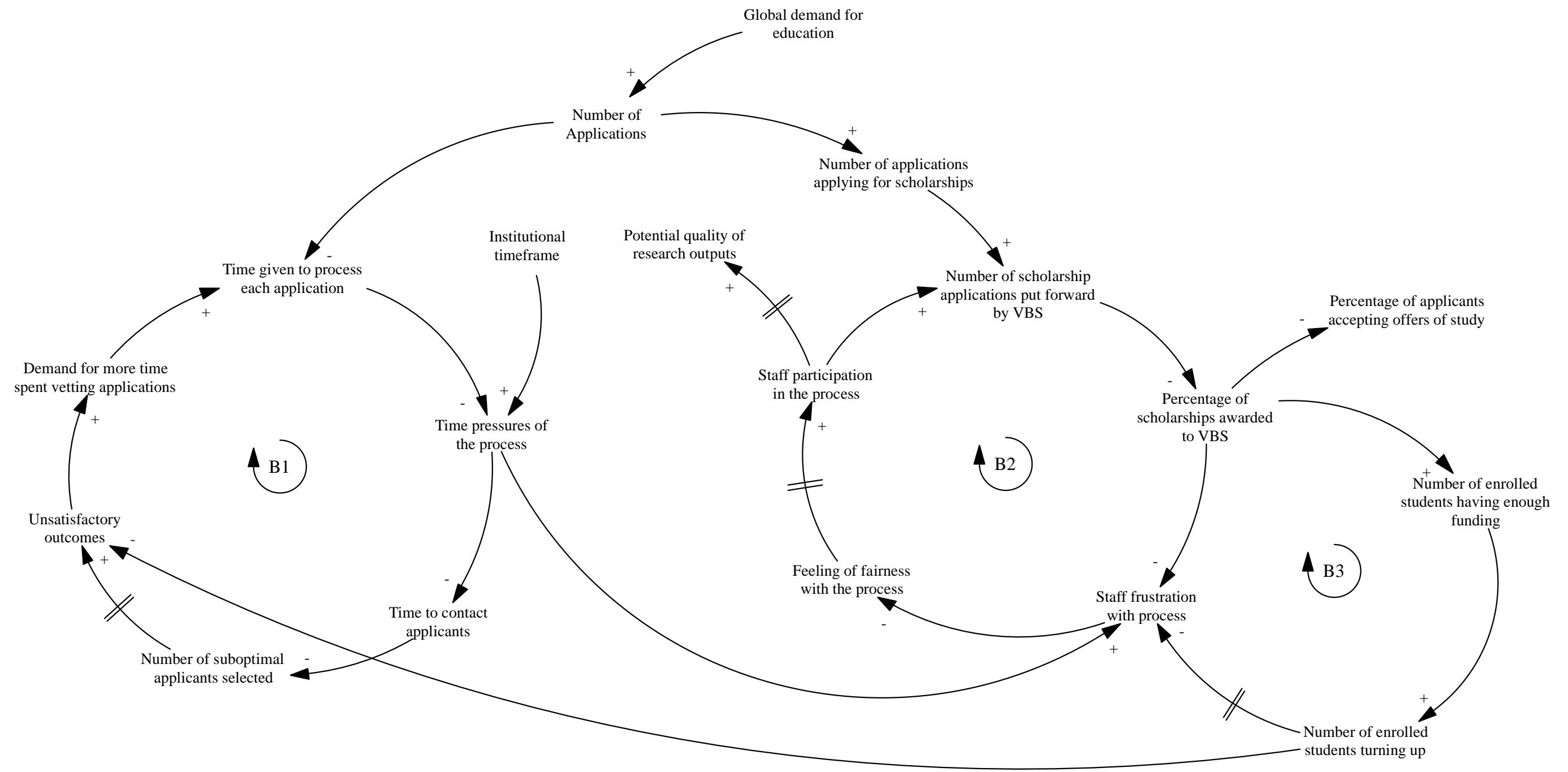**Appendix 4: Committee Method Fail Points Enlarged**

Appendix 6: Colleague Method Fail Points Enlarged

Appendix 8: Causal Loop Changes Enlarged