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DEVELOPING A FRAMEWORK OF *LEAN* ORIENTATED TOOLS AND PRACTICES TO BE INTRODUCED AT WITS: A WITS PLUS CASE STUDY

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A research report submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, in partial fulfillment of the requirements for the degree of Master of Science in Engineering.

Johannesburg 2020

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Declaration of Originality

I, the undersigned declare that:

- This research is being submitted as a due requirement to the University of the Witwatersrand, Johannesburg, in partial fulfillment for the degree of Master of Science in Engineering (Industrial) (50/50).
- This research is my own unaided work unless specifically referenced as such in the text
- No work submitted here has previously been published
- All the information gained herein was whilst enrolled at the University of the Witwatersrand



Nicoleen Potgieter

13 November 2020

Abstract

This research report aims to identify *Lean* orientated tools and practices that can be used within the University of the Witwatersrand, Johannesburg (Wits) to create awareness and knowledge that can support the analysis and improvement of administrative processes.

Many administrative processes at Wits are complex and involve many stakeholders. When a new process or a change to a process is introduced staff does not always analyse the changes or realise the impact thereof on current processes. Through ignoring this, duplicated processes are created leading to a lot of frustration. There is therefore a need within the University for staff to gain a better understanding of how to analyse and improve processes when changes are introduced without creating any duplication. This study will, therefore, consider selected *Lean* orientated tools and practices to see how these practices can assist in this regard.

The study involved staff from Wits Plus and Faculties at the University and made use of pre-interviews and post-interviews and a workshop to establish which *Lean* orientated tools and practices were best suited to analyse and improve administrative processes. The workshop introduced and exposed participants to *Lean* orientated tools and practices and allowed them to use them in practice. The findings identified Flow Diagrams, DMAIC (Define, Measure, Analyse, Improve and Control), and the Six Honest Serving Men framework as the three most suited practices to analyse and improve administrative processes. These practices are proposed in a framework for future use and support to Wits staff.

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Lastly, to my wonderful sister Jolinda Prinsloo, I would not have been able to do this without your continuous love, friendship, and support.

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Nomenclature

AISU	Academic Information Systems Unit
BIS	Business Intelligence Services
DMAIC	Define, Measure, Analyse, Improve and Control
DR	Deputy Registrar
DVC	Deputy Vice-Chancellor
FT	Full-Time
GEMP	Graduate Entry Medical Programme
LHE	*Lean Higher Education*
LSS	*Lean* Six Sigma
N+2	A programme must be completed within two years of regulation time.
PGCE	Postgraduate Certificate in Education
PDCA	Plan Do Check Act
PT	Part-Time
RACI	Roles, Accountability, Communication, Information table
SIMS	Student Information Management System
TQM	Total Quality Management
WITS	University of the Witwatersrand, Johannesburg
WRC	Wits Readmission Committee
WRC-1	Wits Readmission Committee (First Committee)
WRC-2	Wits Readmission Committee (Second Committee)

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Chapter 1: Introduction

Chapter One introduces the purpose of this research and provides context for the research that was undertaken. The motivation, research question, and objectives for this research will be discussed in this chapter along with the limitations and bias of the study and the framework that will be proposed. In this chapter, the role and interactions of Wits Plus with the Faculties of the University's Wits Readmissions process will be explained.

1.1 A Personal Narrative

I completed my undergraduate degree studies at the University of Pretoria after which my career started in the education environment where I worked in the private sector at National Private Colleges for six years. I joined Wits in 2002 as an Admissions Consultant and over the past 17 years, I have occupied various service offices within the University.

From my early working years, I learned to appreciate properly run systems and processes and my first encounter with an office with no processes in place was when I joined the Faculty of Humanities in 2004. Had I perhaps at that time been aware of *Lean* principles, eliminating duplication and waste, my approach to 'cleaning up' the administration within the Faculty office would have taken a very different approach. My strong feelings towards the importance of having properly structured, mapped, and communicated processes in place however came about in 2015 with #FeesMustFall.

The movement brought about numerous changes and University rules and processes were changed in split seconds to accommodate student demands. Jansen (2018) noted that 'Universities' academic and organisational cultures were being broken down in the narrow interest of politics by political parties who do not care about Higher Education in the country'. He further pointed out that 'Higher Education (HE) Institutions function on rules and regulations and over the past few years processes to deliver quality service to students has been turned up-side-down.' He warns that the blatant defiance of University processes can, in the long run, lead to the collapse of University systems and the culture Universities try so hard to create.

Consequently, I decided that my research would aim to use my years of experience and the valuable knowledge gained from my *Lean* studies to improve processes. I have encountered many situations with staff being frustrated with the multitude of processes or lack thereof, seeing time and time again staff having to start from scratch with a process as a predecessor did not leave a documented trail when they left the University. I am hoping that my findings will prove to be useful to the University improving service levels not only to our students but also to ourselves.

1.2 Background

Dickeson(2011) notes that both Universities and Colleges have been searching for more efficient academic programmes and support service delivery with Houston (2008) pointing out that the focus of higher education has changed from accountability to improvement, and that using *Lean* methodologies is key in this improvement strategy. Kang and Monyonge (2014) write that fierce competition is taking place within higher education regarding service delivery and providing a learning environment to students, with facilities and services that support student life.

With increased University fees, students are expecting to receive better service, therefore putting Universities under pressure to improve their services (Kang and Monyonge, 2014). Tyagi et al. (2015) state that there needs to be continuous innovation to uphold a competitive advantage and through implementing *Lean* tools and methods, knowledge creation and support can be initiated.

A *Lean* approach can be optimised for administrative processes and there are valuable arguments to be considered when thinking of implementing *Lean principles* in the service industry, especially in higher education (Beckers, 2015). In his, book Lean Higher Education: Increasing the Value and Performance of University Processes, Balzer (2010) defines *Lean* in higher education as 'defining the value of processes from the perspectives of beneficiaries, identifying process flows'. This he states is done by eliminating waste, creating process flows, and striving for perfection through continuous improvement and transforming processes. He gives examples of flow diagrams and value stream mapping showing where processes break down due to waste. He further notes that in most universities, leaders do not always step back to have a holistic view of all processes to discover the problems experienced by staff. There is often no framework guiding them as to how a process can be changed or improved. He notes several common concerns regarding service levels within the higher education environment:

- University processes fail to meet the needs of parents, students, faculty and departments;
- That processes within universities are perceived to be extremely slow and not adding value;
- When there is a complaint or failure of processes, intervention is required from staff in authority;
- That documented processes are poor, with no standardisation, instruction or training;
- That processes fail to benefit from staff insight;

- That there is no mechanism for staff to share their thoughts, concerns, suggestions; and
- That there is no transforming climate assisting an organisation to improve service levels regularly.

In many instances, administrative processes at Wits fall short, with staff being frustrated at a lack of processes having to start from scratch with a process as a predecessor did not leave a documented trail on leaving the University. This supports the point that Balzer (2010) makes in that documented processes are poor and there is no standardisation, instruction, or training. Dennis (2007) notes that through sharing knowledge and having clearly defined standards an organisation can do well even if key members of staff leave. He suggested creating a management system where records of important learning facts can be shared. Figure 1 provides a graphic representation of the frustrations that workers experience when processes are unclear or unfamiliar.

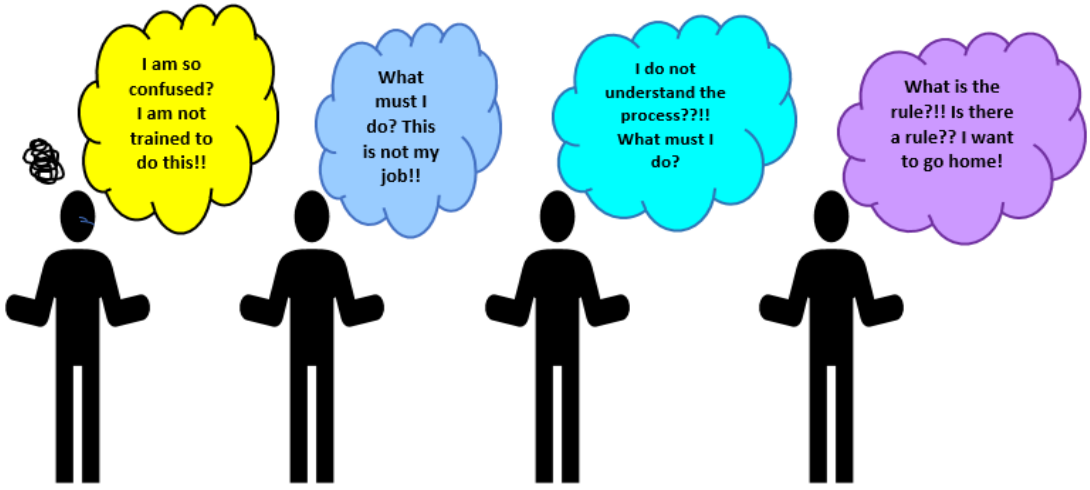


Figure 1: The Frustrated Worker

Radnor and Bucci (2011) note three shared advantages when an organisation introduces *Lean i*nitiatives:

(1) Creating an understanding that there is a need to change;
(2) Revising processes and practices that have not been revised for many years;
(3) Engaging staff in a way that will enable them to question and challenge their work practices.

Implementing *Lean,* however, in a University is no easy task, and Jørgensen et al. (2007) note that several studies have shown that the implementation of *Lean* may be anything but a helpful experience for staff. For this reason, the aim of this research is not to implement *Lean* at Wits but to experiment practically with five *Lean* orientated tools and practices. In doing so, the three most suited practices will be identified and recommended in a framework that in the future will be able to support Wits staff in analysing and improving their administrative processes. This may not be the purest way of implementing *Lean* but Netland and Powell (2017) note that whatever approach is taken there are huge opportunities to improve the way universities work and *Lean* is an important part of this. How *Lean* is applied should not be seen as a failure but as an essential developmental step and an opportunity to apply *Lean* from experience of key staff (Netland and Powell, 2017).

Bicheno and Holweg (2016) state that there are two approaches to *Lean*, firstly the purist approach and then the alternative where some have comprehended that 'real *lean'* is motivated more by behavior and that it offers a growth opportunity. They note that every '*Lean* Guru' has her/his own style regarding *Lean* transformation noting that there is no right or wrong way. Ballé et al. (2006) state that going *Lean* should be less about 'leaning out' every business process but about improving performance, seeing and solving problems, and growing the intellectual capacity and skill of the organisation members. *Lean* transformation should be framed to change the thought processes of employees to be Kaizen conscious. *Lean* is about growing the behavior

and experience of the people who practice the system and, although difficult, it empowers individuals to bring out their motivation and capabilities (Ballé et al. 2006).

When looking at the University and improving the services it renders, it is not always clear what method to follow. Leite and Vieira (2015) notes that *Lean* services do not have a specific model of tools, practices, or standards but rather a mix of tools and practices that can be applied to the situation that needs to be improved. Atkinson (2004) states that *Lean* is a concept, a set of tools and techniques and methodologies that leads to effective resource allocation while Radnor and Walley (2008) state that going *Lean* involves using a variety of tools and techniques. Netland and Powell (2017) see institutions taking elements of the *Lean* toolkit e.g. visual management and applying them to support improvement also noting that Lean Six Sigma, sticky note mapping processes, and whiteboards work best to change initiatives.

In conclusion, it is stressed again that this research is not to implement *Lean* at Wits. The research is done to find ways in which *Lean* orientated tools and practices can be used at Wits to support the analysis and improvement of administrative processes, especially as little to no thought is given to analyse and improve processes currently. Balzer et al. (2016) note that the goal is to improve processes, empower employees, who know the process to re-invent and transform them using *Lean* practices and principles.

1.3. Terminology

Throughout the report, reference will be made to certain terminology. For ease of reference, Table 1 explains what each term means:

Table 1: Terminology Table

Faculty	A Faculty comprises the offices of the Dean, Faculty Registrar, and Schools, including Faculty Human Resources and Finance offices. Students register for their degree in a specific Faculty and the Faculty is responsible for the complete life cycle of a registered student.
Full-time studies	A student who attends classes on a full-time basis during the day (Witwatersrand, 2019)
Non-degree purposes	Course/s taken by a student when they are not registered for a degree but as an occasional student.
Part-time studies	A student who attends classes after hours (after 5 pm).
Programme	General Rule 1.24 states that a programme is a course or set of courses that may lead to a qualification. (Witwatersrand, 2019)
Occasional studies	General Rule 1.21 states that Occasional studies are studies which are undertaken by a student for non-degree purposes, not leading to a degree (Witwatersrand, 2019)
Short course	General Rule 1.30 states that a short course is a certified teaching and learning activity. (Witwatersrand, 2019)
Readmission	General Rule 5.7.2 stipulates that the Senate may cancel the registration of students whose performance is not satisfactory, and this student will need to apply for readmission into the University. (Witwatersrand, 2019)
Wits-Plus	Centre for Part-time studies.

1.4. Overview of Wits Plus Centre for Part-Time Studies

Wits Plus was established to cater for the more mature student, the working person wanting to complete either a Bachelor of Arts or a Bachelor of Commerce degree. Over the past three years, Wits Plus has grown exponentially to 6613 course registrations in 2019. Wits Plus offers a wide range of degrees and its offerings have grown to include bachelor's degrees in Computer Science, Engineering, Graduate Entry Medical Programme (GEMP) part-time courses, Postgraduate Certificate in Education (PGCE), various short courses as well as occasional studies.

The inclusion of more degree offerings at a part-time level has increased the interactions between Wits Plus and all the Faculties. In most instances, Wits Plus offers identical courses that are on offer full-time but a part-time basis. In some cases, however, Wits Plus may offer additional courses, e.g. Human Resources Management to part-time students that are not available to full-time students to cater to the needs of the working student. Figure 2 below gives a graphical illustration of the types of offerings at Wits Plus also highlighting the Faculty interactions. Each course or programme is owned by a Faculty, while Wits Plus offers a service to the Faculty in delivering the course or programme. Students are currently able to register at Wits Plus for a degree, as an occasional student or for a short course. The right-hand side of the figure shows the interaction Wits Plus has with the five Faculties and for whom they offer degree programmes, short courses, and occasional studies.

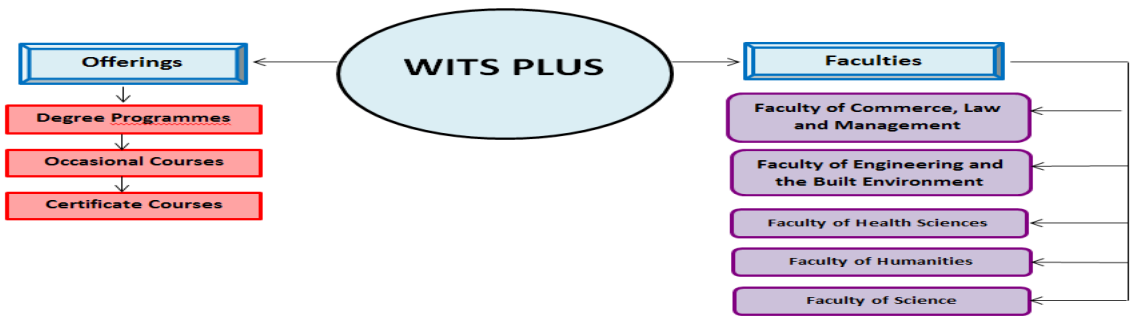


Figure 2: Wits Plus Offerings and Faculty Interactions

For a clearer understanding, it should be noted that each of the five Faculties reports to a Dean and these Deans in turn report to the Deputy Vice-Chancellor (DVC) Academic, of the University. The administration of each student's record is dealt with by the Faculty Offices, which are in turn managed by a Faculty Registrar, reporting directly to the Dean. Wits Plus, on the other hand, is not a Faculty nor does it report to a Dean but a Director who reports to the DVC (Academic). Figure 3 is an illustration of the current reporting structure. Wits Plus also does not have a Faculty Registrar in place but a Senior Officer who carries out similar functions to those of the Faculty Registrar. Wits Plus finds itself on the outer periphery of the Faculty structures and therefore many times is forgotten when Faculties implement new processes or change their rules which directly affect the students studying through Wits Plus. Wits Plus do not compile their own rules or practices but follow the rules as determined by the Faculties. The problem here arises in that the needs of part-time students often vary from the needs of full-time students, therefore, making one rule or process that fits all not always feasible or practical.

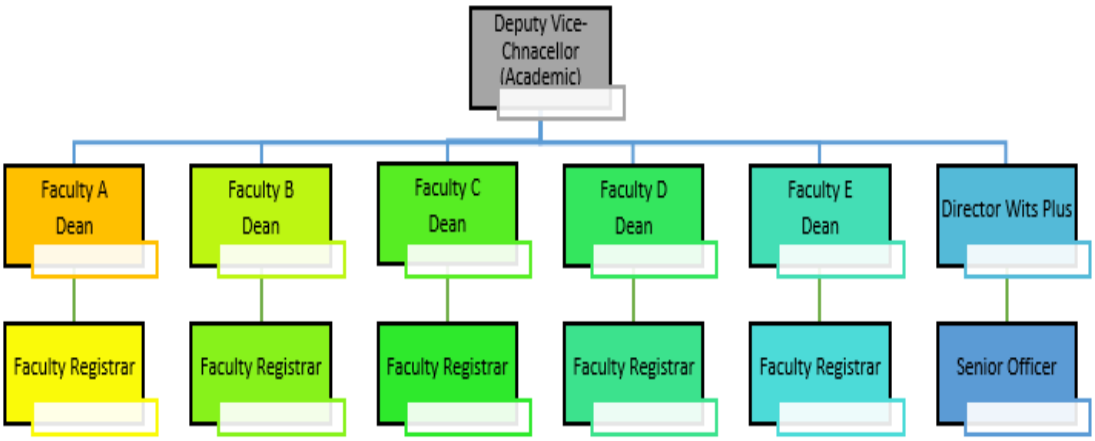


Figure 3: Reporting Organogram

To complicate matters further, despite the growth in student numbers and offerings, most processes and rules that regulate students' registrations, readmission, and graduation between Wits Plus and the Faculties have remained unwritten. In the past year, the need to standardise these processes to improve the levels of service has increased, especially where there are variances in processes between full-time and part-time students. Rules specific to Wits Plus need to be formalised, with staff agreeing on the roles, responsibilities, and accountability between the offices.

This raises the question as to why previously no thought has been given to develop an improvement process or framework. There are various reasons for this, including:

- Staff having limited time to analyse and agree on standardised processes;
- High staff turnover that occurs annually within service departments and Faculties;
- Lack of a clear understanding by staff of administrative processes and why they are required;
- Lack of a clear understanding that there is a need to analyse and improve processes.

Many administrative processes happen throughout the year within the Faculties and service departments. For this research, however, the Wits Readmissions Committee (WRC) process, a complex process involving both Wits Plus and the Faculties, will be used. Confusion and frustration exist between the Faculties and Wits Plus as to when what processes need to take place when a student is readmitted. There is a clear need to analyse and streamline the WRC processes for there to be a better understanding and to improve the process as a whole for all the stakeholders.

1.5. The Wits Readmission Committee Process (WRC)

As discussed, the Wits Readmission Committee process (WRC) will be used in this research and to assist the reader the WRC process is explained in the following section.

The Wits Readmission Committee follows two stages known as WRC 1 and WRC 2 that take place at the beginning of each year. The process normally starts during September when the University advertises the dates for the publication of the various Faculties' results and the dates for applications to the respective WRC meetings to all students.

The Faculty Board of Examiners meetings takes place at the end of each year, in each of the five Faculties, discussing and ratifying the results of each student within the Faculty before publication. The Board of Examiners meetings also considers the results of the students registered at Wits Plus. Students failing to meet minimum requirements (passing enough credits to progress into the next year of study) are excluded and they are not allowed to re-register in the following year for their degree programme. This includes students registered on a part-time basis. Students receive an outcome code called Minimum Requirements Not Met (MRNM). To be considered for registration in the new academic year, the students coded MRNM must appeal to WRC1. There is no involvement from Wits Plus in the WRC process, except to code students MRNM for the Board of Examiners meeting.

Students appealing their exclusion make use of an online application system when applying to WRC1. Manual applications are also considered. Based on the student's application and evidence submitted, the WRC committee decides on the readmission of the student into the academic year. If WRC1 decides that the student's reasons are not valid for readmission, the student is refused permission to reregister but they can appeal to the WRC2. Normally this committee only considers new evidence raised by the student for readmission.

WRC2 has the final decision on whether the student will be allowed, with certain conditions, to reregister or if they will be excluded for at least 1 year from the University.

WRC1 will readmit students as follows:

1. Readmitted without any conditions and they can reregister in the new academic year,
2. Readmitted with conditions. Students who are readmitted with conditions must see an 'At Risk Coordinator' or 'Teaching and Learning Advisor' within the respective Faculties to discuss and agree on certain conditions. These advisors guide students through the process of their course registration and programmes they need to attend during the year in order not to place themselves at risk again at the end of the subsequent academic year.

There are different WRC outcome codes used by Faculties to code student records and these codes are noted in Table 2. Through the coding, Faculties can track the number of students who have applied to the Wits Readmission committees, those readmitted through the structures, and those excluded from the University. These numbers are reported yearly to the Senate of the University.

Table 2: WRC Codes (adapted from the Wits Student Information System (SIMS))

OUTCOME CODE	MEANING
M1A	Renewal of registration permitted by Wits Readmissions Committee-1
M1C	Renewal of registration permitted by Wits Readmissions Committee-1 with conditions
M1E	Wits Readmissions Committee-recommends to WRC2 that renewal of registration is not permitted
M2A	Renewal of registration permitted by Wits Readmissions Committee-2
M2C	Renewal of registration permitted by Wits Readmissions Committee-2 with conditions
M2E	Permission to renew registration refused by Wits Readmissions Committee-2
MAA	Failed minimum requirements – readmitted by Exams Committee on conditions
MAP	Exclusion waived with conditions – may proceed
MAR	Exclusion waived with conditions – return to same year of study
MBA	Minimum requirements not met. Renewal of registration permitted by the Exams Committee
MBJ	Representation made to the Wits Readmissions Committee
MBP	Exclusion waived – may proceed to next year of study
MBR	Exclusion waived – must return to next year of study
MBZ	Failed minimum requirements- Needs permission to re-register in same Faculty
MEXL	Did not meet mid-year requirements
MRNM	Minimum requirements not met

Many times, students who are readmitted on conditions must pass their courses mid-year, and should they fail at mid-year their registrations are immediately canceled without any further option for appeal. In most cases, these students are excluded for a period of between six to eighteen months from the University. Students' records are coded accordingly on the student system through all these stages.

To involve Wits Plus more in the WRC process, to streamline and improve Wits Plus service levels to their students and the Faculties, this process motivated the undertaking of this research.

1.6. Research Motivation

Netland and Powell (2017) states that Higher Education faces funding challenges and with operations overloaded with unnecessary and unproductive activities there is a need for universities to become more efficient and effective.

This research aims to find ways in which *Lean* orientated tools and practices can be used at Wits to support the analysis and improvement of administrative processes. In many instances, Wits administration processes fall short as no framework or guideline can direct staff with what steps to follow once new administrative processes are introduced or existing ones are changed. When a new process or a change to a process is introduced, staff do not analyse these changes and see how they impact on a current process. They are therefore not able to incorporate them sensibly into a current process without creating unnecessary waste. Instead, duplicated processes are created leaving staff frustrated and not always knowing what is required of them.

Corbett (2007) points out that an organisation's goal should be to improve performance by encouraging employees to eliminate unneeded activities and operational waste.

1.7. Purpose of the Research

Balzer (2010) states that there is currently no framework that can guide universities on how to change or improve their processes, with Corbett (2007) noting that when a *Lean* approach is adopted, the biggest challenge in a non-industrial environment is to know which tools or principles to use.

The purpose of this research is therefore for Wits Plus and Faculty staff to experiment with five *Lean* orientated tools and practices. Through this experiment, they will identify which of the tools or practices can support them when analysing and improving their administrative processes when changes are introduced, without creating unnecessary waste. Ballé et al. (2006) note that by using *Lean* principles the thinker is positioned in the right direction. The *Lean* orientated tools and practices that are found to be most supportive in analysing and improving processes will then be included in a Wits Process Flow Framework, a basic structure that can be used for analysing and improving administrative processes. The framework can also be used in staff training and succession planning. It will guide staff to think differently about the work they do, and their behavior towards their tasks, and to be more problem solving orientated, moving away from the way Wits currently manages process changes. Jørgensen et al. (2007) state that a framework can assist a company to access its currents status of *Lean* development and identify which areas need improvement. McManus et al. (2007) also note that with a framework there are opportunities to improve methods and tools. For purposes of this research, the WRC process will be used when experimenting with the *Lean* orientated tools and practices to see which can be recommended for the framework.

1.8. Research Question and Problem Statement

The main research question for this report is:

Which Lean orientated tools and practices are best suited to support the analysis and improvement of administrative processes at Wits?

1.9. Research Objectives

The main objectives of this research to answer the research question above are:

1. To experiment with five *Lean* orientated tools and practices to analyse the Wits Readmissions (WRC) process between Wits Plus and Faculty A to identify improvement opportunities;
2. To evaluate the *Lean* orientated tools and practices to see which ones support the analysis and improvement of processes;
3. To use the findings to develop and propose a Wits Process Flow Framework that can be used to analyse and improve administrative processes at Wits. This *Lean* orientated framework will be recommended for future use to all Wits Faculties and service departments.

1.10. Research Limitations

The most significant research limitation of this study is the personal bias of the author that will be discussed in further detail in Chapter 3 of this report. The author has extensive experience in the administrative processes within Wits and has knowledge of which processes currently work, and where there are gaps or a lack of processes. Assumptions are made by the author regarding the variety of *Lean* orientated tools and practices that are available and that could work in a higher education environment and are based on the author's personal experience and interactions with Wits Plus and Faculty staff. The author is also aware of the need that has existed for a very long time within these departments to have their processes analysed to improve their working environments. The author strongly feels Wits can benefit from a framework that can guide them to analyse and improve processes.

A further limitation of the study was potential bias in that the author identified the participants to participate in this research due to their extensive years of administrative experience and the frustrations they have experienced with the lack of proper processes being in place at Wits. Anthony (2014) states that if the research initiative is not led by people who have a passion and a good understanding of its full potential then it will fail. Strategic group membership can assist with explaining a company's performance, practices needed to achieve performance, and understanding its decisions making (Ballé et al, 2006).

1.11. Report Layout

The remainder of the report is structured as follows:

Chapter 2: Literature Review

The Literature Review aims to give an overview of *Lean* evolution and the principles and practices of *Lean*. The chapter will introduce and describe the various *Lean* orientated tools and practices that will be used as well as the theory and framework relevant to the study.

Chapter 3: Research Methodology

This chapter aims to describe the methodology and methods used in the research study by looking at the various research design methods focusing on the pre-interviews, the workshop, and post interviews. The chapter will further discuss and justify the research approach, bias, and give a summary of the *Lean* orientated tools and practices used in the study and the data collection.

Chapter 4: Analysis and Findings

This chapter will present an analysis of the data from the pre-interviews, the workshop, and post interviews and show a presentation of the results of the exercises using the various *Lean* orientated tools and practices.

Chapter 5: Discussion of the Findings

This chapter will discuss the findings of the various *Lean* orientated tools and practices the use of these *Lean* orientated tools and practices and the implications thereof. The Wits Process Flow Framework is also presented and discussed in this chapter.

Chapter 6: Conclusion

The final chapter concludes the research by showing how the objectives of the research were met. The Chapter concludes with the shortcomings of the results, further and future recommendations for any further future work.

Chapter 2: Literature Review

2.1 Introduction

The literature review will critically focus on the current literature available about the implementation of *Lean* orientated tools and practices outside the manufacturing industry into various service sectors. It will focus on the implementation of *Lean* orientated tools and practices in the higher education environment noting the advantages and the disadvantages thereof.

2.2 *Lean* Principles

Lean thinking started in the 1940s in Japan when the Toyota automotive manufacturing industry made use of a set of *Lean* practices, whereby they created value through a continuous flow of efficiency (Melton 2005). Currently *Lean* has spread worldwide and industry-wide despite its origins being in the Japanese car and automotive industry, and companies are adopting *Lean* principles outside the manufacturing industry.

Lean is a philosophy that focusses on increasing efficiencies within processes by removing waste and creating extra time by removing unwanted steps within a process. Melton (2005) notes that *Lean* is a revolution and it is changing the way people go about their work, creating continuous flow with new ideas and the development of processes. Bicheno and Holweg (2016) note that *Lean* would not be able to survive if there was no continuous improvement, with a continuous need to reduce waste, enhance value and involve the people that work within an organistation.

Lean aims to minimise waste along a value stream and to create value for stakeholders. Bicheno and Holweg (2016) describe the five fundamental *Lean* principles noted by Womack and Jones illustrated in the diagram below:

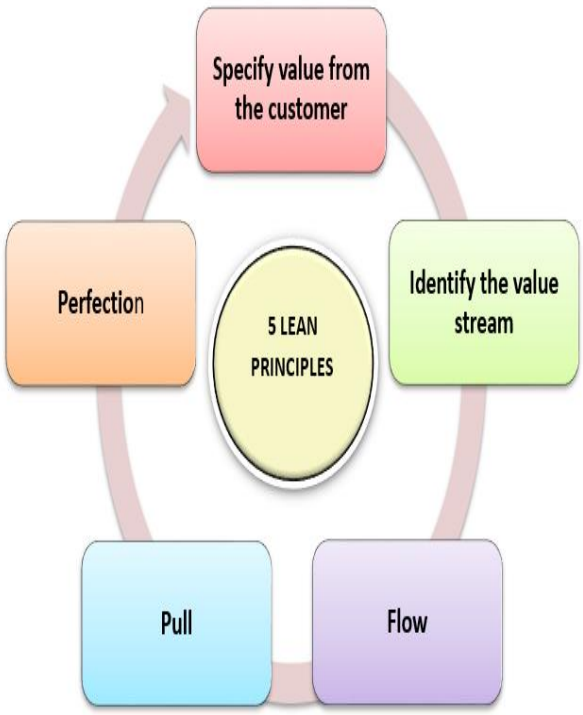
1. **Specify the value from the customer's point of view -** what does your customer want and what is necessary? Give the customer what they want, when they need it. Identify value then the waste is clear and can be eliminated. 2. **Identify the Value Stream -** center on people or activities who add value or can contribute to the **value stream**. 3. **Flow**; create a flow of value for your customer. 4. **Pull,** short term response to the needs of your customers and their demands. Do not overproduce. 5. **Perfection**, the more your processes improve the more you identify waste and strive for perfection in eliminating it. Deliver what the customer wants when they want it.	

Figure 4: Five *Lean* Principles (adapted from Bicheno and Holweg 2016*)*

There are various *Lean* orientated tools and practices, with all of them having defined stages; results can be fast, eliminating waste while making changes to improve processes. *Lean* continuously strives to resolve problems and engage stakeholders. When introducing *Lean*, quality is improved and it results in the delivery of value. The only decision to be made is that institutions and stakeholders are valued enough to introduce *Lean* and to use the tools to change operations.

2.3 Evolution of *Lean*

It has often been thought that *Lean principles* can only apply to the manufacturing industry and therefore it was difficult to understand how to introduce *Lean principles* into other industries. Corbett (2007) notes that *Lean* was developed as a set of tools or practices to be used by workers for them to eliminate inefficiencies and waste from production systems. This was done to improve quality and reliability in manufacturing but lately, several companies have shown that any company can apply *Lean principles* as it improves productivity without increasing costs. The change of environment from manufacturing into others has not changed the goal of *Lean* and the principals remain the same to improve efficiencies, performance, and eliminate waste from processes. The challenge, however, comes when adapting manufacturing practices to a non-manufacturing/industrial environment. Bicheno and Holweg (2016) note that once you take *Lean* out of its original context you will find some tools no longer apply as originally developed, and the change may require *Lean* to be adapted into the new context.

2.4 *Lean* in the Service and Higher Education Sectors

Bhatia and Drew (2006) state that Governments around the world want to deliver better education and better health care, getting better value for money by looking at *Lean* techniques and *Lean* principles that can be used at the working level.

Leite and Vieira (2015) note that *Lean* services do not have a precise model of tools or practices or standards but rather apply a mix of tools and practices to the situation that needs to be improved. Radnor et al (2006) state that the public sector engages less with the full set of *Lean* tools and more with the principles of *Lean*. Most organisations use limited tools e.g. Value Stream Mapping, suggesting that many tools used in manufacturing are not directly applicable in a service environment. In some instances, tools must be adapted for a greater need for flexibility to address the needs of the customer. Asnan et al. (2015) outlines that the five principles of *Lean* as discussed by Womack and Jones could be applied in the service sector. Eliminating waste is also an important aspect which the service sector should focus on. When applying *Lean* practices in the service sector there is a focus on the employee, enforcing their importance without losing sight of what the customer needs, solving their problems, and by giving them what they want, when they want it.

Balzer et al. (2016) note that *Lean* principles and practices have been incorporated in both the private and public sectors with LHE enabling post-secondary institutions to look for similar solutions to respond to the demands of higher education. The higher education environment is changing rapidly, especially with the introduction of new and more sophisticated technologies.

This means that institutional service levels cannot remain the same, quality is critical, and there needs to be an understanding of what quality issues affect students, academics, employees as well as other clients and how to support them. There needs to be an awareness of what needs to change, what needs to be created, and how processes and practices can be reused. It is, to say the least, a radical change. Ambekar (2016) states that the education sector can benefit from *Lean*, understanding waste, and improving quality service delivery. He notes that the value of *Lean* needs to be identified and the outcome of *Lean* in higher education is to reduce waste, have efficient processes, and engage the workforce. Comm and Mathaisel (2005) did a quantitative study on *Lean* in 18 public and private universities in the USA and found that a university or a college could be a good candidate for the application of *Lean* practices and principles. They note that the best practices of *Lean* established by Nightingale (1999), are being applied by some higher education institutions which are to optimise flow and to focus on the customer while improving continuously and promoting *Lean* thinking at all levels. They further state that if *Lean* is to be implemented successfully seven best practice components must be present, as these will assist with waste elimination and making processes more efficient and provide better value for the customer. These are:

(1) Environment for change - change initiatives must be proactive,
(2) Leadership - the leadership should drive the change,
(3) Culture – the culture must be open and honest, and staff must feel that they can participate,
(4) Employee empowerment – employees must have the permission to make the required changes and recognition must be given to them for taking initiative,
(5) Training – there needs to be proper training for everyone to understand the steps that need to be followed,

(6) Communication – managers need to share information and encourage all staff to do the same,
(7) Measurement - to determine progress.

Antony (2014) noted that Cardiff University in Wales started to introduce *Lean principles* to improve their processes while the King Abdullah University of Science and Technology took on board the structured approach of the *Lean* Six Sigma (LSS) to improve their service levels to students (Svensson et al. 2013). King Abdullah University launched an LSS programme in 2011 to improve the quality of their business processes as well as to provide their staff with a platform where they could initiate improvement processes. They used LSS to provide tools to the staff to change administrative processes. Currently, 25% of the staff component has been trained and improvement projects are being executed across the university. Hines and Lethbridge (2008) note that universities can reduce waste to improve service levels and they recommend that the focus should not be on one process when implementing *Lean* principles as other parts of the organisation will be affected. *Lean* transformation needs to take place at the highest level.

Kang and Manyonge (2014), note that *Lean* programmes can have a significant impact on higher education. However, for institutions to do this change is required, revising processes and practices. Introducing *Lean* orientated practices will enable staff to rethink work processes and commit to continuous improvement with constant monitoring (Oliveira-Brochado and Marques, 2007).

Emiliani et al. (2005) writes that most institutions in the USA struggle with service levels and financial viability. He points out that university administrators and staff should not think that *Lean* could not apply in a higher education environment and notes that Kaizen can successfully improve service levels. Kaizen refers to continuous improvement, a typical *Lean* methodology that is a team-based process of improvement. Emiliani et al. (2005) mentions teaching students that *Lean* principles e.g. value stream mapping, understanding waste, and Kaizen, will be highly valued by managers who employ them, as their knowledge would lead to better outcomes for stakeholders.

The question arises as to why *Lean* tools should be used to achieve better service. Why is *Lean* not used more in an educational environment? George (2003) states that if higher education institutions implement *Lean* they would have similar improvement experiences as those experienced by service industries. *Lean* starts with adding value to processes, better enabling a working environment that has a direct impact on service delivery. Bicheno and Holweg (2016) state that *Lean* sees mistakes as learning opportunities. When introducing *Lean* into any environment, it increases the value and reduces waste and there will be advantages and disadvantages in doing so.

Introducing *Lean* is however a huge undertaking. Balzer et al. (2016) note that the success of implementing *Lean* will depend on the preparedness of the University. Anthony et al. (2012) state that to tackle support functions with a prescribed method of *Lean* often delays growth and makes very little impact on the overall programme. To avoid this from happening when *Lean* is introduced into any process it involves a serious mind shift focusing on not only one process alone but also all processes within an organisation. Zhou (2016) notes that the application of *Lean* tools and techniques can methodically assist with defining, evaluating, and attack inadequacies.

As noted by Balzer et al. (2016), implementing *Lean* is a big undertaking and therefore this research is not aimed at introducing *Lean* at Wits but to experiment practically with five *Lean* orientated tools and practices. The reason for not implementing Lean is because there is no mandate from University management to do so. If this is to be done in future, the buy-in of both the University management and staff will be required. However, this research was done to start a process whereby staff can find a way to analyse and improve their administrative processes, and although it may not be the purest way of doing *Lean* it is a start to respond to a need and to put a system in place.

2.5 *Lean* Orientated Tools and Practices

There are various *Lean* orientated tools and practices to improving processes and Zhou (2016) notes that Value Stream Mapping, Single-Minute Exchange of Die (SMED), 5S, and Kaizen can deal with a variety of issues and circumstances. Atkinson (2004) states that *Lean* is a concept, a process, a set of tools, techniques, and methodologies that is successful in bringing about effective resource allocation. The only major problem Corbett (2007) identifies is when implementing a *Lean* approach in a non-industrial environment you need to know which tools to use and how to apply them effectively. Different cultures and infrastructure mean that one cannot just apply any *Lean* tool or technique used in manufacturing the method must be custom-made to address the realities in that specific environment.

Ballé et al. (2006) note that it will not work if you apply *Lean* tools and principles to every process you have, but when *Lean* tools and principles are used to change employees' thought processes, the possibilities are limitless. It is therefore envisaged that this framework will support staff to think differently about the work they do, their behavior, and to be more problem solving orientated. A detailed breakdown of each of the *Lean* orientated tools and practices that will be experimented with in this research follows below.

2.5.1 Value Stream Mapping (VSM)

Rother and Shook (2003) call the Toyota method Value Stream Mapping 'Material and Information Flow Mapping' stating that it is a way to learn and see, a paper and pencil tool that assists the understanding of the material and information flows as a product moves through a value stream. With this tool a visual drawing is made representing every process, asking vital questions when drawing the future state. They state that it is the best way to teach people to see value as well as the origin of the waste.

Ballé et al (2006) note that Value Stream Mapping is a useful tool to use when on the path to "going *Lean".* It assists with imaging the information flow, finding true value adding activities, and determining the potential for improvement. Dal Forno et al. (2014) also used Value Stream Mapping as a technique when diagnosing the implementation and maintenance of a *Lean* approach concluding that Value Stream Mapping identifies improvement opportunities, as it eliminates waste with the support of operational staff. They note that Value Stream Mapping is a useful tool to understand current processes and to identify opportunities to make enhancements. VSM is useful to guide improvements and is used to remove waste from a process. To do this, there needs to be an understanding to improve process flows as well as any interactions with stakeholders and VSM can continuously identify opportunities to improve processes and reduce waste.

Wilson (2009) notes that Value Stream Mapping (VSM) applies to various business processes and is not bound to manufacturing processes only. VSM can be used for all processes within an office environment. Bonaccorsi et al. (2011) note that by using Value Stream Maps a process can be looked at holistically to find ways of improvement of a process, identifying and tackling serious issues. It is a useful tool to identify all processes, value-and non-value adding.

Value Stream Mapping maps are information flows, taking into account policies and regulations when mapping a process. Comm and Mathaisel (2003) also made use of Value Stream Mapping to analyse parts that can be improved through *Lean* methodology. They note that using a Value Stream Map can reduce cost and time as it identifies waste. A visual map is made of the current situation, while another map is made of the ideal situation. The tool is useful in mapping the goal that needs to be achieved as well as the relationship between the departments allowing the opportunity to put an implementation plan into place. Melton (2005) states that when you want to add value you need to understand the value, what your customer values, map, and define these activities identifying non-value adding steps and wastes removing them from the processes. Through process mapping, the touchpoints between departments also become visible.

Rother and Shook (2003) note that in Value Stream Maps are a qualitative tool describing in detail how a facility should function to create flow. In a value stream, all value and non-value add works towards a big picture of improving the whole process. They note that to develop a future state, the current state needs to be analysed, more than one process is visualised and more than just waste is seen. Bonaccorsi et al. (2011) question whether VSM can be applied unaltered within the service industry and suggests that a Service Value Stream Management Map (SVSM) modified from the VSM must rather be used to address service needs. Although altered, they do note that there is merit in using value stream maps as it commits to *Lean* and *Lean* education. There is a choice of which value stream needs to be improved, giving the opportunity of mapping the current and future states while identifying waste and the impact it has on improvement targets.

2.5.2 DMAIC (Define, Measure, Analyse, Improve and Control)

DMAIC a problem solving method aiming to improve processes by following a five-step methodology used in the Six Sigma process (Ganguly, 2012) meaning:

- Define - select your problem and set a goal.
- Measure - assess the current situation and investigate what is the problem.
- Analyse - identify and explain why things are the way they are.
- Improve – draw up an implementation plan to see how the best outcome can be achieved.
- Control - adjust what is wrong to be able to control it in the new situation.

DMAIC is data-driven and deals with defects, quality, and waste (Sehgal and Kaushish, 2015). Its five-phase improvement process connects statistical and other tools found to be effective in improving practices (Snee, 2010). DMAIC improves efficiencies, enhances the quality, and reduces costs. It has evolved beyond the manufacturing industry into the service sector and has systematically provided a framework that is result orientated. Bendall and Marra (2005) found that DMAIC can be used effectively to reduce quality problems and eliminate complaints from customers as it systematically reduces variation in processes. DMAIC should preferably be used when concentrating on a specific area of interest and a top-down method should be used as it is more beneficial when aligning the business strategy and linking it with the customers' needs (Lynch et al., 2003). Schroeder et al. (2009) further comment that DMAIC is a 'meta routine' used when changing an existing routine or design or when moving into a completely new routine.

Sokovic et al. (2010) find that DMAIC gives the best results when the process is flexible, further noting that it is a systematic process, based on facts and providing a rigorous framework that is results orientated. Snee (2010) stresses that DMAIC is easy to understand and has been used successfully around the world, stating that it is elegant in its simplicity.

2.5.3 PDCA (Plan, Do, Check, Act)

Johnson (2002) notes that PDCA is a well-known model for continuous improvement as it teaches organisations how to:

- Plan – recognize the opportunity and plan the change,
- Do- test the change,
- Check- review and analyse the findings to identify learnings, and
- Act- take action based on what was learned under the check step.

The PDCA is the most widely used improvement cycle and it is considered to be the foundation of the Toyota Production System as it is part of their daily actions (Bicheno and Holweg, 2016). Sokovic et al states that PDCA is a well-known cycle for continuous improvement asking what is being accomplished, how to change improvement, and what improvement changes can be made. The PDCA method helps to control a process whilst looking for continuous ways of improving a process. Moen and Norman (2006) note that the PDCA provides a framework for improvement methods that can be applied to any type of organisation as it allows for a simple way to empower staff and to facilitate teamwork. The PDCA is continuously looking for better solutions to improve processes and assist in achieving the goal that has been set.

2.5.4 'Six Honest Serving Men' – Framework

'Kipling analysis (Gould 2018)', or the 'Six Honest Serving Men' asks six powerful questions that can be applied as a problem analysis tool to gather information. When the questions are used together, it is understood how and why a process started, whom it affects, and how to fix it if it is not working. Gould (2018) unpacks the six questions as follows:

- **WHY** is it necessary? – it is important to know why things are happening and the way they are happening;
- **WHAT** is the purpose? – what action needs to be taken;
- **WHERE** should it be done? – get information on where it should be done who would be responsible;
- **WHEN** should it be done? – gives a timeframe to a process;
- **WHO** is best qualified to do it? – helps understand who is responsible for the task and who the stakeholders are for no one is left out of the process;
- **HOW** is the best way to do it? – questions the detail on what needs to happen.

Hutzinger (2002) notes that when participating in a Kaizen workshop the six questions above form part of the phrases commonly heard and listed. The answers to:

- Why? and What? identify unnecessary detail which needs to be eliminated,
- Where? When? and Who? leads to combining and rearranging,
- How? leads to developing the best way and simplifying the process.

Bicheno and Holweg (2016) note that the 'granddaddy' of all *Lean* processes and stability improvement methods is Training within Industry noting a similarity between PDCA and the use of Kipling's Six Honest Serving Men and waste elimination in the job methods programme. They note that the industrial engineering skills of eliminating, combining, rearranging and simplifying used together with the 5 Whys and the Six Honest Serving men yields many improvement ideas when applied to every step of the job.

2.5.5 Fishbone Diagram

The Fishbone diagram is also known as the 'Ishikawa diagram' or the ' cause and effect diagram' proposed in 1943 by Kaoru Ishikawa (Ilie and Ciocoiu, 2010), a professor of engineering. He was a pioneer in quality management processes and the Fishbone diagram was initially proposed as a thinking tool to improve productivity. Later it was seen as one of the best tools to control quality and improvement. The diagram represents the major problems in a process that makes a process unsustainable. The Fishbone shows the relationship between seemingly disconnected elements with each rib representing a cause that in turn contributes to the outcome. Bilsel and Lin (2012) note that the Fishbone diagram is a great, intuitive tool that can determine the causes of problems. The diagram analyses multiple problems and therefore you need to draw up multiple diagrams. Using the Fishbone diagram creates an opportunity to understand risk and to establish how to address and mitigate this.

2.5.6 Comparison of the *Lean* Orientated Tools and Practices and the Reasons for Selecting these Tools and Practices

Lean orientated tools and practices are a way of accomplishing change and when describing these in this chapter there are various opportunities that are revealed. Table 3 illustrates each analysing step that is followed when using the particular *Lean* orientated tool or practice. Table 4 and Table 5 shows the comparison between the tools and practices and how they complement each other by noting the advantages and disadvantages of each. These tables further support the reason for selecting these tools in that they facilitate the following:

1. process orientation;
2. definition of process analysis and evaluation;
3. reduction of waste; and
4. measurement of performance.

Table 3: Different Elements of each *Lean* Orientated Tool and Practice

VSM	DMAIC	PDCA	Six Honest Serving Men	Fishbone
Provides a visual representation of all activities	Provides structure to a process	Provides an improvement methods framework	Provides a framework that clarifies roles	Provides a method whereby all possible problem causes are identified.
Define scope	Define the process	'Plan' considers the processes that need to be improved	What is the purpose of the process?	Analyse each step that contributes to a process
Analyses current state of the process	Measures how a process is being implemented and how well it is being executed	Considers improvement and how much of a process is required	Describe why the process is necessary?	Diagnose system process
Defines the desired future state – the ideal process	Analyses the process	Changes the required elements of a process	Shows when it should be done?	Determines the cause of the problem
Draw up an implementation plan	Identify improvement options and implement an improvement plan	Make required changes to processes and other related procedure documents	Who should be doing this who is the owner of the process and responsible for changing it?	Identify problem areas to eliminate and streamline the process
Draw up an improvement plan	Control the new process and ensure ownership		How is the best way to do it?	Eliminate problems and streamline the process

Table 4: Comparison Table – Advantages of the Five *Lean* Orientated Tools and Practices

VSM	DMAIC	PDCA	'Six Honest Serving Men'	Fishbone Diagram
Visual representation	**Provides structure**	Applicable to any type of organisation	Recognises the importance of questioning	**Identifies all possible problem causes.**
Identifies value-adding steps	**Reduces waste**	**Provides a framework**	**Clarifies roles**	Determines causes in a structured way.
Identifies non-value adding steps	Addresses a specific problem	Guides theory and knowledge	Focuses on gaps in skills training	**Uses knowledge of all participants.**
Identifies gaps in the process	Quality management approach	Allows for the adaption if there are changes	Considers ethical frameworks	Focuses on the causes of the problem; do not look at the complaints and irrelevant discussions.
Know your customer and what they value	**Focuses on the customer and the process**	**A simple way to empower staff**	**Builds self-awareness**	**Easy to understand graphical format.**
Continuous improvement and striving for perfection		Facilities teamwork	Analyses a process	Levels the knowledge by allowing everyone to share their expertise
				Identifies areas where there is a lack of data.

Table 5: Comparison Table - Disadvantages of the Five *Lean* Orientated Tools and Practices

VSM	DMAIC	PDCA	'Six Honest Serving Men'	Fishbone Diagram
Records what happens on the floor which can limit the level of detail	**Complex**	**Long term approach**	Lack of ownership	Analysing multiple problems you need to draw up multiple diagrams.
Complicated when there are too many value streams	Demanding methodologies	Constant improvement	**Open to one's interpretation**	Interrelations may be missed amongst different problems if there are various diagrams.
Cannot always see when you look at VSM how it translates into reality	**Needs time and resources for proper implementation**	Difficult to sustain	When is the best time to do it?	Not possible to differentiate the strength of the cause and effect relations.
Limited knowledge about the tool	Needs to look more at continuous improvement			**Diagrams can be difficult and inefficient when used in an electronic form.**
Time-consuming	Every person needs to be clear on their role when introducing this tool to improve processes in an organisation			Can become disorderly.
	Does not have a specific roadmap/s			

2.6 Conclusion of the Literature Review

The literature review started by giving the reader a brief overview of the history of *Lean, Lean* principles and practices, and the evolution thereof. The review further explored the potential gains when applying *Lean* orientated tools and practices in the higher education sector and the extent to which it has been introduced into this sector. The chapter continued by exploring the five *Lean* orientated tools and practices that will be used in this research, giving a brief background describing each tool. The various elements that are used by each process to analyse and improve a process are shown including the advantages and disadvantages of using each process. The information given in this chapter will support the development of the methods section in Chapter 3 and will form the basis from which *Lean* orientated tools and practices will be recommended for the Wits Process Flow Framework.

Chapter 3: Research Methodology

3.1 Introduction

This chapter will focus on and discuss in depth the methods that were used by the researcher to obtain the results of this research. From these methods, the most suitable *Lean* orientated tools and practices will be identified to inform the development of a suitable process flow framework.

3.2 Methodology

This part of the report will consider the various approaches taken when conducting research. This section will consider the research approach whilst looking at the sampling and data collection methods. In conclusion, section **3.6 Method** will look at the methods the researcher used to execute the study.

3.2.1 Research Design: Qualitative Research Method

Kothari (2004) states that two approaches can be followed when conducting research namely the Quantitative research approach, or a Qualitative research approach.

Abawi (2008) notes that qualitative research aims to develop an understanding of a human or social problem from many perspectives and is undertaken to find the answer to the question starting with 'Why?', 'How?' or 'In what way?' Abawi (2008) notes that analysing this qualitative data can become time-consuming and can be influenced by the bias of the researcher. It can, on the other hand, provide deep and rich data that can be very useful. Qualitative research is context and case dependent and therefore results need to be kept in context and the researcher has to report personal and professional information that can have an impact on the data collection and interpretation.

Patton (2015) notes that researchers who make use of the qualitative research method must provide ample quotations from their participants who partook in the research.

Rahman (2017) states that qualitative research is not statistical, and it combines numerous realities noting several advantages and disadvantages in using this method. Qualitative research produces detailed descriptions of the participant's opinions, feelings, and experiences that can interpret the meaning of their actions. It understands the human experience in specific situations and this type of research studies individual situations or actions, and it understands different people's viewpoints. The research sees the experience participants have and how their understanding is informed by culture the data collection is subjective and comprehensive and it has a flexible structure (Rahman, 2017).

On the other hand, Rahman (2017) notes that the method focuses on participants' experiences and meanings more than on the contextual sensitivities, giving it low credibility in certain settings. This method can generalise data received from a small sample size to a whole population and analysing the data can be difficult, taking a considerable amount of time.

For this research, the author used a qualitative research method to collect the data. This method was used as the author wanted participants who directly deal with the WRC process and who are experiencing the problems to express their views and experiences in the research. The research is not based on the collection of numerical data that needs to be analysed by using mathematical methods. The data was collected by using pre-interviews, followed by a workshop after which post-interviews took place.

3.2.2 Reliability and Validity

Validation is an essential part of the research and it involves the documentation of the research in such a way that another researcher can come to the same conclusions using a similar case study. Worley and Doolen (2006) note that using multiple sources to create a chain of evidence and asking sources to review the results may increase validity. Dörnyei (2007) notes that reliability and validity guarantee the results of the performance. Researchers should be able to choose the method that answers their question the best, not losing sight of the fact that the more accurate a researcher is during the conducting of the research the more accurate the findings would be (Alshenqeeti, 2014).

3.2.2.1 Bias

The author noted in Chapter 1 of this report that one of the limitations of this research is personal bias. Noble and Smith (2015) note that researchers using qualitative methods are criticised quite often for lack of rigor and transparency in their analytical procedures and findings and that the research is simply a collection of personal opinions subjected to the researcher's bias. They further note that it becomes quite difficult when using qualitative methods as there are no standards by which such research is judged. Cohen et al. (2007) note that bias needs to be minimized with Norris (1997) stating that using validity practices do not ensure accuracy, trustworthiness or objectiveness and that it is the nature of research that the knowledge can be revised.

Noble and Smith (2015) suggest that to ensure the trustworthiness a qualitative researcher should incorporate strategies to ensure the trustworthiness of their findings. In the case of this research, the author incorporated the following strategies to ensure the trustworthiness of the findings. The author accounted for personal bias and acknowledged that there was bias in the sampling method, there is a critical reflection of the methods used ensuring the depth and relevance of the data collection

and a meticulous record was kept of the pre-interviews, workshops, and post-interviews to ensure that the data interpretations were consistent and transparent.

The author compared and looked for differences across the interviews and the workshop to ensure that there were different perspectives and not only that of the author. The author furthermore included rich verbatim descriptions of participants' accounts to support the findings included in Chapter 4. The author demonstrates clarity regarding the thought process during data analysis and subsequent interpretations through making use of the Interview question tables to note the aim of each question.

Finally, to address bias, the author also made use of triangulation as discussed in the following section.

3.2.2.2 Triangulation

Patton (1999) notes that Triangulation refers to a researcher using multiple data sources or methods in conducting qualitative research to develop an all-inclusive understanding of a topic. Carter et al. (2104) note that there are four types of triangulation namely (1) Method triangulation, (2) Investigator triangulation, (3) Theory triangulation, and (4) Data source triangulation.

For purposes of this research, the author made use of the Method triangulation type. This was chosen as it involves the use of multiple data collection methods about the same topic. In the case of this research, pre-interviews took place, after which a workshop was held followed by post-interviews to ensure the credibility of the research findings. Post-interviews were held with Wits Plus and Faculty A which assisted with the confirmation that accurate and credible conclusions were drawn from the workshop findings.

3.3 Sampling

There are two ways to collect data, one called convenience and the other purposive sampling. Convenience sampling (haphazard sampling or accidental sampling) is where subjects are close to a researcher while with purposive sampling (deliberate sampling) the researcher has a project in mind.

For this research, the author makes use of the purposive sampling method. The data collected through using this method contributes to the understanding of a theoretical framework. The researcher normally has a project in mind when using this method, in this case, it is the analysing of the WRC process. Data collection relies on the sound judgment of the researcher and therefore it is called 'judgmental, selective or subjective sampling'. The researcher makes a deliberate choice when selecting the participants, departments, events, or organisations that are studied. Participants are chosen based on having specific characteristics or specific qualities, with no fundamental theories and with no specific number of participants. It will be people who are willing to provide information due to their knowledge and experience; they are chosen because they are knowledgeable, experienced, and are willing and available to participate (Laerd, 2012).

Purposive sampling uses various sampling methods (Etikan et al., 2016) and in the case of this research, the homogeneous sampling method was used. This method samples people with the same traits and in this research case staffs' occupations, exposure, and experience in a Wits administrative role. This sampling method was further chosen, as this group of staffs' would be best able to answer the research question. There are advantages and disadvantages to using Purposive Sampling and Laerd (2012) notes that some of the advantages are that it can reach the target sample quickly and that it justifies generalisations made from the sample that is being studied and provides a wide range of non-probability sampling techniques. In the case of this research, participants were chosen due to their Faculty and administrative background and specifically due to their experience with the WRC process.

Participants were also willing to participate and could contribute to the process, share their knowledge and input and experience with one another.

The disadvantage of using this technique is that it is based on the researchers' bias and when using purposive sampling it can be difficult to defend the representativeness of one's sample.

3.4 Data Collection Methods

For this research, the two data collection methods used were interviews (pre and post) and a workshop. It should be noted that the research was conducted with a small group of participants. This was since within the Faculties and Wits Plus only the managerial staff are directly involved in the WRC process. Pre-interviews were conducted with the managers of Wits Plus and Faculty A as they deal directly with the WRC process and they were specifically chosen as they were experiencing the most challenges when it came to the WRC process, in dealing the longest with excluded students moving between Wits Plus and Faculty A. The workshop included more staff and the managers from three other Faculties who were also directly involved in the WRC process.

The Teaching and Learning Advisors from Faculty A were also included as they assist with the counseling of excluded students. These people were included in the workshop to contribute to richer discussions on the WRC process and contribute to the choice of *Lean* orientated tools or practices that could be chosen to form part of the Wits Process Flow Framework. Between all the staff, they have more than 20 years of administrative knowledge and experience within the higher education sector. Other staff could not be included in this research as they do not deal with the WRC process and would not have been able to add value to the research. Table 5 notes the staff who participated in the research.

Table 6: University Staff Participation Table

Centre/ Faculty	*Employment level*	*Number of Participants*
Wits Plus	Wits Plus staff member	1
Faculty A	Faculty staff members	3
Faculty B	Faculty staff member	1
Faculty C	Faculty staff member	1
Faculty D	Faculty staff member	1

In the section below the researcher will discuss and expand in more detail the reasons for choosing these data collection methods.

3.4.1 Interviews

Interviews are a flexible method of conducting research. While doing the interviews staff knowledge, experiences, and different personalities are considered when validating the data. McDaniel et al. (1994) reviewed the validity factors from interviews and found that if an interview is structured in such a way to examine job-related competencies logically and in an organised way, there is a better prediction of future performance.

Alshenqeeti (2014) notes that when using interactive interviews, the interviewer can press for clarity and a topic can be probed. There is also a high return rate with fewer incomplete answers. Interviews can involve reality with a controlled answering order and they can be relatively flexible. On the other hand, Alshenqeeti (2014) notes that interviews can be time-consuming and that it works only for small-scale studies.

A further disadvantage is that it is never 100% anonymous and is open to potential subconscious bias with potential inconsistencies. Cohen et al. (2007) propose that when using interviews as a research method the attitude of the interviewer, tendency to seek answers to support own merits, and preconceived notions should be minimised to reduce bias.

Olivia (2018) notes that there are various types of interviews can be made use of, (1) Structured Interviews, (2) Unstructured Interviews, and (3) Semi-Structured Interviews. For purposes of this research, the author made use of the semi-structured interview method in conducting the pre and post interviews. The reason for deciding on semi-structured interviews was due to the author having specific questions to ask that allowed for targeting the experience of the staff while allowing for additional questions to be asked to ensure that certain ideas could be further expanded on. By using this method staff were able to express their thoughts and feelings on process mapping, what they wanted to achieve, and how they see the outcome of the research.

In conclusion, there can be advantages and disadvantages when conducting interviews, and when a researcher selects a type of interview it will depend on what they want to achieve from the interviews. To ensure that the interview data is valid and reliable, Alshenqeeti (2014) suggests that the researcher try to avoid asking leading questions, to take notes and not just tape record an interview and by giving the interviewee the chance, to sum up, and clarify points. In the case of this research, the author recorded the pre-interviews, workshop, and post-interviews including the taking of notes. The interviewees were given the opportunity in both the pre- and post-interviews to ask further questions for clarity and the same method was applied to the participants in the workshop.

3.4.2 Workshop

Osborn in 1948 first described the methods for using a creative group for problem-solving, which later became known as brainstorming with the term 'workshop' used only from the 1960s when Osborn's social ideas spread to other domains e.g. policy-making, organisational change and innovation (Ørngreen and Levinsen, 2017). There are three types of workshops (1). Exploratory Workshops, (2). Learning Workshops, and (3). Creating Workshop.

For this research, the author used exploratory workshops. The reason for using this type of workshop is to allow staff to explore the current state of the WRC process, how the process currently works between Wits Plus and Faculty A, identifying gaps and challenges, and how these can be addressed.

It is important to validate the data collected from the workshop and Sufi et al. (2018) note that evaluating workshop data ensures that quality statements are made and that the workshop benefits the stakeholders. They made the following suggestions to measure the impact of a workshop:

1. Set objectives and goals by defining the output and outcomes, make use of a pre-workshop questionnaire to set goals that need to be addressed. This assists with questions asked after the workshop and to measure the overall impact.
2. Balance time and effort considering costs.
3. Create metrics of important issues of what is studied to make things comparable and to create a standard that will support the decision-making at the workshop.
4. Understand bias and be aware of it to evaluate the data honestly.
5. Design a survey to evaluate the workshop as it helps to know if the workshop has made a difference. Gather feedback before, during, and after the workshop by using a post questionnaire to measure the impact.

6. Use a game after the workshop to see if people understood the concepts and knowledge areas.
7. Measure people who did not attend by encouraging attendees to share their experience with them.

Baysinger (1997) notes that there are advantages and disadvantages to using workshops noting that through a workshop, you can motivate your participants allowing for flexibility regarding its length and frequency. Workshops can be a series that build on one another. The disadvantage of using a workshop is that many of the participants may have too wide a range of skills and there may be difficulty in covering all the material in a single workshop. It may also be difficult to handle large groups (Baysinger, 1997).

By using the workshop method for this research it is envisaged that the participants would through their expertise be able to identify what actions need to be taken to best address the challenges they face and to move a new WRC process forward. By using, the various *Lean* orientated tools and practices it would be best to confirm which of the tools and practices would support the analysing and improvement of administrative processes going forward.

3.5 Ethics

The ethical considerations as set out by the University of the Witwatersrand, Johannesburg ethics for when research is conducted when it includes human subjects were adhered to when the data was gathered for this research. Ethical clearance was received from the School Ethics Committee at the University protocol number MIAEC 033/19 (Appendix A) before the research commenced.

The following ethics documentation was also completed for this study:

- Letter of consent from the Director of Wits Plus to conduct the research
- Letters of consent from the participants to participate in the study

The letter of consent was explained to all participants before them participating in the interviews and the workshop. They were made aware that participation was voluntary, and that the data was gathered for research purposes only.

3.6 Method

This section describes the method the researcher used in executing the study and is divided into three parts namely:

- **Part 1**: Pre-Interviews. Hour-long pre-interviews were scheduled and conducted on 10 and 11 April 2019 with two staff members, one from Wits Plus and one from Faculty A before the Workshop was held.

- **Part 2**: Workshop. A full-day workshop was held on 10 May 2019 with the staff member of Wits Plus and three staff members of Faculty A. The author also included participants from three of the other Faculties who are responsible for the WRC processes in the workshop. These faculty members were also included due to new degree offerings in conjunction with Wits Plus and they would be working with Wits Plus going forward when it comes to the WRC process.

- **Part 3**: Post-Interviews. Hour-long post-interviews were scheduled and conducted on 24 and 30 May 2019, approximately two weeks after the workshop. Interviews were held again with the same staff with whom the pre-interviews were conducted. The purpose of these interviews was to discuss and confirm the findings of the workshop and to establish if Wits Plus and Faculty A still agreed with the findings of the workshop.

3.6.1 Research Question

As noted in Chapter 1 the main research question for this report is:

Which Lean orientated tools and practices are best suited to support the analysis and improvement of administrative processes at Wits?

The Wits Readmissions process (WRC) as discussed in Chapter 1 that takes place with Wits Plus and the Faculties was chosen as the administrative process that would be used in this research. The five *Lean* orientated tools and practices Value Stream Mapping, DMAIC, PDCA, Six Honest Serving Men, Fishbone Diagram) identified in Chapter 2 were used.

3.6.2 Part 1: Pre-Interviews

The pre-interviews were scheduled and completed with one Wits Plus and one Faculty A staff member. Participants were asked specific questions to establish if they have drawn up process maps before or if they were aware of any process maps or improvement tools and the current state of processes within their offices with a focus on the WRC process. The author compiled an interview schedule with pre-interview questions that guided the interviews. The pre-interviews were recorded while the researcher made notes against each of the questions that were asked. The responses were transcribed from the audio recordings and supplemented with written notes during the analysis. Table 7 represents the interview questions and the aim of each question.

Table 7: Pre-Interview Questions Table

INTERVIEW QUESTION ASKED		AIM OF THE QUESTION
1.	**Which cohorts of students are currently registering with Wits Plus?**	• Establish which type of students are registered and what the needs of these students are.
2.	**Which rules/guidelines are currently in place to govern the life cycle of students?**	• Establish if processes are in place and which processes are in place. • Are these processes consistent across Wits Plus/Faculties?
3.	**Explain to me how the WRC process works.**	• Establish which rules are in place. • Are the same WRC rules in place across Wits Plus/Faculties?
4.	**What role does Wits Plus play in the WRC process?**	• Establish if there are different roles. • Do all staff participate in the process equally?
5.	**Would you say that the WRC processes are working between Wits Plus and the Faculty?**	• Are processes in place? • Is there an understanding of process mapping?
6.	**Would you like to see the WRC process change and what would you like to see change?**	• Establish if there is a need in Wits Plus/Faculties to have processes or rules changed?
7.	**Explain to me how you deal in your office with the situation when a new process is introduced.**	• Establish if there is process knowledge. • Does training happen?
8.	**What process flows if any do you have in your office?**	• Establish knowledge of process mapping. • Do process maps exist?
9.	**Have you ever used any *Lean* tools to map processes?**	• Is there any experience with mapping processes and using *Lean* tools to do so?
10.	**Would you say all staff are clear on what processes they need to follow when dealing with a student/inquiry in the office?**	• Establish knowledge of processes and rules. • Establish training needs.
11.	**Would you say it is worthwhile to map processes?**	• Establish the need and whether they would find the mapping useful.

3.6.3 Part 2: Workshop

The Workshop aimed to introduce participants to the various *Lean orientated* tools and practices and allow them to use these by drawing up process maps through which the WRC process was analysed and improvements proposed. The author of the report facilitated the Workshop. The Workshop was recorded, and the responses were transcribed from the audio recordings and supplemented with the output documents from the Workshop during analysis (Refer to Appendix: Workshop Brainstorming Notes and Appendix G: Workshop Notes).

(1) Session 1: The Workshop started with a presentation from the author. An overview of the history of Lean was given; noting the service sectors where *Lean* orientated tools and practices has been successfully introduced and implemented after which there was a discussion of these *Lean* orientated tools and practices that were identified that would be used during the workshop (refer to Appendices D and E for the Workshop Agenda and Workshop Presentation). The author decided to give the participants the *Lean* orientated tools and practices in the following order (1) Value Stream Mapping, (2) DMAIC, (3) PDCA, (4) Six Honest Serving Men, and (5) Fishbone diagram.

(2) Session 2: A brainstorming session followed the presentation session before participants started to experiment with using the *Lean* orientated tools and practices to create visual flow charts of the WRC process. During this session, all participants noted how the WRC process worked in their specific area noting the interactions between Wits Plus and Faculties.

The following points were considered during this exercise:

1. The current challenges stakeholders face,
2. Pinpointing their challenges,
3. Identifying gaps in the WRC processes taking place between Wits Plus and the Faculties,
4. Determining gaps in staff's knowledge regarding the WRC process,
5. Identifying waste in duplication of processes and to reduce waste from future processes,
6. Identifying gaps in the communication between Wits Plus and the Faculties,
7. Determining variance in processes between Faculties and Wits Plus.

These discussions were all captured by the author on flipchart paper and displayed around the room (refer to Appendix U). These informed the flow charts that were drawn up which are shown and discussed later in this chapter.

(3) Session 3: After the brainstorming session, participants started to experiment on process flow charts of the WRC process by using the various *Lean* orientated tools and practices given to them. The participants decided as a collective to work together as one group on these flow charts with each participant allowed to give their input in the process. Participants could voice any opinions they had on the *Lean* orientated tools and practices during this time; they could also refer to the paper exercise of the morning session.

(4) Session 4: Participants gave their verbal input and rating of the *Lean* orientated tools and practices at the end of the workshop. Participants noted which *Lean* orientated tools and practices they understood best, the advantages of each, and which ones would they believed would support them in creating further workflows of processes within their offices to analyse and improve their processes.

3.6.4 Part 3: Post-Interviews

In conducting the post-interviews, a semi-structured interview style was followed, and these took place two weeks after the workshop was conducted. The post-interviews were conducted on a one-on-one basis with the same staff as were interviewed at the beginning of the research being one staff member of Wits Plus and one staff member from Faculty A. These two staff members are responsible for the management of both these departments. The interview schedule contained a list of structured questions that guided the post-interview questions (Refer to Appendix C).

The purpose of the post-interviews was to establish the impact of the workshop and if experimenting with the *Lean* orientated tools and practices to draw up process flows used in the workshop had the desired outcome in that:

1. Through experimenting with these *Lean* orientated tools and practices the Wits Readmissions (WRC) process was analysed and improvement opportunities were identified;
2. *Lean* orientated tools and practices were identified that will be used and will support the analysing and improvement of processes;
3. A framework can be created from these *Lean* orientated tools and practices that can be used to create other process charts of other and new processes.

To validate the post-interview process and to ensure alignment between the questions Table 8 Post-Interview Questions illustrates the questions asked and the aim of the question.

Table 8: Post-Interview Questions Table

	INTERVIEW QUESTION ASKED	AIM OF THE QUESTION
1.	**Did you find the workshop useful?**	• Establish from participants if the need was met.
2.	**Did you find the creation of process flows of the processes useful?**	• Establish if there is an understanding of *Lean* orientated tools and practices offered.
3.	**Looking at all the process flows, which of the tools do you think can add the most value?**	• Establish if the participant understood the *Lean* orientated tools and practices. • Confirm with the participant which *Lean* orientated tools and practices would be used.
4.	**Will you use *Lean* orientated tools and practices in any other of your processes?**	• Establish if the processes would be used.
5.	**Which of the *Lean* orientated tools and practices used at the workshop do you prefer most and why?**	• Establish and confirm which were the most understood *Lean* orientated tools and practices and why.
6.	**Which of the *Lean* orientated tools and practices used at the workshop do you least prefer? Why?**	• Establish which of the *Lean* orientated tools and practices were not understood and understand why.
7.	**Do you think it is useful to create process flows and why?**	• Establish an understanding and value add.
8.	**Would you recommend to other administrative units to use these *Lean* orientated tools and practices to map their processes?**	• Establish value add.

3.6.5 Analysis

3.6.5.1 Pre-Interviews

During the pre-interviews eleven questions were posed to the staff of Wits Plus and Faculty A. The questions aimed to establish the processes currently in place in both Wits Plus and Faculty A as well as the level of knowledge that existed when it came to process mapping. The answers to the questions were reviewed and assisted the researcher to:

1. Determine staffs understanding of process mapping;
2. Determine if any process mapping had been done previously;
3. Determine the need for process mapping;

The answers to the questions assisted the researcher to confirm that there was a need within the University's administrative environment to map processes and to explore various Lean orientated tools and practices to do so. The answers from the pre-interviews also assisted the researcher to confirm the five *Lean* orientated tools and practices that would be used during the workshop.

3.6.5.2 Workshop

The data gathered from the workshop was scrutinised and analysed by the researcher. The researcher reviewed all the answers and comments made at the workshop against each *Lean* orientated tool and practice that was used and graded these against the following categories:

1. The tool/practice was not useful
2. The tool/practice was partially useful
3. The tool/practice was useful
4. The tool/practice was most useful

3.6.5.2.1 Grading Criteria and Grading Categories

Each *Lean* orientated tool and practice that was used to experiment with received an average grading score against the grading category and these are set out in Table 9: Grading Criteria and Description of the Grading Categories.

Table 9: Grading Criteria and Description of the Grading Categories

Grading Category	Description	Average Grading Level
Not useful	The tool/practice is not found to be useful by the participants when analysing and improving a process. After an explanation, it is seen to be complicated and not a tool/practice that will be readily used. The answer to the tool/practice is graded below a 25% level.	**1.0**
Partially Useful	The tool/practice is found to be partially useful when analysing a process. Most participants indicate that they will not readily use the tool/practice to analyse a process and the answer to the tool/practice is graded below 50%.	**2.0**
Useful	The tool/practice is found to be useful. Participants agree that it analyses a process, identifies areas and opportunities to improve but there are however some limitations. The answer to the tool/practice is graded below 75%.	**3.0**
Most Useful	The tool/practice is found to be most useful. Participants agree that it analyses a process, identifies areas, and opportunities to	**4.0**

	improve and they will use this tool/practice to support them. The answer to this tool/practice places it above the 75% grading level.	

3.6.5.3 Post-Interviews

Two weeks after the conclusion of the Workshop post-interview meetings were held with staff from Wits Plus and Faculty A. During the post-interviews, the researcher posed eight questions to the staff with the aim being to confirm the findings from the workshop. The grading scores compiled from the workshop were compared by the researcher against the answers to the questions from the post-interviews. Specific questions were posed regarding the *Lean* orientated tools and practices used and during the workshop and their usefulness. In doing so the responses confirmed that the three *Lean* orientated tools and practices identified in the workshop were still preferred and would be used to map existing processes and new processes and that these could be proposed for a framework.

3.7 Conclusion

In this chapter, the author described the various research methods used to collect data for this research report and to answer the research question and from which ultimately a process framework could be compiled and recommended. The chapter further discussed the pre-interviews, the workshop, and the post-interview methods used to point to the advantages and disadvantages. In conclusion, the grading criteria and categories to analyse and report on the results were discussed.

Chapter 4: Data Analysis and Findings

4.1 Background

The purpose of this chapter is to show a detailed analysis of the full findings of the pre-interviews, the workshop, and the post-interviews. The chapter also shows the process maps drawn up during the workshop.

This chapter is set out as follows:

- Analysis of the findings by showing the findings of each of the *Lean* orientated tools and practices that the participants experimented with.
- Findings of the pre-interviews, the workshop, and the post-interviews.
- Discussion of the findings
- Introduction of the proposed framework

4.2 Introduction

The following section shows the findings from the pre-interviews, the workshop where participants experimented with the *Lean* orientated tools and practices, and the post-interviews. During the workshop, the participants voiced their opinions when experimenting with the tools and practices and these are included in the findings of this chapter. This section also shows the graphical illustrations and the outcomes given for each *Lean* orientated tool or practice that was used. The three *Lean* orientated tools and practices with the highest scores are recommended for the Process Flow Framework in Chapter 5.

4.3 Analysis Section

4.3.1 Pre-Interviews

4.3.1.1 Aim of the Pre-Interviews

One-on-one pre-interviews were held with the key staff members from both Wits Plus and Faculty A who are responsible for the management of Wits Plus and the Faculty, and who are directly involved with the WRC process. The pre-interviews probed whether staff have made use of and created any process maps to analyse processes and if so, what method they used.

The aim of the pre-interviews as noted in Chapter 3 was to see:

1. Which type of students are registered at Wits Plus and if processes were in place;
2. If processes were consistent across Wits Plus/Faculties;
3. If the same WRC rules were in place across Wits Plus/Faculties;
4. If all staff participate in the process equally;
5. If there was an understanding of process maps;
6. If there is a need in Wits Plus/Faculties to have processes or rules changed;
7. If there is process knowledge;
8. If training happens;
9. If there is knowledge of process maps;
10. If process maps existed;
11. If there was an experience with the creation of process maps.

The responses received from the key staff members from both Wits Plus and Faculty A interviewed are illustrated in Table 10: Findings: Pre-Interview Questions. This table includes the author's remarks that assisted with the agenda-setting of the workshop. It further ensured the addressing of key issues during the workshop.

Table 10: Pre-Interview Questions

Pre-Interview Questions	
Question 1Which cohorts of students are currently registering with Wits Plus?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
• The majority of students are the more mature working student who passed Grade 12 before 2017. These students have different needs, as they are more mature than the typical 19-year-old is. There is also the excluded cohort of students from various other Faculties that apply and register at Wits Plus.	❖ Students are becoming more aware of the Wits Plus offerings and therefore registering at Wits Plus. Excluded students are seeing Wits Plus as a way of continuing their studies.
Question 2: Which rules/guidelines are currently in place to govern the life cycle of students?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
• Currently, the same rules that apply for full-time (FT) students apply to part-time (PT) students but in many instances, their rules are unwritten, with changes communicated verbally or at meetings to Wits Plus. This sometimes occurs very late causing many frustrations for the part-time students. Wits Plus has never compiled its own rules; therefore, there are no formal rules or guideline booklets in place because that has always been done by	❖ There is a need for formalising rules for Wits Plus, as they currently have no formal say in any changes. If a Faculty does not write a rule, it is not done and an unwritten rule/practice is used to address incidents with students. Faculty forgets to inform Wits Plus of rule changes. This is not done purposively but causes problems especially if a rule is changed at the beginning of the year.

the Faculties. The concern with this is that staff will not know the rules if the manager leaves and guidelines that can be shared with both staff and students are required.	
Question 3: Explain to me how the WRC process works?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
• Students who do not meet the minimum requirements are excluded regardless of being a Wits Plus or Faculty students and students apply on-line or manually to be considered for readmission. All applications regardless of being a full-time or part-time student are prepared by the Faculty for the WRC meetings. Faculties constitute the WRC committees, the Faculty WRC considers all applications, and Wits Plus is not part of this committee. WRC committee decides on the readmission or not of all the students (both full and part-time) and Faculty codes the outcome on the student record. Faculty decides on the conditions for readmissions of the Wits Plus students and the Faculty tend to be very lenient with their conditions, as they are full-time working students.	❖ Wits Plus is completely out of the loop with the WRC process, with no oversight on their students applying to WRC nor forming part of the WRC meetings. Wits Plus does not handle any students WRC application nor are they involved in any of the coding of the WRC students when WRC1 or WRC 2 committees uphold the exclusion. They have no formal say about the conditions that are set for their students.

Question 4: What role does Wits Plus play in the WRC process?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
• As noted in the previous question, Wits Plus does not play an active role in the WRC process and it is not so much an issue at this stage but can become a problem as questions can be raised as to why Faculty is doing Wits Plus work. Faculty A keeps a manual list of all the WRC applications, and the Faculty works from these but Wits Plus is not involved in this process. If a student has, a valid reason for being excluded, their readmission is approved. The same rules that apply for the full-time students in Faculty A apply to Wits Plus students with the progression rules applied leniently to part-time students. Wits Plus is however growing and there is a need to have WRC processes in place. Wits Plus knows their students and their circumstances and, in some cases, it has been found that Wits Plus is confused when students are excluded as Faculty decides on their behalf.	❖ Wits Plus needs to be part of the WRC process as they have a more holistic view of their students. The need for formal Wits Plus rules is noted again.
Question 5: Would you say that the WRC processes are working between Wits Plus and the Faculty?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
• In most cases, the answer would be yes but there are problem cases e.g. students excluded from full-time studies, having reached N+2	

searching for a place to go to complete their degree, and Faculty rules do not allow for them to reregister for the same degree again in the Faculty. These students are also not allowed to continue their studies through Wits Plus and several students have slipped through and registered with Wits Plus. On the other hand, Faculty can readmit a student with one outstanding course forcing them to go to Wits Plus to complete the last course they need for their degree. Processes need to be streamlined, as schools are sometimes reluctant to take students back, although students have been readmitted and need to be accommodated. With WRC, there can be such a mix of students who are readmitted. Students can be readmitted by the DVC's office and Wits Plus is not aware of these decisions as these cases are only communicated to Faculties, but students need to reregister with Wits Plus. Confusion arises w.r.t the number of courses that students can take when readmitted, students requesting to see the rules in writing. There needs to be scenario mapping as various types of students can be excluded. There also needs to be more clarity on credits especially if a student who was excluded from full-time studies can register for part-time studies.	❖ Students want to access rules, and these are not written down or streamlined. This stresses the need again for progression rules. ❖ Rules are further required for students wanting to transfer between FT and PT studies. There seems to be a lot of confusion regarding the WRC process that needs to be followed, by when, by whom, and for which students. Although the processes are complex and unwritten, there is a good working relationship between the various stakeholders.
Question 6: Would you like to see the WRC process change and what would you like to see change?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**

• Yes, as the process is not always clear even if it is just a basic table with who must do what, when, how would be helpful, and to have perhaps commonly shared templates so that everyone has the same standard.	❖ The process needs to be mapped and roles and responsibilities need to be clarified to identify gaps and duplications.
Question 7: Explain to me how you deal in your office with the situation when a new process is introduced?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
• If an instruction is given, then the process is introduced. No documented process is in place that is followed.	❖ No thought is given to the effect the new process will have on the current processes. Processes are not reevaluated to see what the impact of the change will have if any duplications are created when the new process is introduced.
Question 8: What process flows if any do you have in your office?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**

• Processes are not specifically mapped. Year planners that show activities that happen monthly within the office are available as well as a RACI document showing per task who is responsible, who is accountable who it needs to be communicated to and who needs to be informed.	❖ It is not clear how much other staff understands all processes that need to be followed in Wits Plus or Faculties so there is a need for process maps that can be shared with staff. Mapping will make planning easier.
Question 9: Have you ever used any *Lean orientated* tools or practices to map processes?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
• No not *Lean* tools. Faculty A has started to note down the PG submission processes. It would be useful to be exposed to various *Lean* tools and practices that can assist with drawing up process maps and streamlining processes. It would be useful to have a process that can guide how to draw up process maps It takes up time to draw up process maps and it is difficult to find time to do. In most cases now staff use their common sense when doing their work and handling issues and problems.	❖ Currently, there are no process maps and if it is done, it is seen as a task for the Manager. Staff are not part of drawing up process maps. Staff needs to be involved as their buy-in is required.
Question 10: Would you say all staff is clear on what processes they need to follow when dealing with a student/inquiry in the office?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**

• Not always. In most cases, if a process is an unclear staff do not know what to do and it lands on the table of the manager.	❖ Instead of addressing problems, they are escalated, as the staff member is unclear as to what to do.
Question 11: Would you say it is worthwhile to do a process flow of the WRC processes?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
• Yes, and to have it on a shared drive for all staff to access. Processes also do not talk to one another causing a lot of duplication. Many times, things change but there are no documented processes that can be used by staff. Having this will assist especially if a staff member is not in the office or on leave.	❖ There is a process, but it is not formally documented. If there are process maps staff can be clear on what to do.

4.3.2 Workshop

4.3.2.1 Aim of the Workshop and the Purpose of using Process Mapping

Bicheno and Holweg (2016) note that the real purpose of mapping is to design a future state, a way to visualize the current state and future states. As noted in Chapter 3 the Workshop aimed to allow participants to be exposed to various *Lean* orientated tools and practices and by taking these and experimenting with them to create process maps of ways to improve the WRC process. By drawing process maps staff can better visualise a process to see the value of how it streamlines a process and eliminates waste and hopefully they would be able to use the same method for other administrative processes within their offices. Netland and Powell (2017) note that when *Lean* tools are applied as part of the broader initiative the use of approaches e.g. Lean Six Sigma, sticky note mapping processes, or whiteboards work the best.

In this research, process maps were drawn up using the five *Lean* orientated tools and practices. They were chosen as they enabled:

1. a process focussed orientation,
2. process maps to be drawn up,
3. definition of the process,
4. analysis and process evaluation,
5. the performance to be measured, and
6. improvement by reducing unnecessary steps that can create waste.

The section that follows shows the detailed illustrations of the process maps created from the workshop discussions. Process maps allow for the analysing of current and future states and creating the opportunity for processes to be broken down into more organised steps whilst allowing the compilation of a future implementation flow (Bonaccorsi et al., 2011). The *Lean* orientated tools and practices were explained by the author to the participants in session 1 of the workshop. The participants worked together in one group and this allowed each member in the group to contribute to a process flow, bearing in mind their ideas and suggestions to better analyse and suggest improvements to the WRC process. Dennis (1996) notes that group members characteristically have a lot of information about possible alternatives and this information shapes the pre-discussions as well as the member's preferences that can shape the group decision. In the case of this research, the group work allowed all participants to make a positive contribution to the workshop. Group discussion improves the quality of decisions allowing members to share information giving access to a larger pool of information. (Dennis, 1996)

As pointed out in Chapter 1, this may not be the purist way of applying *Lean* tools or practices but is a starting point to encourage staff to think about the work they do, and how they can analyse and improve processes. It is an excellent vehicle for involvement and participation and it is great to generate ideas (Bicheno and Holweg, 2016). Beckers (2015) also notes that the visual representation of processes and waste when working in a group can be useful as it gives an overview as well as providing structure to the process. Anthony et al.2012 also states that visual management is a great tool to assist with understanding a process, what is under control and what not.

4.3.2.1.1 Value Stream Mapping (VSM)

Value stream mapping is an important tool used to remove waste from a process and in doing so there needs to be an understanding to improve processes maps as well as any interactions with stakeholders. VSM can continuously identify opportunities to improve the process and reduce waste. VSM was the first tool given and explained to participants at the workshop. Figure 5 is a visual illustration of the main themes to follow when using a value stream map breaking down into current and future states leading to an implementation plan.

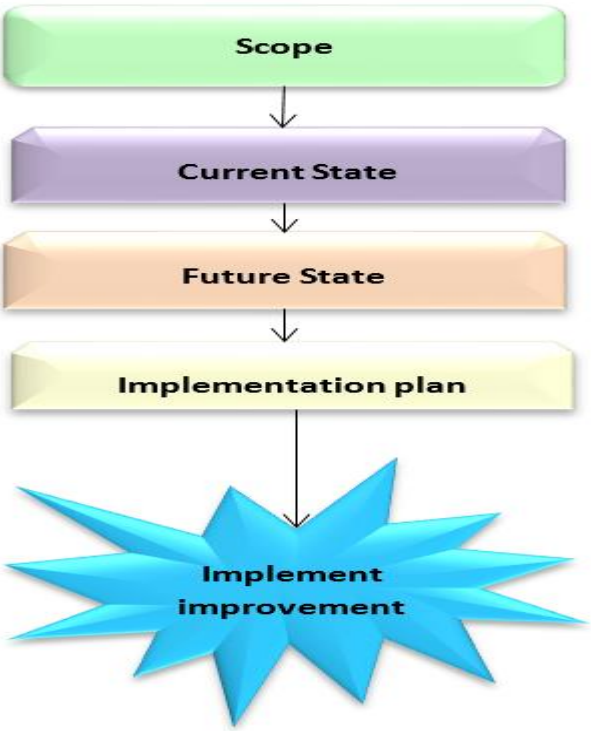


Figure 5: Value Stream Map (VSM)
(Adapted from Rother and Shook, 2003)

The current state of a process needs to be mapped from which a new future state can be developed. Figure 6 identifies all the steps currently followed by Wits Plus and the Faculties when it comes to the WRC process, none of these processes are currently documented.



Figure 6: Current WRC Process

Figure 7 illustrates the WRC communication and rule processes. In this diagram, it is proposed that Wits Plus should be involved in the coding of their students. It also shows the inclusion of Wits Plus in the Board of Examiners' meetings to be part of the decision-making when it comes to the exclusion of their students.

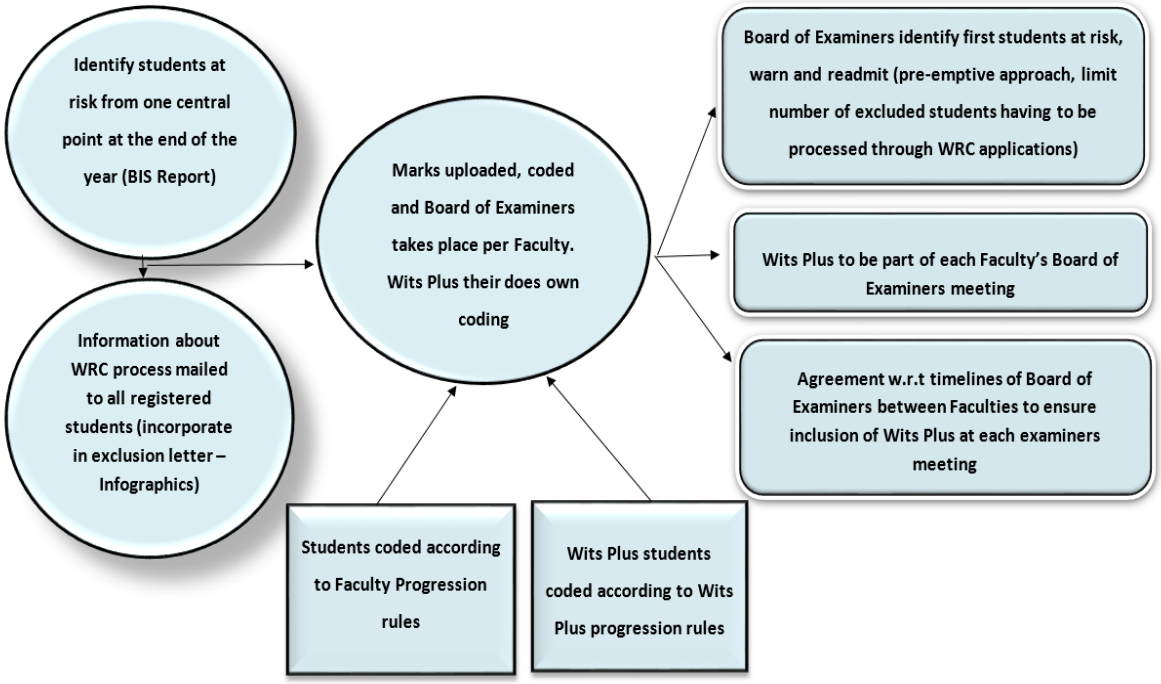


Figure 7: WRC Communication and Rule Process

Figure 8 is the second diagram shows the process to follow during the WRC meetings. This map shows the process when students apply to WRC and are either readmitted or excluded, including the periods of exclusion and that, they need to reapply if they are excluded. It also includes Wits Plus in the WRC meetings going forward.

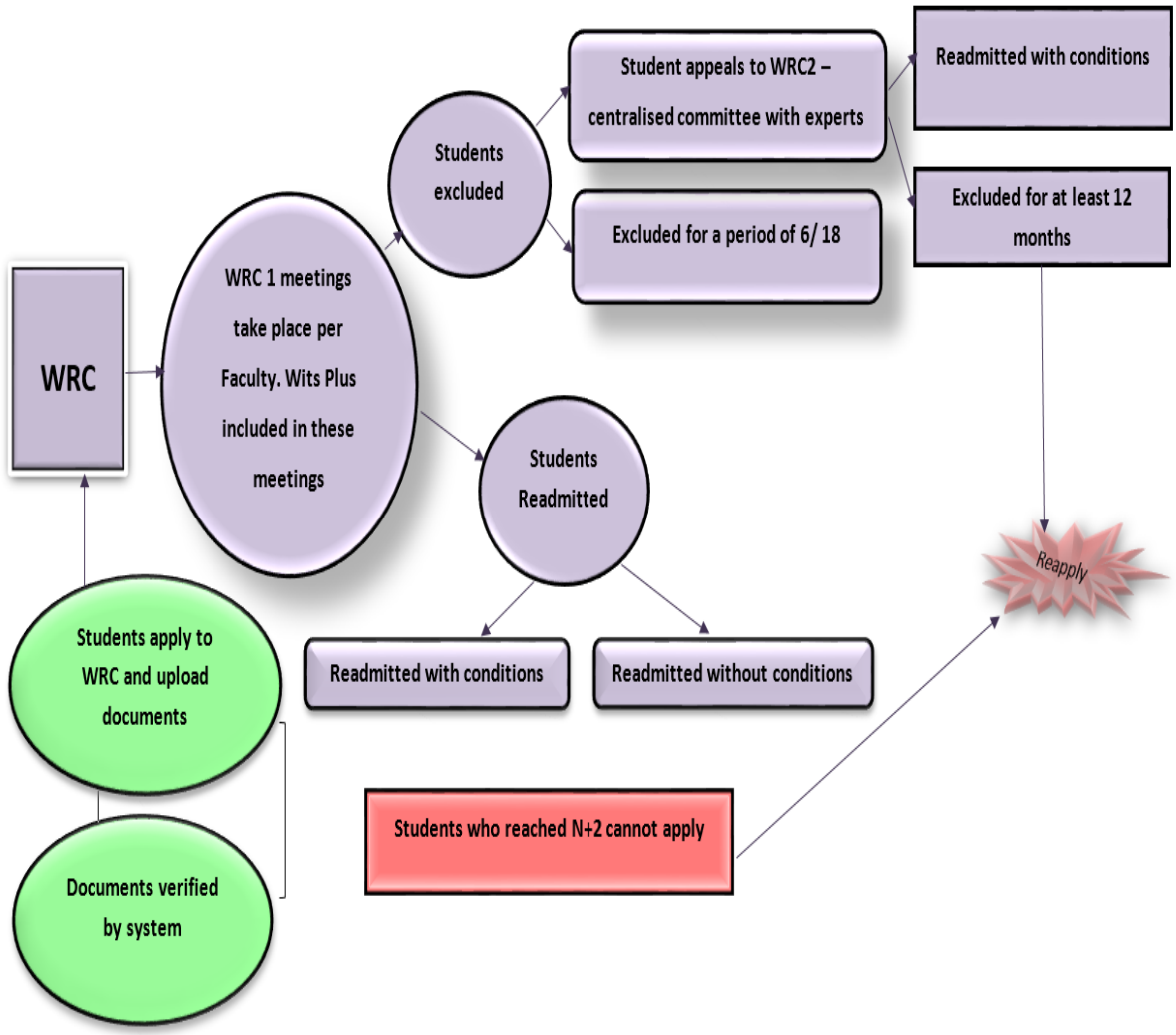


Figure 8: WRC Meeting and Outcomes Process

Figure 9 shows the process after concluding the WRC meetings per Faculty including the communication that needs to take place with the students as well as the counseling and intervention sessions that take place with the students during the year. It further illustrates the mid-year exclusions should students not meet the mid-year conditions stipulated by the Board of Examiners, leading to their registrations being canceled.

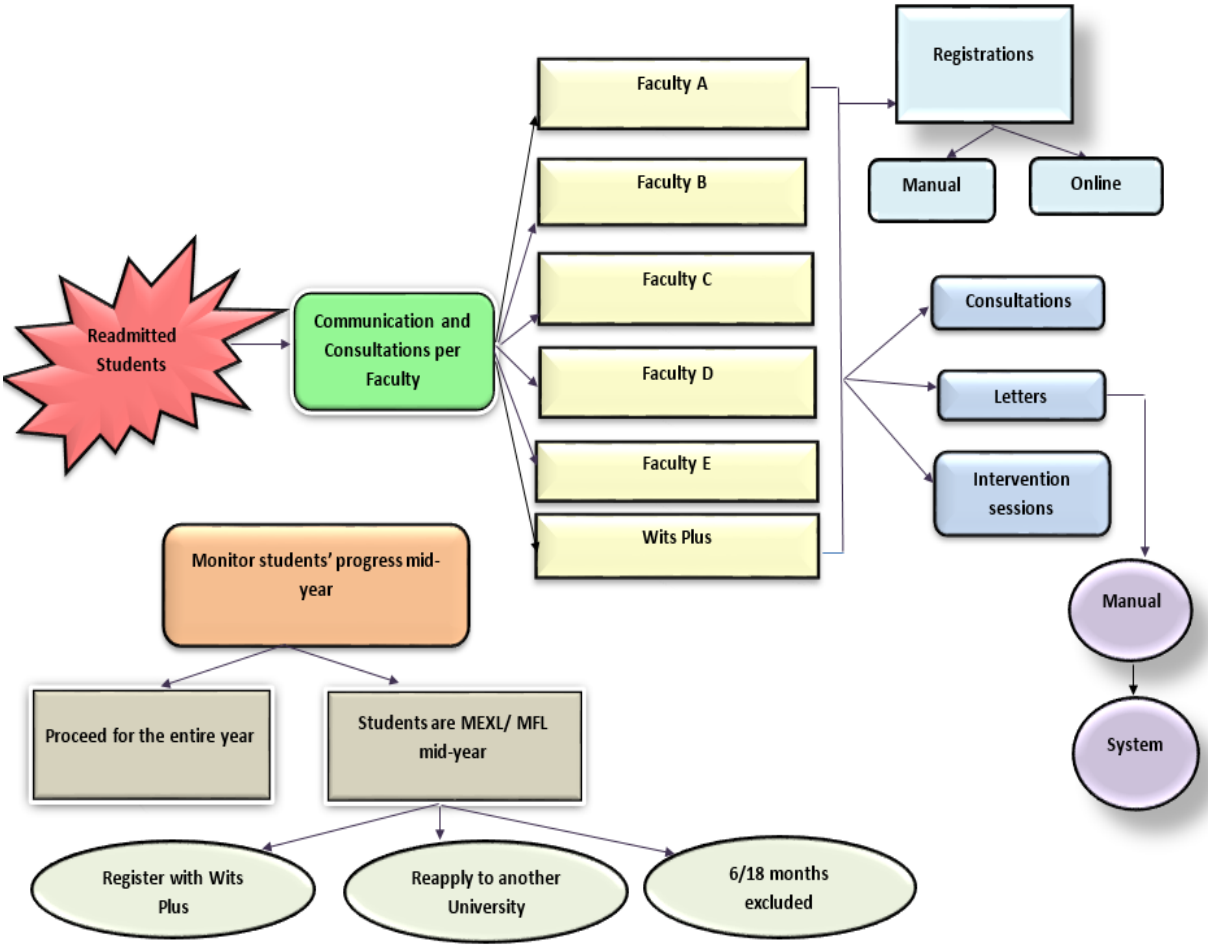
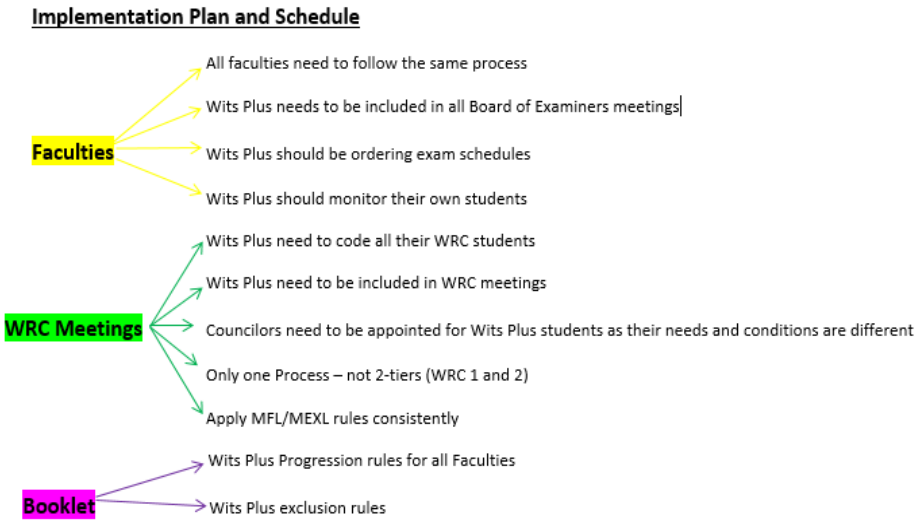


Figure 9: Readmitted Students Registrations and Mid-Year Exclusions Process

Figure 10 shows the implementation plans coming from the workshop as well as the action plan table detailing the action plans and timelines that participants noted with the new refined WRC process. From all the processes identified in Figures 6 to 9 detailed value stream maps can be drawn up.

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Action	Plan	Timelines	Responsible person
Wits Plus should be ordering exam schedules	Access to SIMS	2020	AISU
Wits Plus should monitor their own students	Get Wits Plus to order schedules, access to SIMS	2020	Wits Plus
Councilors need to be appointed for Wits Plus students as their needs and conditions are different	Discussion with DVC Academic		DR, DVC, Director Wits Plus
Wits Plus need to be included in WRC meetings	Faculties to invite to Meetings	Jan 2020	Faculties
Wits Plus Progression rules for all faculties	Write rules and compile a booklet	June 2019	Wits Plus
Wits Plus exclusion rules	Write rules and compile a booklet	June 2019	Wits Plus
Centralised WRC2 process	Discussion with DVC Academic and Registrar	2020	DR

Figure 10: Implementation Plan with Timelines

4.3.2.1.2 DMAIC

DMAIC can be used to solve problems in a planned way. The process maps depicted in Figures 11 to 16, illustrates the process maps discussed by using the DMAIC stages at the workshop.

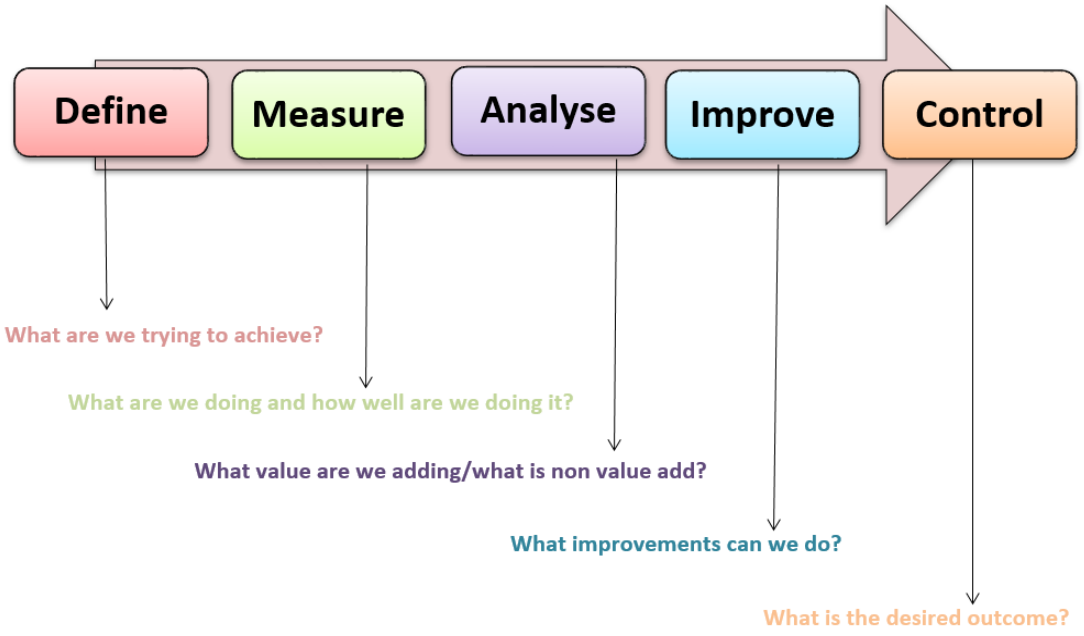


Figure 11: Five Stages of DMAIC

Participants used each of the five DMAIC stages to discuss and scrutinise the WRC process. Figure 12: DMAIC illustrates how the workshop participants defined the WRC process, and the goals they set out to achieve with changing the process for it to be improved.

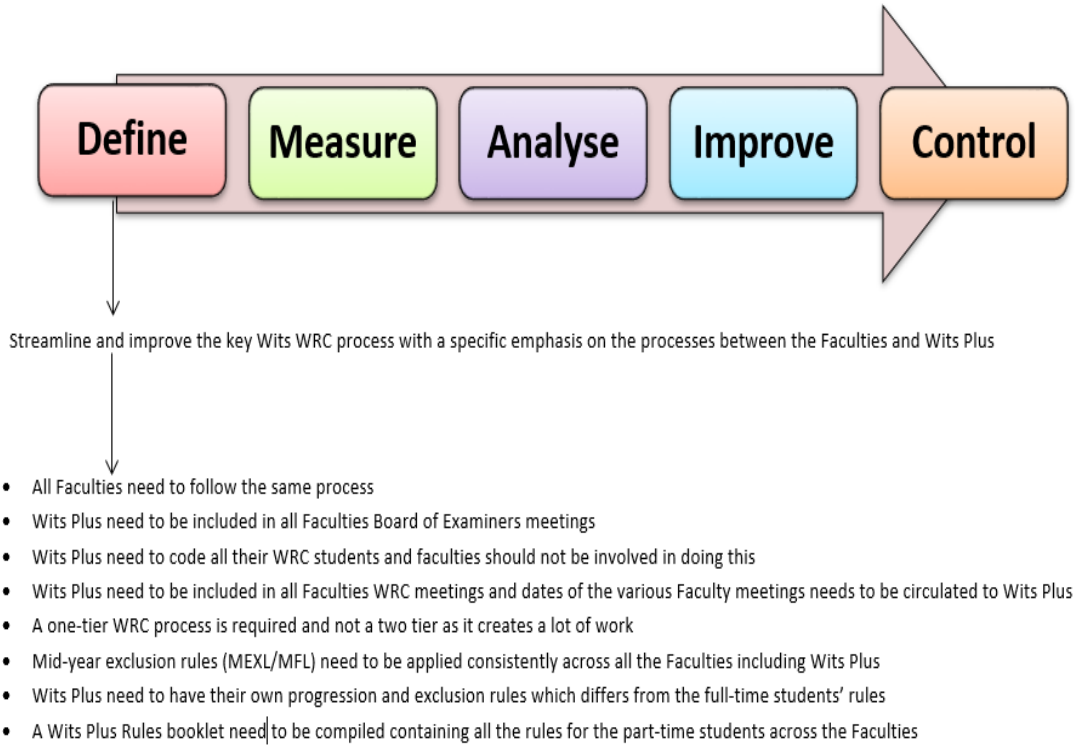


Figure 12: DMAIC – Define the Problem and Set Goals

Figure 13 illustrates how the workshop participants measured and assessed how they are currently handling the WRC process. They noted the weaknesses within the WRC-process but similarly had the opportunity to reflect on what they do well.

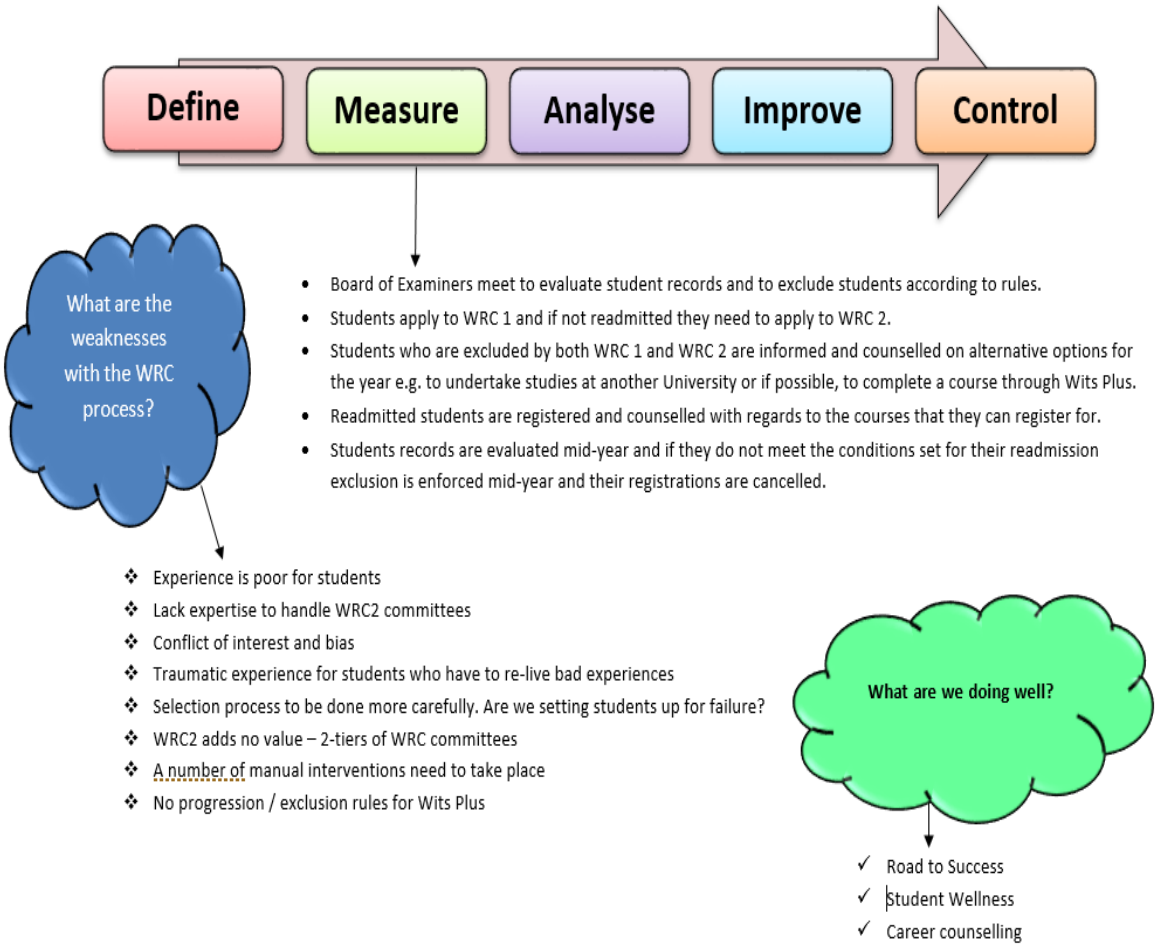
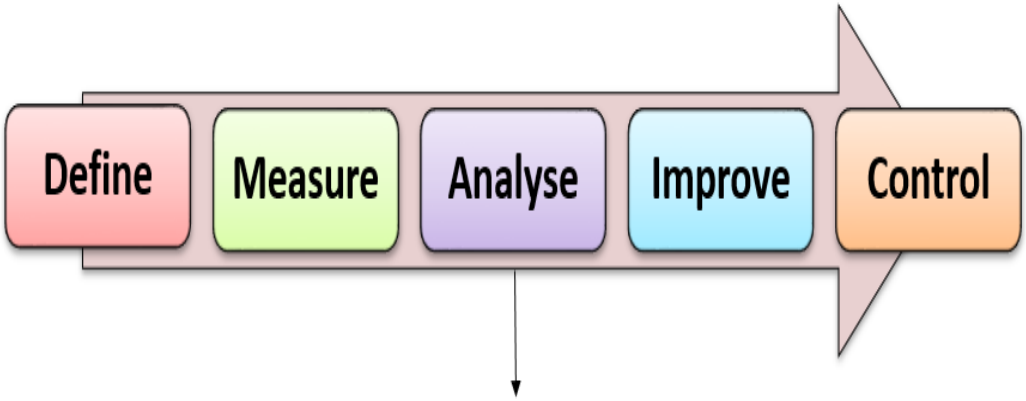


Figure 13: DMAIC - Measure the Process

Figure 14 illustrates and explains why things are the way they are. This diagram further illustrates the value and non-value adding steps within the WRC process.



The WRC process is a 2-tiered process with students applying manually or online to the Wits Readmission Committees in the various Faculties when they are excluded at the end of the year. Exclusion is due to students not passing enough credits(points) in order to be promoted to the next year of study. Wits Plus students are excluded and need to apply to the Faculty Readmission Committees in which the degree is hosted. The WRC committees meet, and decisions are made if the students can reregister or needs to be excluded. Students who are excluded by WRC 1 has another opportunity to apply to WRC 2 where they can appear in person to state their case for readmission. Students readmitted at any stage (WRC1 or 2) receive a set of conditions which they need to meet mid-year or the end of the year. Wits Plus students' conditions are set by the Faculty with Wits Plus in many cases not knowing which students are readmitted with what conditions. Students are excluded for a period of one year.

Value Adds	Non-Value Adds
• Process that exist	* WRC2 duplication of WRC 1(2-tiered process)
• Student support services	*Physical collation of documents
	* Duplication

Figure 14: Analyse the Process

Figure 15 illustrates the suggested improvements to the WRC process as noted by the workshop participants. It was felt that these improvements would go a long way in streamlining the process and making Wits Plus part of the WRC process. It will take the decision-making away from Faculties to determine what readmissions conditions need to be set for excluded part-time students since there is not an understanding of the needs of a part-time student.

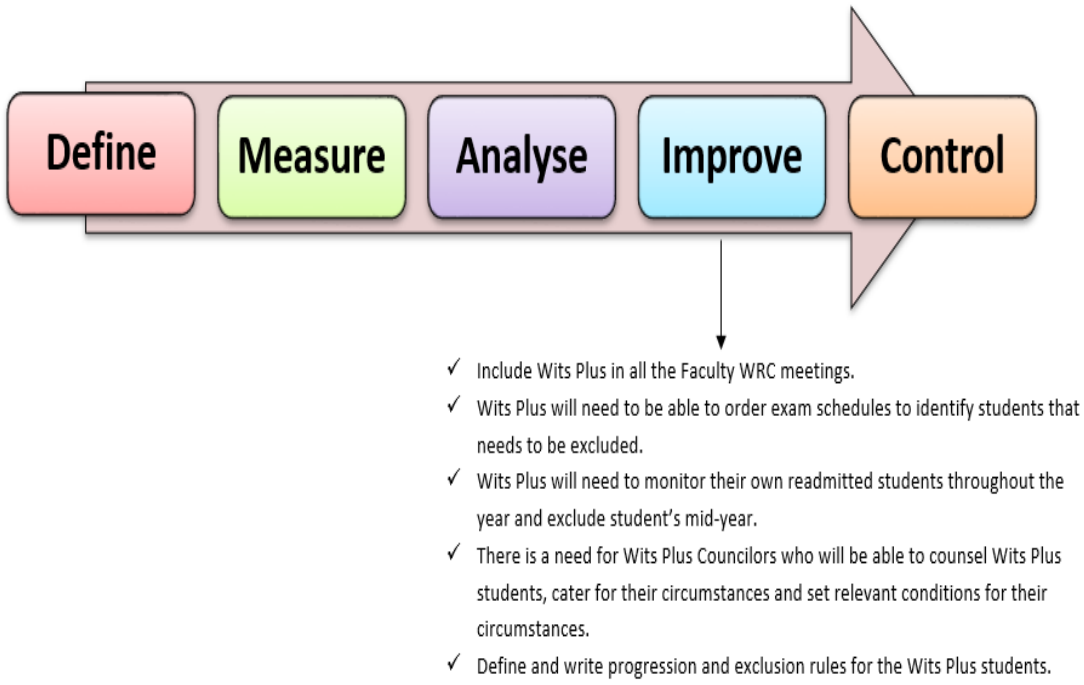


Figure 15: DMAIC - Improve the Process

Figure 16 was compiled to illustrate the desired outcome the workshop participants noted and suggested to improve and move the WRC process forward.

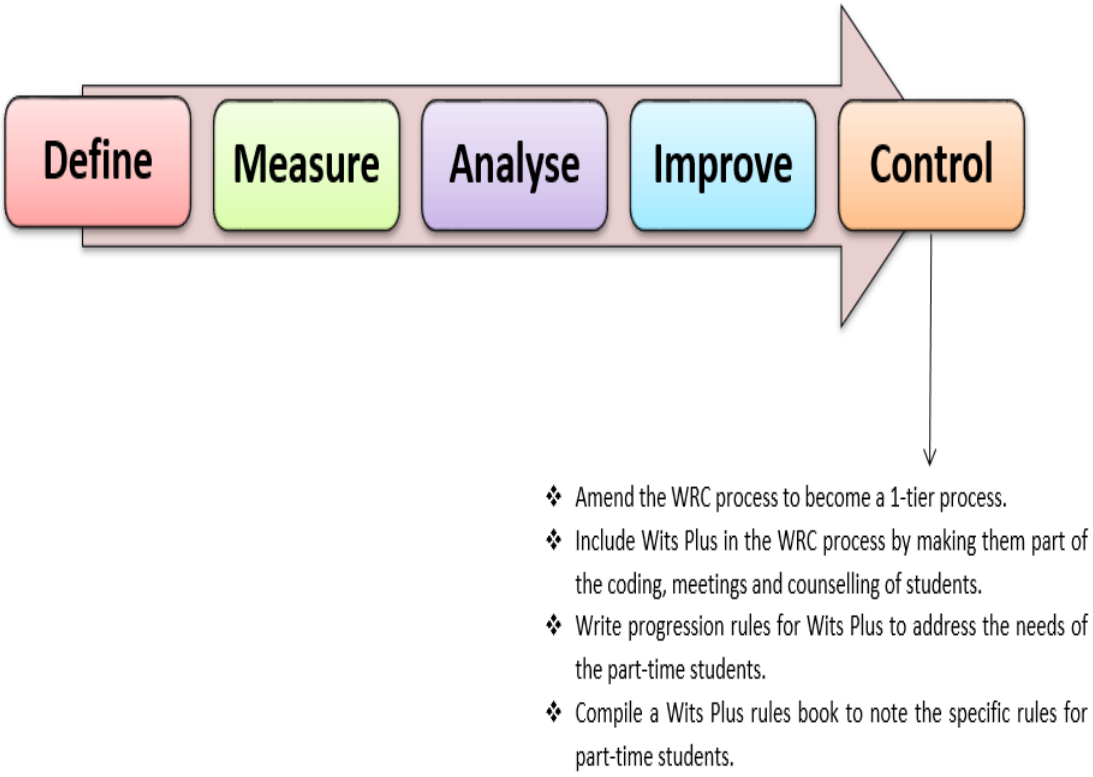


Figure 16: DMAIC - Control

4.3.2.1.3 PDCA (Plan, Do, Check and Act)

The PDCA method assists in controlling a process whilst looking for continual ways of improving a process. Figure 17 PDCA Cycle illustrates the different stages of the PDCA cycle - Plan, Do, Check, and Act.

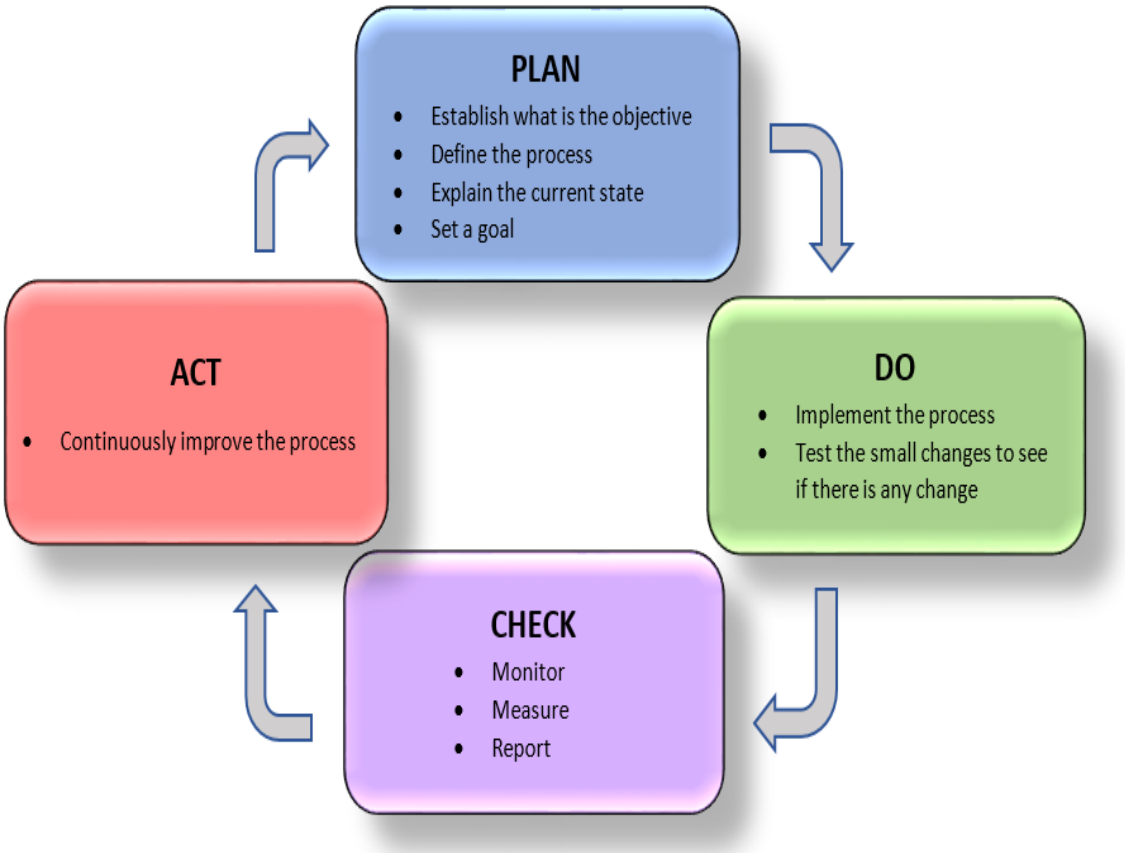


Figure 17: PDCA Cycle

Figure 18 illustrates the participants' mapping when they used this tool to define the WRC process. In the Plan block, the participants defined the process highlighting the goals they want to achieve with the process. In the Do phase, they included the planning of what needs to be done going forward to improve the WRC process. In the Check phase, the participants noted the monitoring processes that need to be introduced going forward and in the final phase Act, the improvement and taking the process forward is noted.

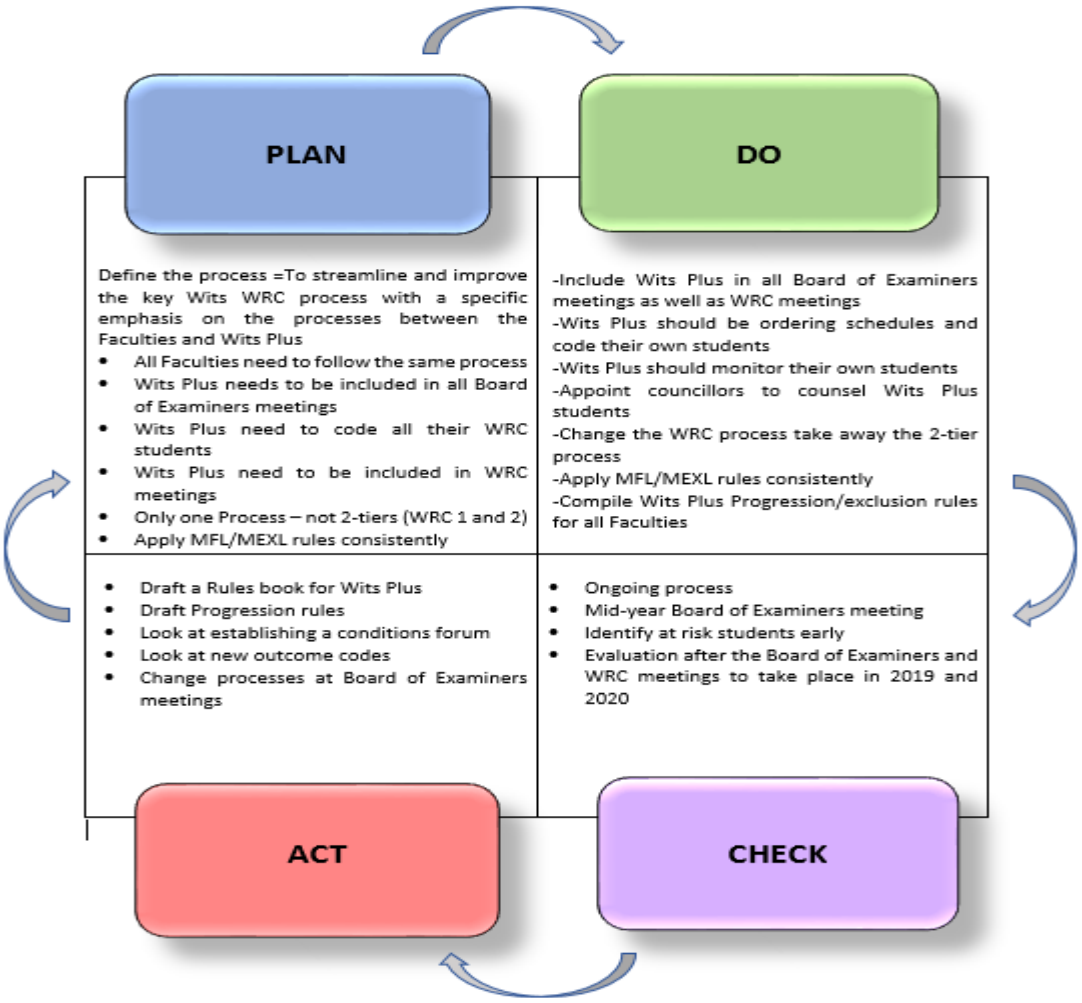


Figure 18: PDCA – WRC Process

4.3.2.1.4 'Six Honest Serving Men'

The 'Six Honest Serving Men' framework is useful to get to important information swiftly with each question reviewing a specific detail. Figure 19 is a visual illustration of the six questions that are asked when using the 'Six Honest Serving Men'.

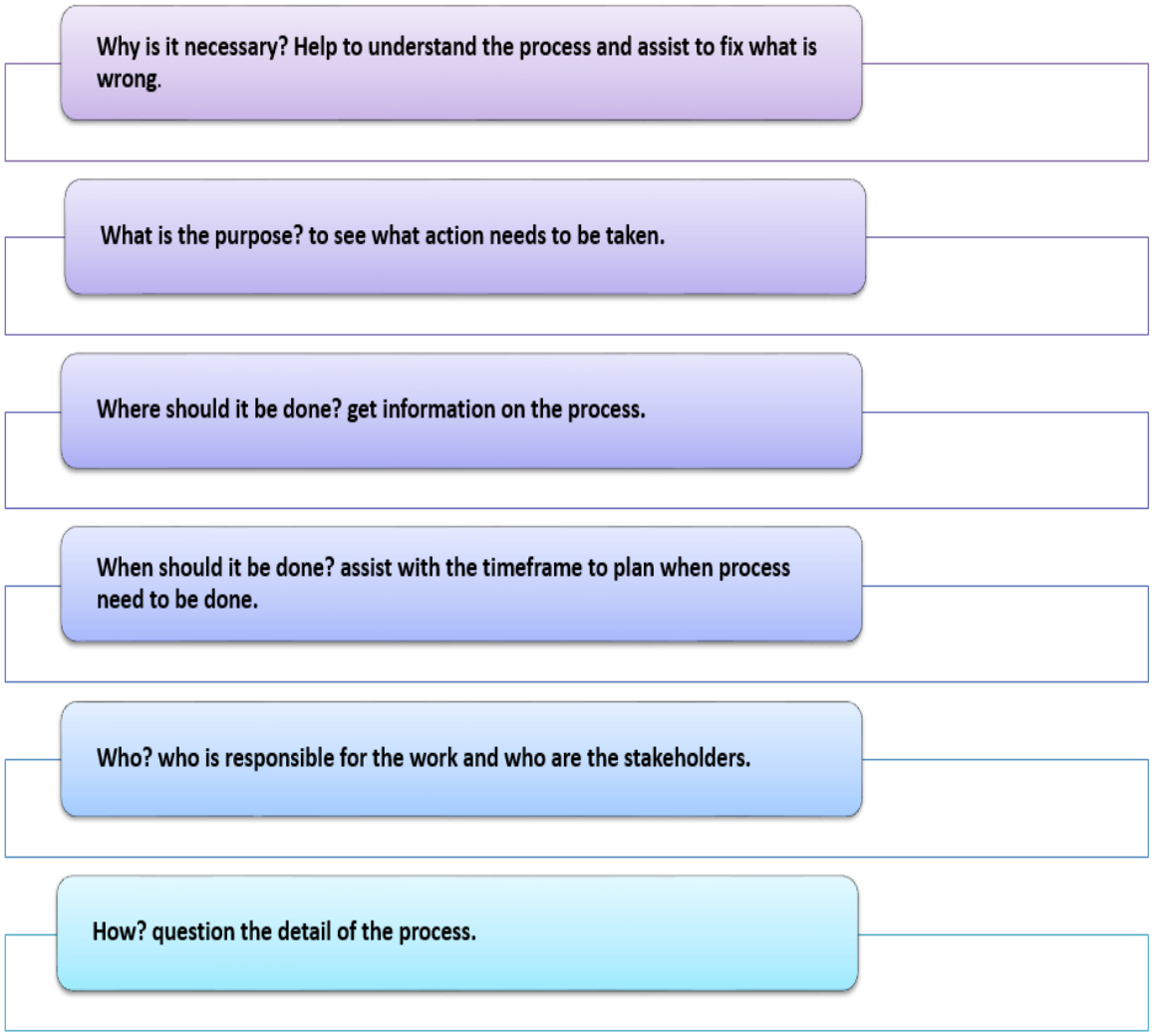


Figure 19: 'Six Honest Serving Men'

Figure 20 is an illustration of the mapping that took place by the participants in the workshop when using the 'Six Honest Serving Men'.

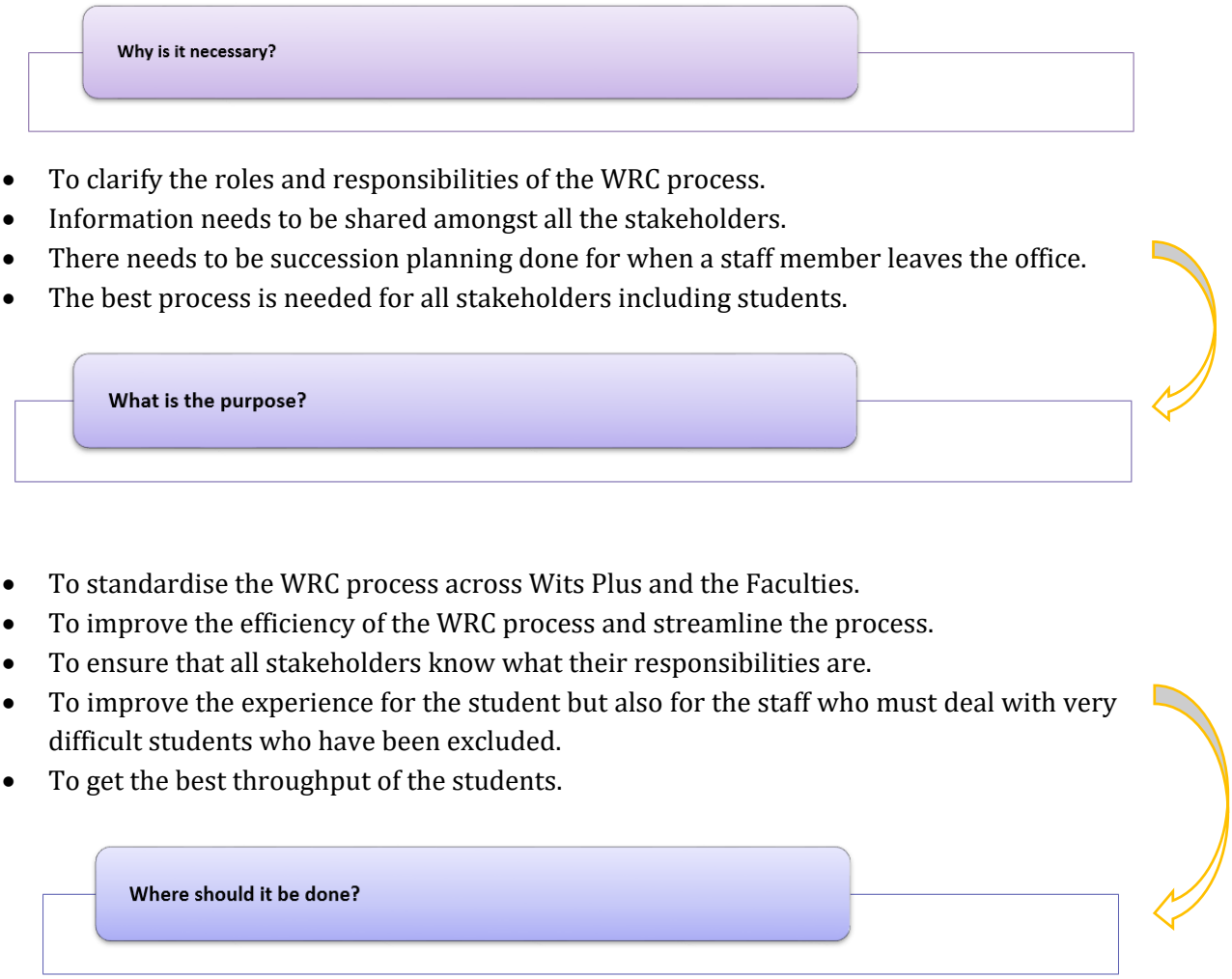


Figure 20: 'Six Honest Serving Men Mapped'

When should it be done?

- Pre-screening of students needs to happen before the end of year exams (October) to establish how many students will be excluded. Wits Plus needs to be part of this process and should be able to request schedules to work through the records of the Wits Plus students to also establish who is at risk.
- Identify at the Board of Examiners meetings students who are not high risk, who can be recommended to be readmitted with conditions, and who do not have to be excluded. Wits Plus needs to be part of the Board of Examiners meetings and needs to know about these decisions that are taken on the student's records.
- WRC meetings take place at the beginning of each year. The later these meetings take place the closer it moves to registrations. One of the concerns with the WRC2 process is that it happens at the same time as registrations making it difficult to run the two processes concurrently.

Who?

- WRC 1 is best placed within the Faculties, as is currently the process to be dealt with by the Faculty Administrators. Wits Plus needs to be part of these committee meetings.
- WRC 2 needs to be a centralised committee with a support structure of more professional staff e.g. Psychologist who would be best able to advise on the readmission of students.
- Going forward Wits Plus Administrators need to be part of all WRC processes.

How?

- Include Wits Plus in all WRC meetings going forward.
- Wits Plus needs to monitor its own readmitted students throughout the year and advise on mid-year exclusions.
- Wits Plus progression and exclusion rules need to be drafted and approved.
- A Wits Plus rules book needs to be compiled.

Figure 20: 'Six Honest Serving Men' - Mapped

4.3.2.1.5 Fishbone Diagram

The Fishbone diagram identifies the root causes of a problem and it provides a systematic way of looking at the elements that cause a situation. Picarillo (2018) note that a Fishbone Diagram is a comprehensive evaluation of the causes of the main problems. It was the last tool given to the participants to use, however, they did not want to engage with the diagram. Participants struggled to understand the value of the diagram and found it to be complicated and noted that it looked difficult. The author did not force them to engage further with the diagram, as the staff were also very fatigued at this stage and did not want to continue.

4.3.3 Post-Interviews

4.3.3.1 Aim of the Post-Interviews

The researcher compiled the post-interview questions to inform the findings from the workshop. Table 10: Post-Interview Questions notes the questions that were asked by the author with the responses received from Wits Plus and Faculty A in the one column and the remarks of the researcher in the other.

Table 11: Post-Interview Questions

The post interviews were conducted with the Manager of Wits Plus and the Faculty Registrar of Faculty A

Post-Interview Questions	
Question 1: Did you find the workshop useful?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
Very valuable but there is a need for uniformity across departments.	Understanding that there is a need to change.
Question 2: Did you find the drawing up process flows of the processes useful?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
Yes, the process maps were found to be most useful. Found that e.g. the DMAIC and the Six Honest Serving Men asked all the important questions regarding administrative processes.	That there is a value in using the *Lean* orientated tools and practices.
Question 3: Looking at all the process flows which of the tools do you think can add the most value?	

Responses from Wits Plus and Faculty A staff	Researcher's Remark
• Honest Serving Six Men • Value Stream Mapping • DMAIC	The most useful *Lean* orientated tools and practices were again identified confirming the outcome from the workshop.
Question 4: Will you use *Lean* orientated tools and practices in any other of your processes?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
Yes, especially the Honest Six Serving men. This practice is clear on the outcome that needs to be achieved. Departments will never be the same when this practice is used. Comfortable to use.	Confirmed the value add and that it will be used.
Question 5: Which of the *Lean* orientated tools and practices used at the workshop do you prefer most and why?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**

The Six Honest Serving Men adds value as it asks all the correct administrative related questions.	Departments need a practice that immediately speaks to the heart of their problem and what they need to do.
Question 6: Which of the *Lean* orientated tools and practices used at the workshop do you least prefer? Why?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
Fishbone Diagram was not understood or the value it can add.	Simple tools and practices are needed but there is a sense also that participants are requiring a solution for a problem and there is not an interest in what causes the problem.
Question 7: Do you think it is useful to draw up process flows to map processes and why it is useful?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**

Will look at rules and draw up process maps and will use and check if they are, still on the track where are they going to improve. Staff will find value in it to see a process flow on the wall. Make one rethink a process. Can mix tools and practices the combination also works well.	Process maps used in the workshop have already been circulated to other staff within the departments and positive comments have been received with regards to their value add. Staff are enthusiastic to draw up process maps using *Lean* orientated tools and practices. Rethinking processes is already being implemented. Where staff was sceptical to find time to draw up process maps they commented after the workshop that they will now make time to - make it part of their staff meetings.
Question 8: Would you recommend to other administrative units to use these *Lean* orientated tools and practices to draw up process flows of their processes?	
Responses from Wits Plus and Faculty A staff	**Researcher's Remark**
Yes, I would recommend it to any service department. Think it can be useful to everyone in the University. Already started with implementation.	Implementation started confirming the buy-in. Staff sees the value in using the *Lean* orientated tools and practices assisting them with a problem.

4.4 Findings

4.4.1. Introduction to the Findings

In this section, a detailed breakdown of each of the *Lean* orientated tools and practices and the comments recorded from the workshop are noted. Cohen et al. (2007) note that in doing research any bias needs to be minimised. To address any bias, the verbal comments from the workshop on the *Lean* orientated tools and practices are included in the discussion of each *Lean* orientated tool and practice. Noble and Smith (2015) recommend that qualitative researchers include rich verbatim descriptions of participants' accounts to support findings. The *Lean* orientated tools and practices are assessed and discussed according to the scores they received, ranging from the highest-scoring tool to the lowest. The advantages noted in Chapter 2 are included in the discussions and compared to the advantages of the findings of the workshop expressed by participants. The highest-scoring *Lean* orientated tool and practice are recommended for the process flow framework that will be discussed at the end of this Chapter.

4.4 2 Pre-Interview Findings

From the pre-interviews with staff from both Wits Plus and Faculty A staff noted their frustrations with the lack of clearly defined processes and process mapping, that they have little knowledge of drawing up process maps and that they could find value in having a framework that can support them to analyse and improve their administrative processes. Staff noted in the pre-interviews that they would welcome a documented WRC process that could be applied consistently across the five Faculties and Wits Plus addressing the needs of all the stakeholders. It would be beneficial to have all processes clearly defined and visible, as it will assist the staff to know what to do. The pre-interviews established that the staff had not used process maps as a method to analyse and improve their processes.

4.4.3 Workshop Findings

As a reminder to the reader, the findings compiled from the workshop are graded in the following four categories illustrated below in Table 12.

Table 12: Grading Criteria and Description of the Grading Categories

Grading Category	Description	Average Grading Level
Not useful	The tool/practice is not found to be useful by the participants when analysing and improving a process. After an explanation, it is seen to be complicated and not a tool/practice that will be readily used. The answer to the tool/practice is graded below a 25% level.	**1.0**
Partially Useful	The tool/practice is found to be partially useful when analysing a process. Most participants indicate that they will not readily use the tool/practice to analyse a process and the answer to the tool/practice is graded below 50%.	**2.0**
Useful	The tool/practice is found to be useful. Participants agree that it analyses a process, identifies areas and opportunities to improve but there are however some limitations. The answer to the tool/practice is graded below 75%.	**3.0**
Most Useful	The tool/practice is found to be most useful. Participants agree that it analyses a process, identifies areas, and opportunities to improve and they will use this tool/practice to support them. The answer to this tool/practice places it above the 75% grading level.	**4.0**

4.4.3.1 Findings - Value Stream Mapping (VMS)

Participants experimented with Value Stream Mapping. By using the WRC process, they discussed the current state of the process and looked at ways of improving the current processes by compiling a new future state. Duplicated steps creating waste were identified in the process and an improvement plan going forward was identified. The tool was verbally graded at 3.0 as illustrated in Table 13 below.

Table 13: Scoring Matrix Findings: Value Stream Mapping

Grading Category	Average Grading	Participants' Grade
Not Useful	**1.0**	
Partially Useful	**2.0**	
Useful	**3.0**	**3.0**
Most Useful	**4.0**	

The workshop participants noted that they found the value stream mapping tool useful to map process. It supported them in understanding the process better. They were able to analyse the process and to identify areas of improvement and duplicated processes that created waste. The tool made it easy to identify an improvement plan and can be used to analyse other processes within their offices to improve other processes. Participants found the tool valuable, interrogating a process to create value flow, and remove waste. The following verbal comments were made: 'Value stream mapping interrogates our process'; 'so used to just do what we do'; 'quite valuable'; 'you can determine a value stream';' there is some duplication'; 'interrogates a process'; 'next to DMAIC'. Participants further commented that deciding to use VSM as a tool to analyse

processes within their offices will be a big undertaking and they favored using the 'Six Honest Serving Men' and DMAIC more. Participants did however conclude with commenting that they would use VSM as a separate exercise especially in cases where process maps must be drawn up when they have complex processes that need to be analysed.

4.4.3.2 Findings – DMAIC

Participants experimented next with the DMAIC. By using the steps that are found in the DMAIC (Define, Measure, Analyse, Improve, and Control) the workshop participants looked at each leg of the process. Participants verbally graded the tool at the end of the workshop to fall in the useful category giving it a score of 3.0 as indicated in Table 14 below.

Table 14: Scoring Matrix Findings: DMAIC

Grading Category	Average Grading	Participants Grade
Not Useful	**1.0**	
Partially Useful	**2.0**	
Useful	**3.0**	**3.0**
Most Useful	**4.0**	

Participants engaged with each of the DMAIC steps and used them to answer the questions on how the current WRC process is working and how it should be working. They enjoyed using the different steps analysing the WRC process and noted that there can be value in using these steps to draw up other processes maps within their offices. Participants found DMAIC to be thought-provoking, bearing in mind the impact a process has on a student. For them, DMAIC interrogates a process, identifies areas of waste and duplication, and creates awareness of parts of the process not thought of before. Participants made the following verbal comments: 'don' t see as a map but it makes you think'; 'makes you define your process'; 'it includes the student experience'; 'will use both tools DMAIC and Six Men'; 'think of the experience of the customer'; 'very specific'; 'makes you think about your stakeholders"; 'insight into so many elements'; 'makes you think about what you want to change'.

4.4.3.3 Findings – PDCA

Following the DMAIC participants used the steps of the PDCA which is quite similar to the steps used in DMAIC. Though experimenting with the PDCA participants scored the PDCA at 2.0 partially useful shown in Table 15.

Table 15: Scoring Matrix Findings: PDCA

Grading Category	Average Grading	Participants Grade
Not Useful	**1.0**	
Partially Useful	**2.0**	**2.0**
Useful	**3.0**	
Most Useful	**4.0**	

Participants found the PDCA to be a useful problem-solving method, drilling down into a process. They noted that the PDCA allows for teamwork, standardisation of a process highlighting the problem areas. In using the PDCA they also became more aware that they operated in silos from one another and there is a need to standardise processes across faculties. The following verbal comments were made: 'duplication';'similar to DMAIC'; 'makes you drill down'. Although useful method participants felt that the PDCA had shortcomings and if given a choice they would rather make use of the DMAIC steps. If PDCA had been used before the DMAIC, it could perhaps have had a higher score and a different outcome in the verbal responses.

4.4.3.4 Findings – 'Six Honest Serving Men'

Participants experimented next with the 'Six Honest Serving Men' and scored this framework at 4.0 placing it in the Most useful category as shown in Table 16.

Table 16: Scoring Matrix Findings: 'Six Honest Serving Men'

Grading Category	Average Grading	Participants Grade
Not Useful	**1.0**	
Partially Useful	**2.0**	
Useful	**3.0**	
Most Useful	**4.0**	**4.0**

Participants found this framework easy to use, asking straightforward and practical questions and noted that asking these six questions would be the first thing they would do in the future when they have to analyse a process. Participants noted that the framework focusses on key questions, clarifies roles and responsibilities sparking the thought process before drilling into the more difficult issues. The six questions go to the core of what should be focused on while giving insight into elements not thought off before in a process. The 'Six Honest Serving Men' also made participants reflect on the importance of training and succession planning that are key elements not thought of when using the other *Lean* orientated tools and practices. Verbal comments noted from the participants were: 'the six men are going to solve all our problems'; 'first plot a process'; 'before you map use six men to talk about the process'; 'easiest to remember'; 'six men are going to be the one to solve all our problems'; 'straight forward'; 'map what is on your table'; 'ask the correct and practical questions'. Participants noted that they would like to use the 'Six Honest Serving Men' to start the brainstorming session and then to combine it with DMAIC to make for a rich, complete way to analyse a process.

4.4.3.5 Findings - Fishbone Diagram

The Fishbone diagram was the last tool that was suggested to the participants to experiment with. Participants did not want to engage with the diagram and therefore the tool was graded in this particular case at 1.0 as illustrated in Table 17.

Table 17: Scoring Matrix Findings: Fishbone Diagram

Grading Category	Average Grading	Participants Grade
Not Useful	**1.0**	**1.0**
Partially Useful	**2.0**	
Useful	**3.0**	
Most Useful	**4.0**	

Participants noted that they did not see the Fishbone diagram as a useful tool when it came to analysing a process. One comment made by a participant was 'I don't understand that tool'. It should be stressed that participants were tired at this stage of the Workshop and that their lack of engagement with the tool and the score is not necessarily reflective of the tool's function and value.

4.4.3.6 Summary of the Workshop Findings

The various *Lean* orientated tools and practices given to the participants at the workshop attracted valuable discussions with each tool sparking a different conversation and ideas. Specific *Lean* orientated tools and practices lead to specific questions perhaps not asked or even thought off when using another tool. Participants noted some duplication amongst the various *Lean* orientated tools and practices but still found each one different and useful. Thoughts around how well service departments are doing their jobs, and how differently the offices operate from one another were established quite early in the workshop with the stakeholders noting that they work in silos, sometimes looking for reasons not to work together. Concerns were raised around current processes and how insufficient they can be especially processes that are completed at the beginning of the year when everyone functions under pressure. The brainstorming session at the start of the workshop was most useful and participants felt that the exercise got the thought process going and recommended doing it before mapping any process. It was stressed that process maps need to involve every staff member of a department or Faculty Office and it was suggested that departments and Faculties might want to include the mapping of processes in strategic planning sessions to start the process.

Participants noted that they would use and recommend the steps used in the 'Six Honest Serving Men', DMAIC and Value Stream Mapping for a framework. They suggested that they would use the framework of the 'Six Honest Serving Men', asking the six questions at the beginning of the exercise to get the thought process going. After using the six questions to brainstorm, the steps of DMAIC would be used to analyse the process and from which detailed process maps will be drawn. It was felt that there is value in using these together suggesting them in a combination for a new framework and to use in higher education institutions.

Bonaccorsi et al. (2011) note that due to the differences in the manufacturing and the service industries *Lean* concepts often must be reinterpreted or redefined in an appropriate way, which is confirmed in the present study.

In conclusion, it is clear from the comments that the staff enjoyed the interaction with the *Lean* orientated tools and practices, with lively discussion taking place when drawing up the process flow diagrams of the WRC process. Table 18 shows a summary of the workshop findings gathered from each Lean orientated tool and practice.

Table 18: Summary of the Workshop Findings of the *Lean* Orientated Tools and Practices

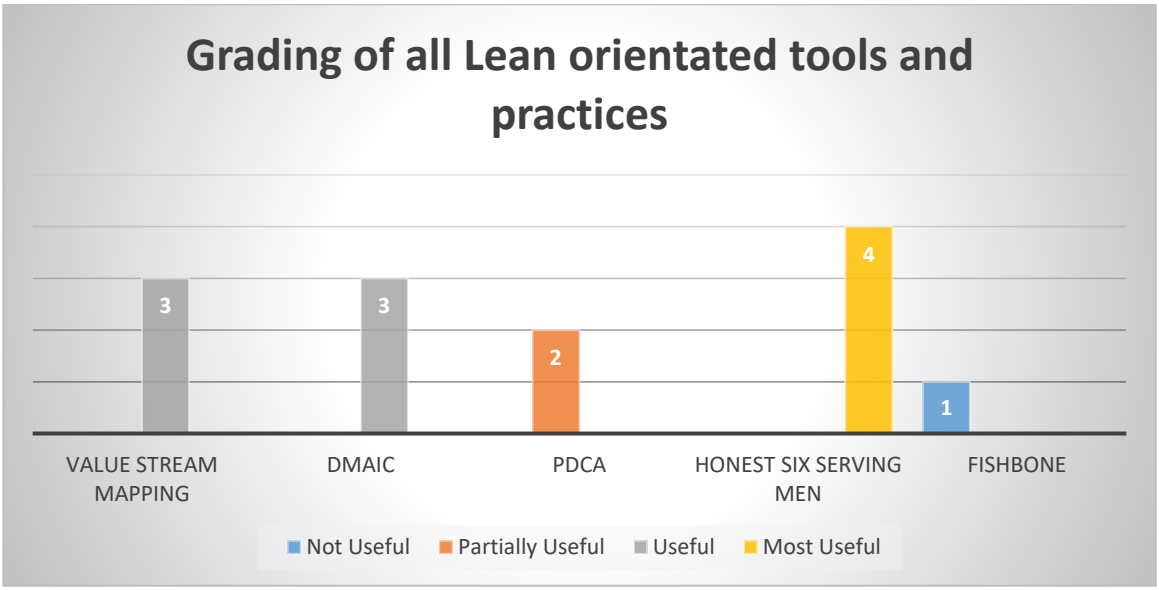
Six Honest Serving Men	DMAIC	VSM	PDCA	The Fishbone Diagram
• Highest scoring Lean orientated practice in the 'well understood' category	• Very good interaction with DMAIC, easy to understand	• Third-highest scoring tool.	• Lower participation rate not the same as enthusiasm expressed when using the other *Lean* orientated tools and practices	• Little interaction .
• Evoked lively discussions	• Will make use of DMAIC when analysing processes within their offices.	• VSM was easy to understand although lengthy.	• A useful tool to solve problems	• No visual attraction
• Goes to the root of the work process	• Thought-provoking	• You need to be clear on your desired outcome when using this tool.	• Enjoyed DMAIC more and if given a choice, would rather use DMAIC before using the PDCA.	
• Asks precise and clear questions	• Takes office process into consideration	• The tool interrogates and questions all parts of a process.		

	but also extend it to the student			
• Useful brainstorming tool	• I would like to combine the tool with 'Six Honest Serving Men' to enrich it.	• Big undertaking and although there was good interaction the 'Six Honest Serving Men' and DMAIC favoured more.		
• Recommended to use in conjunction with DMAIC would make it a rich lean orientated tool not only questioning but also to draw up detailed process maps.				

4.4.3.7 Combined Average Grading of all the *Lean* Orientated Tools and Practices

All the data gathered on all the *Lean* orientated practices used by the participants at the workshop are shown in Figure 21**:** Comparative Grading of all the *Lean* orientated tools and practices.

Figure 21: Comparative Grading of all *Lean* Orientated Tools and Practices



From this graphical illustration, the three *Lean* orientated tools and practices that participants found would be useful and most useful to them to use when analysing a process to improve it were:

1. Value Stream Mapping, scoring a 3 and placing it in the 'useful' grading category;
2. DMAIC also scoring a 3 placing it in the 'useful' grading category;
3. 'Six Honest Serving Men' 4 and placing it also in the 'most useful' grading category.

Value Stream Mapping, DMAIC, and the Six Honest Serving Men will be recommended for a Process Flow Framework that will be discussed in Chapter 5.

4.4.4 Post-Interview Findings

The Post-Interviews the participants in the workshop made the following further valuable observations:

(1.) Process maps identify deviations easily that can be addressed with the staff;
(2.) Visual presentations show duplication;
(3.) Seeing a process makes staff question the value of the process to see if it works;
(4.) The visual maps further assist with checking if a process is still valid and up to date.

In closing the interview, Faculty A noted 'It does not matter how small a process is you need to map it'.

4.5 Conclusion

In closing, several reasons for selecting these *Lean* orientated tools and practices are noted and it was hoped that staff could through practically using these *Lean* orientated tools and practices, decide on one or more to use going forward to draw up process maps within their working environments or even think of creating their process mapping methodology. The workshop exercise, however, and the creation of process maps brought to the foreground the importance of analysing processes to improve them. Staff realized, through drawing up a process flow, that the value of having a visible process is that it would be much easier to change or amend a process than when you do not have a process map of the particular process. Staff confirmed in the post-interviews that DMAIC, Six Honest Serving Men, and Value Stream Mapping remained their three preferred *Lean* orientated tools and practices noting again that a combination of DMAIC and Six Honest Serving Men should be used. Bicheno and Holweg (2016) note that when you take *Lean* out of its context it is required that you adapt it. This is seen to be true from these discussions when proposing a mixture of the DMAIC and Six Honest Serving Men.

Chapter 5: Discussion

5.1. Introduction

The purpose of this chapter is to discuss the findings that were presented in Chapter 4 and to establish which *Lean* orientated tools and practices Wits Plus, the Faculties, and other service departments would use to support them to analyse and improve their administrative processes and propose to be placed in a Wits Process Flow Framework.

5.2 Discussion of each *Lean* Orientated Tool and Practice

The *Lean* Orientated Tools and Practices will be discussed in this section according to the ratings they received from the Workshop.

5.2.1 Discussion: 'Six Honest Serving Men'

Gould (2018) notes that the 'Six Honest Serving Men' is a powerful set of questions. The framework clarifies roles and responsibilities and questions what task should be focused on and why.

In the Workshop, the six questions triggered the most comment from all the participants and were found to be the most useful by all the participants. This was not a surprise as participants interacted best with this practice, and felt that it went to the root of the work that they do, asking precise and clear questions. Participants noted that the framework makes you think of key questions to ask when completing a task including where the process belongs. It gives insight into many other elements not thought off before and it is a good starting point to get the thought process going before drilling into the more difficult issues. Gould (2018) and McDonald (2010) note that the framework analyses a process while recognising the importance of questioning and

focusing on role clarity. The framework focusses on gaps in skills and training within a workforce and assists in building self-awareness.

The 'Six Honest Serving Men' is seen as a useful brainstorming exercise and it was recommended that it should be used in conjunction with DMAIC, as that would make it a rich *Lean* orientated practice not only questioning but also creating detailed process maps. This finding supported a similar finding from Leite and Vieira (2015) who noted that *Lean* does not have a single model of tools or practices that is the best for services, but a mix of tools or practices must be used that can best serve an operation.

5.2.2 Discussion: DMAIC

Snee (2007) notes that DMAIC has been created to act as a general problem solving and process improvement framework and it is an easy method to evaluate processes. When the DMAIC steps are merged into organisation problem and improvement activities, the cultural benefits increase as staff start to think differently, not only about the work, but the way things are done (Snee, 2007). DMAIC received a score of 3.0 and was rated as a useful method to assist with the analysing and improvement of processes. Participants in the Workshop noted that DMAIC interrogates a process, noting which part of a process needs to be adapted, it shows the duplication of processes and creates awareness into parts of a process not thought of before. Participants also noted that structure is provided when using DMAIC and there is a focus on the student and not only the process.

Bicheno and Holweg (2016) note that DMAIC can be used for the smallest process change as well as at various levels e.g. policy deployment, organisational change, and training. De Mast and Lokkerbol (2012) note that DMAIC is an approach to solving a problem having similar functions to the PDCA.

5.2.3 Discussion: Value Stream Mapping

Participants found the concept of using process flows and drawing flows to analyse and streamline a process as useful. The VSM received a score of 3.0 similar to the DMAIC. Cudney (2018) notes that the advantage of Value Stream Mapping is that it requires participants to understand the bigger picture, delivering a process that is of value, mapping what needs to be done before looking at an improvement strategy. Participants found that VSM interrogates all parts of a process, and a department needs to be clear on an outcome when using this tool. Lian and Van Landeghem (2002) note the following advantages when using VSM in that it is a visual representation of all activities, identifying value-adding steps, therefore, leading to continuous improvement, striving for perfection. It leads to knowing the customer and what they want and value. Participants in the workshop noted that VSM creates a visual flow of a process and breaks processes down into organised steps that allows for future planning. Bonaccorsi et al. (2011) state that VSM enhances service performance by identifying and tackling criticalities; it is the preferred way to plan and implement change.

5.2.4 Discussion: PDCA

Soković (2010) notes that the purpose of PDCA is to improve processes, and according to Gupta (2006), it plays an important role in quality management. It teaches an institution how to plan, do, and check to see if it conforms and acts on what has been learned (Johnson, 2002). Participants scored the PDCA at 2.0 in the partially useful category. The reason for this was not because it was not useful, but the participants found that it was similar to DMAIC and rather preferred using DMAIC than the PDCA. Bicheno and Holweg (2016) note that PDCA and DMAIC cycles can be used for the smallest process change and at various levels from Hoshin, Policy deployment, organisational change, training to value stream implementation.

It should also be noted had the PDCA been used before the DMAIC, it could perhaps have had a higher score and a different outcome.

5.2.5 Discussion: The Fishbone Diagram

Bilsel and Lin (2012) note that when a problem occurs, the cause of the problem should be identified and fixed and the Fishbone diagram is a popular tool to help with this. The Fishbone diagram was the tool the staff least interacted with. As noted in Chapter 4 the Fishbone was the tool that the participants did not interact with due to it being last in the Workshop programme, and that they were tired and just not interested in drawing another process. One may think that the visual representation of a fish may attract people to use and interact more with it, but this was seemingly not the case with this group of participants. Another deduction from this can also be that the participants are not interested in what causes a problem but that they have more interest in fixing the problem, finding a solution, and making it work. There is more focus on addressing the symptom and not the root cause.

5.3 Use of *Lean* Orientated Tools and Practices to Analyse and Improve Processes

These specific *Lean* orientated tools and practices were selected to make staff think about the way they do things, to analyse a process, and to see how they can go about improving their work. The aim of the research was however not to find the perfect result with only one specific *Lean* orientated tool or practice but to have the exposure to a variety of *Lean* orientated tools and practices to experience and learn from these, to see the value that they can add and create within their working environment. It was, therefore, preferable to give staff a choice of similar *Lean* orientated tools and practices.

Ultimately, one would like them to become accustomed to more of the *Lean* orientated tools and practices so that they use them continuously to improve their work and to find better ways of doing things.

5.4 Implications

The *Lean* orientated tools and practices were chosen to allow for employee participation in drawing up process maps, taking their ideas and suggestions into account, allowing them to make positive contributions to the change. In participating in compiling process maps, understanding of processes was ensured as well as creating awareness amongst staff of the reason for completing certain tasks.

Drawing up process maps is not just to the benefit of the service department but all the stakeholders of the University, as it results in satisfied customers because there are clearly defined processes. Kang and Manyonge (2014) note that *Lean* programmes can have a significant impact on higher education. However, for institutions to do this, change is required, and processes and practices need to be revised. There were several reasons for selecting these *Lean* orientated tools and practices and it was hoped that staff could, through practically experiencing these practices, decide on one or more to use going forward in their working environments. The workshop exercise brought to the foreground that processes and rules are in place but not consistently followed or applied and that it is important to analyse and improve processes. Staff realised the value of having a visible process and how much easier a process can be changed when there is a visible flow.

5.5 Proposing a Wits Process Flow Framework

Balzer (2010) notes that in most universities, leaders do not always step back to have a holistic view of all processes to discover the problems experienced by staff. There is often no framework guiding them as to how a process can be changed or improved. With a framework in place, there are opportunities to improve the method and tools as well as evolving practices in the framework based upon further codification of best practices. The framework is a means by which service departments should be able to facilitate the improvement of each of their processes which can then lead to improved service levels.

This research discovered the *Lean* orientated tools and practices that Faculties and other service departments within the University would be able to utilise within their offices to draw up process maps of their current or new processes with which to analsye and improve their administrative processes to improve service levels, create value and eliminate waste. By exposing staff to five *Lean* orientated tools and practices to experiment with, they were allowed to experience first-hand the value of applying *Lean* orientated tools and practices to their environment, to draw up a process map of a process to get the best value from it, creating new process maps and in the same instance deleting duplicated steps that create waste.

The research identified three *Lean* orientated tools and practices recommended for constructing a Wits Process Flow Framework. These three tools are:

- Six Honest Serving Men,
- DMAIC,
- Value Stream Map (VSM).

The three *Lean* orientated tools and practices are suggested in a Wits Process Flow Framework (Refer to Annexure H). The framework suggests a process on how to use these *Lean* orientated tools and practices to draw up process maps of new processes or process changes. The following discussion will highlight how the framework would work and could be used. It is hoped that this framework will create awareness amongst staff and stakeholders and be used in staff training and succession planning sessions to make staff aware of the importance of analyzing a process and how this can be done by using process maps. The Wits Process Flow Framework will be recommended to the broader University community, to assist service departments within the University to draw up process maps to analyse and improve their administrative processes.

5.5.1 Wits Process Flow Framework: Step by Step Guide

The Wits process flow framework is a structured four-step approach with each step having a specific focus and method to achieve the desired outcome. It is hoped that this framework will assist service departments within the university to transform their levels of service and inform managerial approaches when implementing and changing processes within a service department. Figure 22 below is an illustration of the Wits Process flow framework noting the four steps to follow when using this framework.

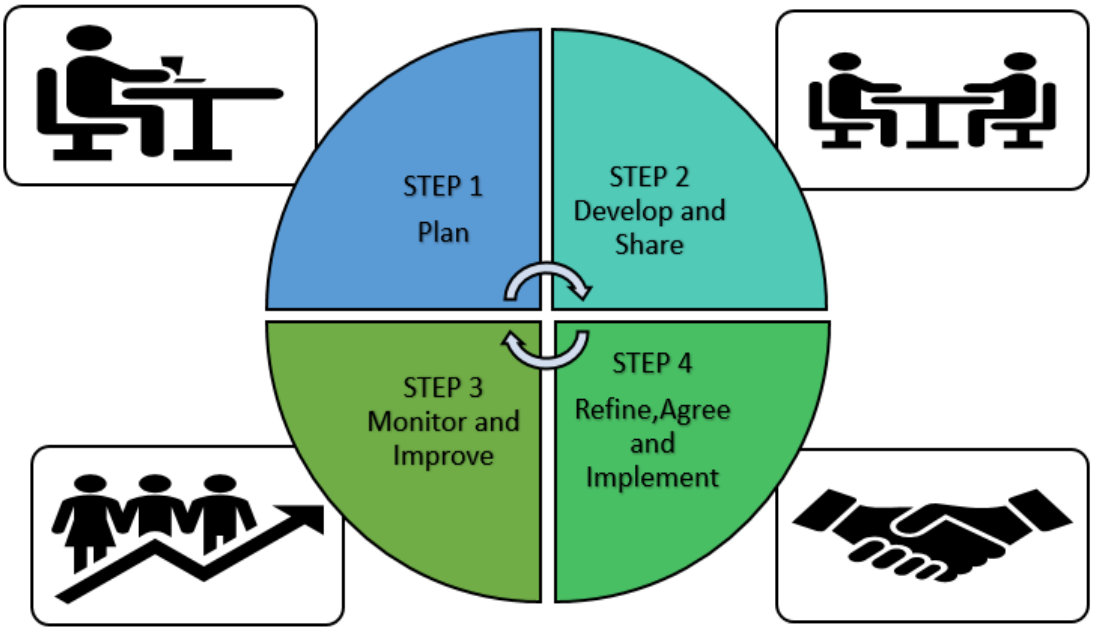


Figure 22: Wits Process Flow Framework

Figure 23: Wits Process Flow Framework Step by Step Guideline illustrates the four steps a service department will follow when using this framework to either introduce a new process within their department or when improving/changing a current process within the department.

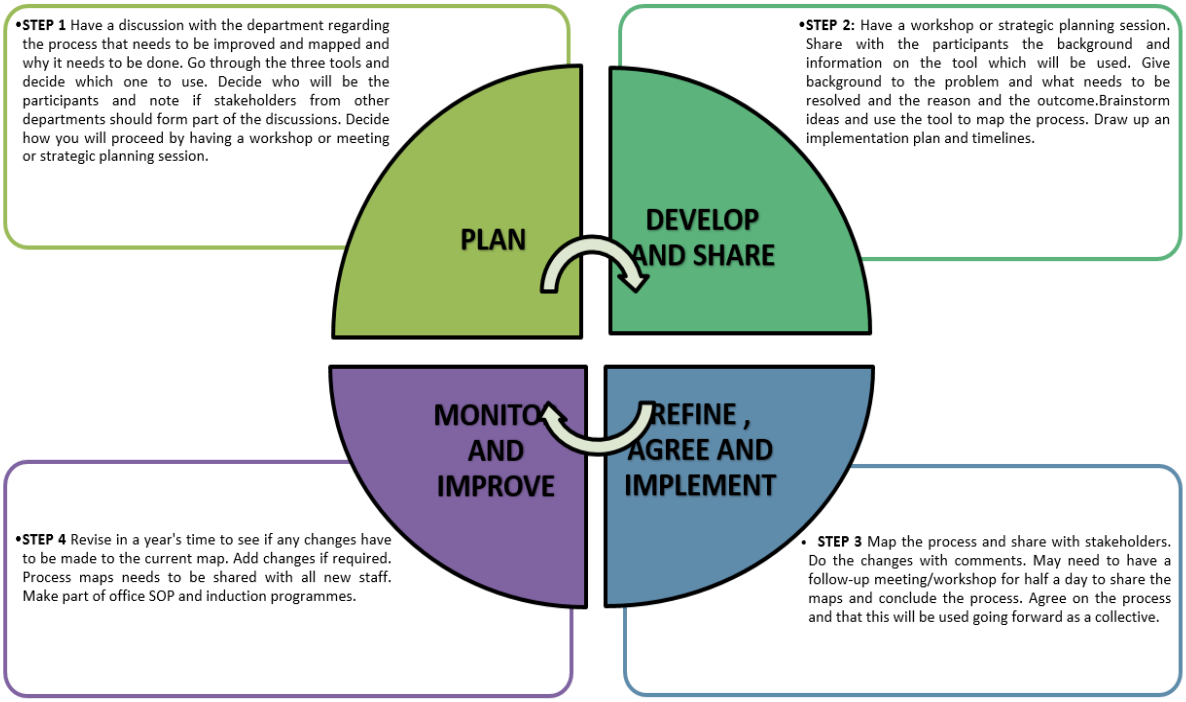


Figure 23: Wits Process Flow Framework: Step by Step Guideline

In the following section, a detailed breakdown is given for each of the four steps when using this framework.

5.5.2 Wits Process Flow Framework – Breakdown of Each Step

STEP 1: PLAN

The Head of a Faculty or Manager of a service department would identify a specific process that needs improvement, or a new process that is being introduced, which will need a plan of action as to how these new processes will be introduced. For this planning and decision making it is suggested that use is made of the Six Honest Serving Men. This *Lean* orientated practice requires the Manager to ask specific pertinent questions before starting to map out how the process will be implemented or change the current one. The Manager can decide on how the current or new process maps is to be presented to staff regarding the steps that need to be followed in doing their daily work. To draw up a process flow, it is recommended that the Manager make use of one of the following *Lean* orientated tools and or practice namely:

(1.) Value Stream Mapping (VSM), or
(2.) DMAIC (Define, Measure, Analyse, Improve, and Control).

If the Manager decides to use DMAIC it would be recommended that the Manager first with staff analyse the process for which the process maps needs to be drawn up, then define the process and suggest improvements. Once the improvements have been agreed upon the impact can be measured over an agreed period ensuring the desired outcome is achieved.

STEP 2: DEVELOP AND SHARE

In this step, the Manager will convene a workshop, in which s/he will explain the process that will be used to draw up the process maps. The Manager may want to use at the start of the process the Honest Six Serving Men to get the thought process going. Process maps will be drawn up by using either the VSM or DMAIC and for this part of the framework, there will be a specific focus on the following legs of the VSM and DMAIC:

- If **VSM** is used**:** The current and future state and an implementation plan
- If **DMAIC** is used**:** Define, Measure, Analyse and Improve

STEP 3: AGREE, REFINE AND IMPLEMENT

This step will happen after the workshop has taken place, refining, and finalising the process maps that took place during the workshop. The maps will be shared with staff for input and changes. The Maager may want to have a meeting or smaller (2-hour) workshop to work through the maps and to agree and conclude on the new process with all the stakeholders.

STEP 4: MONITOR AND IMPROVE

Once the processes map has been introduced into the daily work of the office it needs to be monitored to see if it is assisting with the work processes to make them easier and more efficient. It is recommended that this should be done every six months to a year depending on the cycle of the process. If there are any changes or improvements, the process maps will need to be amended accordingly and it may sometimes mean that not the whole process is changing but only a part of it to make it efficient again.

For this part of the framework, there will be a specific focus on the following legs of VSM and DMAIC:

- If **VSM** is used**:** Implementation and monitoring of the improvement plan
- If **DMAIC** is used**:** Control, to ensure that the suggested plan or improvements work

It is recommended that all process flow diagrams be revisited at least once a year to ensure relevance.

5.6 Conclusion and Final Thoughts

In conclusion, the final thoughts from the participants were that the workshop was a valuable exercise, especially regarding the deliberations that took place, the information that was shared, working together as a collective, and learning from each other. Although Wits Plus and the Faculties work differently, there is value in the collective thinking about processes. There is always a need to rethink a process, before falling into a rut of doing things and not taking time to consider other ways or methodologies. It also started to create awareness of the various *Lean* orientated tools and practices and the value these can add to the University. The three lean orientated tools and practices the workshop participants found most useful in assisting them to analyse and improve their administrative processes were included and proposed in a Wits Process Flow framework.

Chapter 6: Conclusion and Recommendations

6.1 Introduction

In this chapter, the Wits Process Flow Framework is presented as well as any further recommendations for future research that may be undertaken.

6.2 Research Question and Objectives

The main research question is:

Which Lean orientated tools and practices can be recommended in a process flow framework to support the analysing and improvement of administrative processes at Wits?

The main objectives of the research as set out in Chapter 1 that was reached by the completed research was:

1. ***To experiment with five Lean orientated tools and practices to analyse the Wits Readmissions (WRC) process between Wits Plus and Faculty A to identify improvement opportunities.***

   This objective was reached in Chapter 4 where the diagrams show how the WRC process was analysed by using the various tools and practices and the improvement plans that were drawn up from the exercises.

2. ***To evaluate the Lean orientated tools and practices to see which ones support the analysing and improvement of processes;***

This objective was reached in Chapter 4 and Chapter 5. Chapter 4 shows how the five tools and practices were rated by the workshop participants in the grading categories of most useful, useful, partially useful, and not useful. The findings were discussed in more detail in Chapter 5.

3. ***To use the findings to develop and propose a Wits Process Flow Framework that can be used to analyse and improve administrative processes at Wits. This Lean orientated framework will be recommended for future use to all Wits Faculties and service departments***.

This objective was reached and discussed in Chapter 5. By using the findings of the workshop Value Stream, DMAIC, and the Six Honest Serving Men were identified as being the preferred *Lean* orientated tools and practices that would be used in the future to support Wits staff to the analyse and improve their administrative processes.

6.3 Shortcomings in the Findings of the Research

In the section below the author highlights some points which can be potential shortcomings of the findings gathered and it is therefore important to note them as they may have an impact on the findings.

6.3.1 Pre-Interviews

Semi-structured interviews undertaken with one staff member from both Wits Plus and one from Faculty A may be a shortcoming. Other staff members from within Wits Plus and Faculty A, as well as the other Faculties who participated in the workshop, could have been interviewed. In excluding them, they may feel that they have been disadvantaged as they were not able to state their views.

They may have had a different view of the *Lean* orientated tools and practices if they were interviewed alone and not part of the group. The author, however, feels that they were able to state their views during their participation in the workshop. Another shortcoming in just choosing to interview one staff member from Wits Plus and Faculty A could be that these staff know the author and that they did not want to disappoint the author and therefore agreed to participate. The author however feels that the staff had an opportunity before the interviews started to inform the author that they did not want to participate as the question was posed to them by the author if they were comfortable participating.

6.3.2 Sample Size

A small sample size of participants sharing similar characteristics was used in the research, which was based on a purposive sampling method using a qualitative methodology that works successfully with small sample sizes when participants share similar characteristics. The researcher believes that the findings gathered from this sample size are appropriate, although due to the small number of participants working together in the workshop, they could have influenced one another concerning the outcome of the findings of the tools. The staff interviewed are also the only staff that currently deals with the WRC process in the Faculties and Wits Plus.

6.3.3 Tools

The fact that the staff did not interact with the same enthusiasm towards the Fishbone Diagram as to the other tools could raise the question if participants got tired towards the end and that there were perhaps too many tools for them to use in the session. Workshop participants could have influenced one another; if one did not understand the diagram the participant could have persuaded the others to display the same hesitation to engage with the diagram. The researcher, however, believes that the findings gathered for the Fishbone are correct and participants were allowed to express their views and to engage with it. If the study is repeated and a different sample size of participants chosen, or if the Fishbone Diagram is placed earlier in the workshop, the result may be different. Participants also found DMAIC and PDCA similar so if the study is repeated only one of these tools should be used or if both are used, the PDCA could be introduced before the DMAIC to see if the outcome is different in that the PDCA would be favoured more than the DMAIC.

6.3.4 Post-Interviews

Post-Interviews were undertaken with the same members of staff interviewed during the pre-interview sessions. Other participants in the workshop were not part of the post-interviews and might feel disadvantaged for not being part of these post-interviews and thereby given a chance to justify their preferences of *Lean* orientated tools and practices. The author, however, feels that all participants engaged in the discussions during the workshop and did make use of the opportunity to express their views and justify their choice of them. The author is however aware that she could have swayed the decisions made by the group and that they may not have wanted to admit that a *Lean* orientated tool or practice did not work and disappoint the author. The author, however, feels that the participants used the opportunity at the end of the workshop to express their views as participants noted that they think using five *Lean* orientated tools and practices at one workshop was ambitious.

6.4 Further Future Recommendations

The researcher would like to make the following recommendations for future research in this regard:

- If a similar study were repeated, it would be suggested that a different participant sample be included in the research as far as size and levels of employments are concerned as this can refine the findings of the *Lean* orientated tools and practices.
- That with a similar study, the possibility of using fewer *Lean* orientated tools and practices can be explored or even only one *Lean* orientated tool and or practice.
- That in a similar study, more participants from different backgrounds can be included as different minds can change the outcome of the findings concerning which *Lean* orientated tools and practices are preferred.
- That with a similar study participants can be divided into two groups to see if there may be a different outcome concerning the *Lean* orientated tools and practices that they prefer.
- That a similar study can make use of a scoring matrix that the staff can complete during the workshop.
- If the Fishbone diagram is used, it may be valuable to include the services of a postgraduate student, a professional industrial engineer, or business analyst to facilitate digging deeper into the root causes of a specific process.
- If both the PDCA and DMAIC are used, the PDCA could be used before DMAIC to see if there would be a different result.
- A follow-up study should happen within six months to see if the framework is being used.
- In a future workshop, time should be spent discussing and exploring the principles of Lean
- Root cause analysis should be included in a future workshop.

6.5 Conclusion and Final Thoughts

Five *Lean* orientated tools and practices were identified and workshopped with Wits Plus and Faculties to answer the main objective of the research question, namely which *Lean* orientated tools and practices can be recommended in a process flow framework to support the analysing and improvement of administrative processes at Wits. The Wits Readmissions (WRC) process was used to identify improvement opportunities and three *Lean* orientated tools and practices, Six Honest Serving Men, DMAIC, and Value Stream Mapping were identified as the preferred tools to use to develop a process flow framework. Other findings indicated a gap in the knowledge amongst staff about *Lean* orientated tools and practices and the value they can add to analyse and improve processes. The interviews confirmed that the staff felt that they are working in silos, getting a job done without consideration as to how it is done. The workshop and interviews confirmed the limited role Wits Plus plays when dealing with their students' processes affecting them and the Faculties they work with. Due to this, their students are not always getting the same opportunities as other students, or the part-time students get more opportunities than is afforded to full-time students. Silos need to be broken down between the different departments, wherein staff need to work together to foster collaboration and improve overall performance. Efforts on improving processes need to involve the entire University.

The study concluded that many administrative processes within Faculties at Wits are not formally written down and staff are reliant on the experience and memories of colleagues who have been at the University for many years. There needs to be visible strategic leadership when processes need to be changed and this requires proactive leadership from managers to take responsibility for their management roles and engage their teams in looking for ways to improve service levels. There need to be common goals to improve service standards, implementing and adhering to specified service levels that can enable the integration of various departments by ensuring dynamic and uniform information and process maps.

There needs to be a focus on front-end service delivery and more use should be made of technology to play a role in facilitating information flows through improved data sharing and collaboration.

As was noted at the beginning of this research the aim was not to implement Lean. If *Lean* is to be implemented there needs to be proactive change strategies driven by the Leadership of the University to change the environment. Staff need to be trained to understand what will be expected of them with open communication from managers sharing information and encouraging staff. Progress will need to be monitored, and staff will have to feel that they can participate in the *Lean* change, that they will be empowered to make the required changes, and that they will receive recognition for bringing about change. Wits is not at this point yet but there is no reason not to find ways in which *Lean* practices can be used at Wits to start to support the process.

In conclusion, *Lean* orientated tools and practices can provide a vehicle for developing process maps that staff can comfortably use to analyse and improve their administrative processes. Klotz et al. (2008) note that process mapping enables the representation of business processes and that maps allow for the visualisation and controlling activities of an organisation. According to them, the visibility increases transparency or process visibility. It is therefore anticipated that process maps create awareness and visibility support the streamlining of services within the University. It can also form part of departments and Faculties' standard operating procedures, staff induction, and training.

Service departments at Wits are sometimes reluctant to adapt to change. There is, however, value to be seen when *Lean* orientated tools and practices are introduced, and it is worth our while to consider *Lean* techniques to improve service levels within the service departments at Wits. There may still be a long way to go but there is a need to make staff aware of *Lean* methodologies and the value that it can bring to a system. It may be the right time to start thinking differently about processes, the way things are done, and not always complaining that a process is not working.

In the words of Henry Ford 'Don't find fault, find a remedy' (Ford, 2016).

7. References

Abawi, K., 2008. Qualitative and quantitative research. *World Health*.

Alshenqeeti, H., 2014. Interviewing as a data collection method: A critical review. *English Linguistics Research*, *3*(1), pp.39-45.

Ambekar, S., 2016. Exploring the application of lean principles to management education in India. *EXCEL International Journal of Multidisciplinary Management Studies*, *6*(6), pp.1-13.

Antony, J., Krishan, N., Cullen, D. and Kumar, M., 2012. Lean Six Sigma for higher education institutions (HEIs). *International Journal of Productivity and Performance Management*.

Antony, J., 2014. Readiness factors for the Lean Six Sigma journey in the higher education sector. *International Journal of Productivity and Performance Management*, *63*(2), pp.257-264.

Asnan, R., Nordin, N. and Othman, S.N., 2015. Managing change on lean implementation in service sector. *Procedia-Social and Behavioral Sciences*, *211*, pp.313-319.

Atkinson, P., 2004. Creating and implementing lean strategies. *Management Services*, *48*(2), p.18.

Ballé, M., Beauvallet, G., Smalley, A. and Sobek, D.K., 2006. The thinking production system. *Reflections*, *7*(2), pp.1-12.

Balzer, W.K., Francis, D.E., Krehbiel, T.C. and Shea, N., 2016. A review and perspective on Lean in higher education. *Quality Assurance in Education*.

Balzer, W.K., 2010. *Lean higher education: Increasing the value and performance of university processes*. Productivity Press.

Baysinger, G., 1997. *Workshops: Advantages, Disadvantages and Considerations,* accessed 2018, https://web.stanford.edu/group/swain/cinf/workshop97jun/wrkshpadvdis.html

Beckers, D.K., 2015. *Reducing waste in administrative services with lean principles* (Master's thesis, University of Twente).

Bendall, F. and Marra, T., 2005. *Six Sigma Black Belts: What Do They Need to Know*. Journal of Quality Technology (Vol. 33, No 4).

Bhatia, N. and Drew, J., 2006. Applying lean production to the public sector. *The McKinsey Quarterly*, *3*(1), pp.97-98.

Bicheno, J. and Holweg, M., 2016. *The lean toolbox: A handbook for lean transformation*. Buckingham: Picsie Books, p.1.

Bilsel, R.U. and Lin, D.K., 2012. Ishikawa cause and effect diagrams using capture recapture techniques. *Quality Technology & Quantitative Management*, *9*(2), pp.137-152.

Björnfot, A., Bildsten, L., Erikshammar, J., Haller, M. and Simonsson, P., 2011, July. Lessons learned from successful value stream mapping (VSM). In *19Th Annual Conference Of The International Group For Lean Construction, Lima*.

Bonaccorsi, A., Carmignani, G. and Zammori, F., 2011. Service value stream management (SVSM): developing lean thinking in the service industry. *Journal of Service Science and Management*, *4*(04), p.428.

Brochado, A., 2009. Comparing alternative instruments to measure service quality in higher education. *Quality Assurance in education*.

Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J. and Neville, A.J., 2014, September. The use of triangulation in qualitative research. In *Oncology nursing forum* (Vol. 41, No. 5).

Cohen, L., Manion, L., Morrison, K. and Morrison, R.B., 2007. Research methods in education" Routledge.

Comm, C.L. and Mathaisel, D.F., 2005. A case study in applying lean sustainability concepts to universities. *International Journal of Sustainability in Higher Education*, *6*(2), pp.134-146.

Comm, C.L. and Mathaisel, D.F., 2005. An exploratory study of best lean sustainability practices in higher education. *Quality Assurance in Education*, *13*(3), pp.227-240.

Comm, C.L. and Mathaisel, D.F., 2003. Less is more: a framework for a sustainable university. *International Journal of Sustainability in Higher Education*, *4*(4), pp.314-323.

Corbett, S., 2007. Beyond manufacturing: The evolution of lean. *The McKinsey Quarterly*, (3), p.96.

Cudney, E.A., 2018. *Using Hoshin Kanri to improve the value stream*. Productivity Press.

Dal Forno, A.J., Pereira, F.A., Forcellini, F.A. and Kipper, L.M., 2014. Value Stream Mapping: a study about the problems and challenges found in the literature from the past 15 years about application of Lean tools. *The International Journal of Advanced Manufacturing Technology*, *72*(5-8), pp.779-790.

De Jager, J. and Gbadamosi, G., 2010. Specific remedy for specific problem: measuring service quality in South African higher education. *Higher education*, *60*(3), pp.251-267.

De Mast, J. and Lokkerbol, J., 2012. An analysis of the Six Sigma DMAIC method from the perspective of problem solving. *International Journal of Production Economics*, *139*(2), pp.604-614.

Dennis, A.R., 1996. Information exchange and use in small group decision making. *Small Group Research*, *27*(4), pp.532-550.

Dennis, P., 2017. *Lean Production simplified: A plain-language guide to the world's most powerful production system*. Crc press.

Dickeson, R.C., 2010. *Prioritizing academic programs and services: Reallocating resources to achieve strategic balance, revised and updated*. John Wiley & Sons.

Dörnyei, Z., 2007. Research Methods in Applied Linguistics: Quantitative. *Qualitative and*.

Emiliani, B., Kensington, C. and Most, U.S., 2005. Lean in higher education. *Center for Lean Business Management. Available at http://www. superfactory. com/articles/lean_higher_ed. aspx*.

Etikan, I., Musa, S.A. and Alkassim, R.S., 2016. Comparison of convenience sampling and purposive sampling. *American journal of theoretical and applied statistics*, *5*(1), pp.1-4.

Francis, D., 2014. Lean and the learning organization in higher education. *Canadian Journal of Educational Administration and Policy*, (157).

Ford, H., 2016. Don't find fault, find a remedy.

Ganguly, K., 2012. Improvement process for rolling mill through the DMAIC six sigma approach. *International Journal for quality research*, *6*(3), pp.221-231.

George, M.L., 2003. How to use lean speed and Six Sigma quality to improve services and transactions.

Gould, P., 2018. Quality is King. *Using 'Six Honest Serving Men' as a problem analysis tool*, accessed 28 May 2019, https://qualityisking.co.uk/2018/03/using-six-honest-serving-men-as-a-problem-analysis-tool/

Gupta, Praveen. "Beyond PDCA-A new process management model." *Quality progress* 39, no. 7 (2006): 45.

Hines, P. and Lethbridge, S., 2008. New development: creating a lean university. *Public Money and Management*, *28*(1), pp.53-56.

Houston, D., 2008. Rethinking quality and improvement in higher education. *Quality Assurance in Education*.

Huntzinger, J., 2002. The roots of Lean. Training Within Industry: The origin of Kaizen. Association for Manufacturing Excellence, 18, No. 2.

Ilie, G. and Ciocoiu, C.N., 2010. Application of fishbone diagram to determine the risk of an event with multiple causes. *Management Research and Practice*, *2*(1), pp.1-20.

Jansen, J., 2018. *Political parties don't give a dam about the future of education,* accessed June 2018, https://www.timeslive.co.za/ideas/2018-01-18-political-parties-dont-give-a-damn-about-the-future-of-education/

Johnson, C.N., 2002. The benefits fo PDCA. *Quality Progress*, *35*(5), p.120.

Jørgensen, F., Matthiesen, R., Nielsen, J. and Johansen, J., 2007. Lean maturity, lean sustainability. In *Advances in production management systems* (pp. 371-378). Springer, Boston, MA.

Kang, P. and Manyonge, L., 2014. Exploration of lean principals in higher educational institutes–based on degree of implementation and indigence.

Klotz, L., Horman, M., Bi, H.H. and Bechtel, J., 2008. The impact of process mapping on transparency. *International Journal of Productivity and Performance Management*, *57*(8), pp.623-636.

Kothari, C.R., 2004. *Research methodology: Methods and techniques*. New Age International.

Laerd, *Purposive sampling*, accessed 16 November 2018, http://dissertation.laerd.com/purposive-sampling.php

Leite, H.D.R. and Vieira, G.E., 2015. Lean philosophy and its applications in the service industry: a review of the current knowledge. *Production*, *25*(3), pp.529-541.

Lian, Y.H. and Van Landeghem, H., 2002, October. An application of simulation and value stream mapping in lean manufacturing. In *Proceedings 14th European Simulation Symposium* (pp. 1-8). c) SCS Europe BVBA.

Lynch, D.P., Bertolino, S. and Cloutier, E., 2003. How to scope DMAIC projects. *Quality progress*, *36*(1), pp.37-41.

McDaniel, M.A., Whetzel, D.L., Schmidt, F.L. and Maurer, S.D., 1994. The validity of employment interviews: A comprehensive review and meta-analysis. *Journal of applied psychology*, *79*(4), p.599.

McDonald, P., 2010. Teaching the concept of management: Perspectives from 'six honest serving men'. *Journal of Management & Organization*, *16*(5), pp.626-640.

McManus, H.L., Haggerty, A. and Murman, E., 2007. Lean engineering: a framework for doing the right thing right. *The aeronautical journal*, *111*(1116), pp.105-114.

Melton, T., 2005. The benefits of lean manufacturing: what lean thinking has to offer the process industries. *Chemical engineering research and design*, *83*(6), pp.662-673.

Moen, R. and Norman, C., 2006. Evolution of the PDCA cycle.

Netland, T.H. and Powell, D.J., 2017. A lean world. *The Routledge Companion to Lean Management. Routledge, New York*.

Nightingale, D., 1999. Lean Enterprise Model.

Noble, H. and Smith, J., 2015. Issues of validity and reliability in qualitative research. *Evidence-based nursing*, *18*(2), pp.34-35.

Norris, N., 1997. Error, bias and validity in qualitative research. *Educational action research*, *5*(1), pp.172-176.

Oliveira-Brochado, A. and Marques, R.C., 2007. *Comparing alternative instruments to measure service quality in higher education* (No. 258). Universidade do Porto, Faculdade de Economia do Porto.

Olivia, n.d. Choosing an Interview Type for *Qualitative Research,* accessed 12 November 2018, https://www.statisticssolutions.com.

Ørngreen, R. and Levinsen, K., 2017. Workshops as a Research Methodology. *Electronic Journal of E-learning*, *15*(1), pp.70-81.

Patton, M.Q., 1999. Enhancing the quality and credibility of qualitative analysis. *Health services research*, *34*(5 Pt 2), p.1189.

Patton, M.Q., 2015. Qualitative Research, Encyclopedia of Statistics in Behavioral Science.(Brian S. Everitt & David C. Howell, Eds.).(1633-1636).

Picarillo, A.P., 2018. Introduction to quality improvement tools for the clinician. *Journal of Perinatology*, *38*(7), p.929.

Radnor, Z. and Bucci, G., 2011. Analysis of lean implementation in UK business schools and universities. *Association of Business Schools, London*.

Radnor, Z., Walley, P., Stephens, A. and Bucci, G., 2006. Evaluation of the lean approach to business management and its use in the public sector. *Scottish Executive Social Research*, *20*, pp.1-6.

Radnor, Z. and Walley, P., 2008. Learning to walk before we try to run: adapting lean for the public sector. *Public money and management*, *28*(1), pp.13-20.

Rahman, M.S., 2017. The Advantages and Disadvantages of Using Qualitative and Quantitative Approaches and Methods in Language" Testing and Assessment" Research: A Literature Review. *Journal of Education and Learning*, *6*(1), pp.102-112.

Rother, M. and Shook, J., 2003. *Learning to see: value stream mapping to add value and eliminate muda*. Lean Enterprise Institute.

Schroeder, R.G., Linderman, K., Liedtke, C. and Choo, A.S., 2009. Six Sigma: Definition and underlying theory. *Quality control and applied statistics*, *54*(5), pp.441-445.

Sehgal, S. and Kaushish, D., 2015. A State of art of review of DMAIC approach. *International Journal of Science and Research*, *4*(8), pp.450-452.

Seddon, J., O'Donovan, B. and Zokaei, K., 2011. Rethinking lean service. In *Service Design and Delivery* (pp. 41-60). Springer, Boston, MA.

Snee, R.D., 2007. Use DMAIC to make improvement part of 'the way we work'. *Quality Progress*, *40*(9), pp.52-54.

Snee, R.D., 2010. Lean Six Sigma–getting better all the time. *International Journal of Lean Six Sigma*.

Sokovic, M., Pavletic, D. and Pipan, K.K., 2010. Quality improvement methodologies–PDCA cycle, RADAR matrix, DMAIC and DFSS. *Journal of achievements in materials and manufacturing engineering*, *43*(1), pp.476-483.

Sufi, S., Nenadic, A., Silva, R., Duckles, B., Simera, I., de Beyer, J.A., Struthers, C., Nurmikko-Fuller, T., Bellis, L., Miah, W. and Wilde, A., 2018. Ten simple rules for measuring the impact of workshops.

Svensson, C., Baessa, M.A. and Bakhsh, M.M., 2013, September. Establishing a lean six sigma program in higher education. First International Conference on LSS for Higher Education.

Tyagi, S., Cai, X., Yang, K. and Chambers, T., 2015. Lean tools and methods to support efficient knowledge creation. *International Journal of Information Management*, *35*(2), pp.204-214.

Wilson, J., 2009. Directions to discovery. *Industrial Engineer*, *41*(4), pp.38-43.

Witwatersrand, U. o. t., 2019. Faculty Rules and Syllabus of Faculty of Commerce, Law and Management. Johannesburg: Wits University, accessed 01 June 2019, https://www.wits.ac.za/students/

Worley, J.M. and Doolen, T.L., 2006. The role of communication and management support in a lean manufacturing implementation. *Management decision*, *44*(2), pp.228-245.

Zhou, B., 2016. Lean principles, practices, and impacts: a study on small and medium-sized enterprises (SMEs). *Annals of Operations Research*, *241*(1-2), pp.457-474.

8. Appendices

8.1 APPENDIX A
ETHICS APPROVAL CERTIFICATE

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

SCHOOL OF MECHANICAL, INDUSTRIAL AND AERONAUTIAL ENG. ETHICS COMMITTEE
CONSTITUTED UNDER THE UNIVERSITY HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER: MIAEC 033/19**
PROJECT TITLE	Developing a framework of lean tools to be introduced at Wits. A Wits Plus case study.
INVESTIGATOR	Ms. Nicoleen Potgieter
SCHOOL/DEPARTMENT OF INVESTIGATOR	Mechanical, Industrial and Aeronautical Engineering
DATE CONSIDERED	15 March 2019
DECISION OF THE COMMITTEE	Approved unconditionally.
EXPIRY DATE	Date of submission of the project report

ISSUE DATE OF CERTIFICATE 19 Month 2019 **CHAIRPERSON** _____
(Dr. Emwanu)

cc: Supervisor : Mrs. Teresa Hattingh

DECLARATION OF INVESTIGATOR

To be completed in duplicate and ONE COPY returned to the Chairperson of the School/Department ethics committee.

I fully understand the conditions under which I am are authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

_____ _____/_____/_____
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

8.2 APPENDIX B
PRE-INTERVIEW QUESTIONS



Pre-Interview Question
2019

1. Which cohorts of students are currently registering with Wits Plus?
2. Which rules/guidelines are currently in place to govern the life cycle of students?
3. Explain to me how the WRC process works?
4. What role does Wits Plus play in the WRC process?
5. Would you say that the WRC processes are working between Wits Plus and the Faculty?
6. Would you like to see the WRC process change and what would you like to see change?
7. Explain to me how you deal in your office with the situation when a new process is introduced?
8. What process flows if any do you have in your office?
9. Have you ever used any *Lean* tools to map processes?
10. Would you say all staff is clear on what processes they need to follow when dealing with a student/enquiry in the office?
11. Would you say it is worthwhile to map the WRC processes?

8.3 APPENDIX C
POST-INTERVIEW QUESTIONS



Post-Interview Question
2019

1. Did you find the workshop useful?
2. Did you find the mapping of the process useful?
3. Looking at all the process flows which of the tools do you think can add most value?
4. Will you use *Lean* tools in any other of your processes?
5. Which of the *Lean* tools used at the workshop do you prefer most? Why?
6. Which of the *Lean* tools used at the workshop do you least prefer? Why?
7. Do you think it is useful to map processes and why?
8. Would you recommend to other administrative units to use these tools to map their processes?

8.4 APPENDIX D
WORKSHOP AGENDA



WORKSHOP AGENDA

AGENDA			
1.	Arrival	08:45-09:00	All
2.	Welcome and Introductions	09:00-09:05	NP
3.	Aim of the Workshop	09:05-09:20	NP
4.	Lean Engineering: • Brief history on lean and the application of lean tools in Higher Education Institutions • Brief discussion on the Lean Tools that will be used during the workshop	09:20-10:00	NP
	Tea Break(10:00-10:15)		
5.	Outlining the WRC processes as it takes place between Wits Plus and Faculties	10:15-11:30	All
6.	Mapping of the WRC processes using Lean tools	11:30-13:00	All
	Lunch(13:00-14:00)		
7.	Presentation and discussion on the: • Mapping of the WRC process • New processes/points identified	14:00-15:00	All
	Afternoon Tea(15:00-15:10)		
8.	Feedback on the mapping tools used	15:10-15:45	All
9.	Outcome and the way forward	15:45-16:00	NP

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8.5 APPENDIX E
WORKSHOP PRESENTATION



Wits Plus and Faculties WRC Workshop

10 May 2019

Hofmeyr House

WITS
UNIVERSITY

APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



AIM OF THE WORKSHOP

Aim of the workshop -

1. Defining the roles between Faculties and Wits Plus in particular to look at the WRC process and the interactions between Wits Plus and Faculties.
2. To assist Wits Plus to identify possible future processes that will need to be mapped and streamlined.
3. Research report.

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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



HISTORY AND APPLICATION OF LEAN IN HE INSTITUTIONS

- Lean has its origin in the manufacturing industry – Toyota.
- Not a lot of literature on the implementation of lean in service industry especially HE.
- John Bicheno notes that 'Lean is about moving ever closer to uninterrupted flow in sequence of operations that define perfect quality'.
- Lean is about:

❑ Reducing Waste

❑ Enhancing Value

❑ Involves People

Lean cannot exist if any one of the 3 above legs are missing.

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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



WHY LEAN ?

Reasons why lean was chosen:

- Faced many times with new processes especially after #FeesMustFall.
- New processes stacked on top of one another with no thought given to the impact of this on current rules /processes or how they will be affected down the line.
- Silo's – 'silocites'
- There are various lean tools for purposes of the workshop we will use the following tools-

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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



LEAN TOOLS(1)

Value Stream Mapping



(Taken from MECN7028 Lean Manufacturing – Notes(2017))

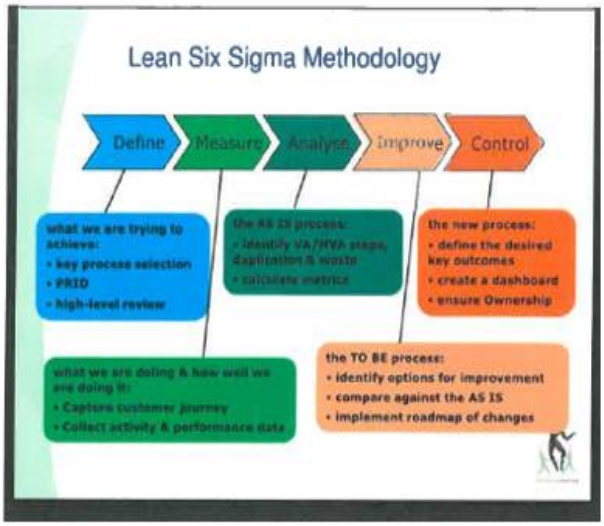
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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



LEAN TOOLS(2)

Lean Six Sigma- DMAIC Methodology



(Taken from MECN7028 Lean Manufacturing – Notes(2017))

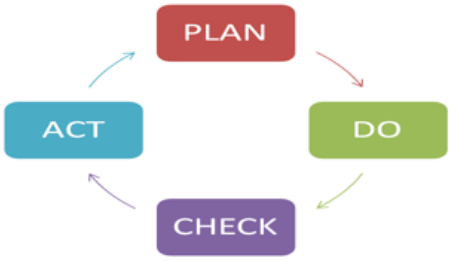
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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



LEAN TOOLS(3)

PDCA



- Which process needs to be improved- identify, get opinions
- How much needs to be improved –review
- The change that needs to be implemented- fit facts together, check practices
- How would you measure the effect of the change-how will you follow up, how often?
- What will be affected by this? (documents, procedures)

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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



LEAN TOOLS(4)

- TWI - Training Within Industry

JI • Job Instruction

JR • Job Relations

JM • Job Methods

JS • Job Safety

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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)

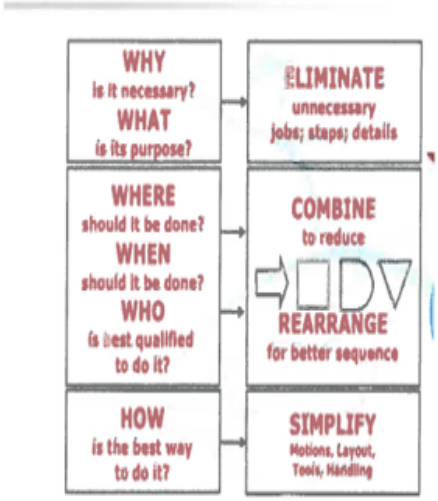


LEAN TOOLS(4)

Job Methods leg

Rudyard Kipling – Six Honest Serving Men

'I knew six honest serving men,
They taught me all I knew;
Their names are what and why and when,
and how and where and who.'



BUCKINGHAM

Lean at Wits

(Taken from MECN7028 Lean Manufacturing – Notes(2017))

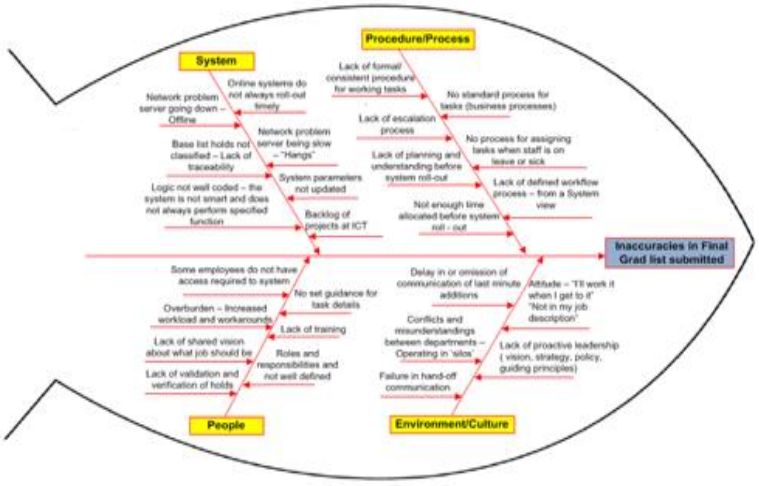
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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



LEAN TOOLS(5)

Fish Bone



(FISHBONE DIAGRAM– COMPILED AFTER THE GRADUATION WORKSHOP ON 03 SEPTEMBER 2018 (Chatur, S., (2018) *Ensuring Accuracy of Final Graduation List))*

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APPENDIX E – WORKSHOP PRESENTATION (CONTINUED)



Thee Factors for Lean Success



Understand Customer's real needs leading to clear purpose

An integrated set of appropriate Lean tools

Leadership and 'people' commitment over an extended period

From Darrell Mann

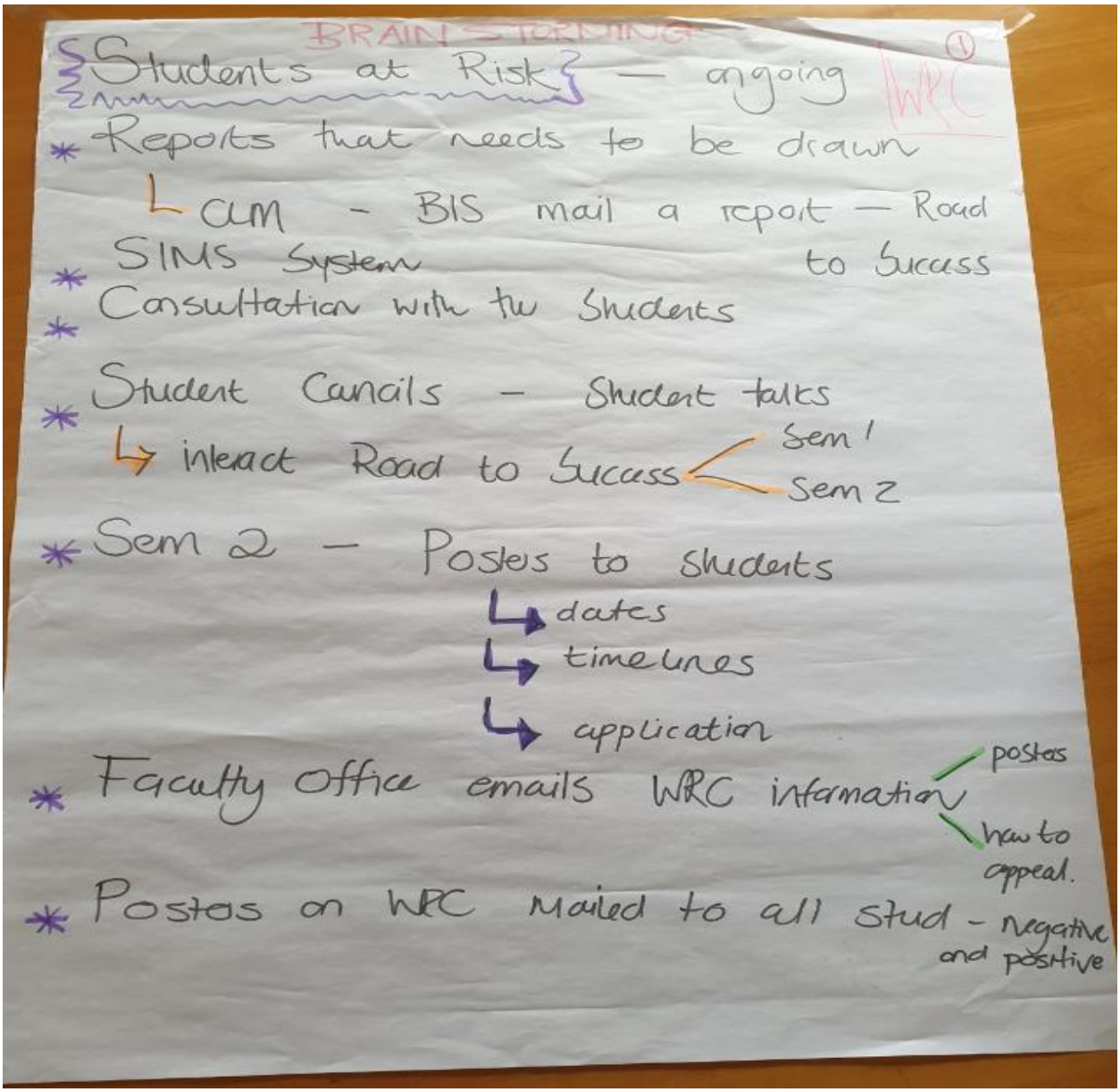
BUCKINGHAM

Lean at Wits

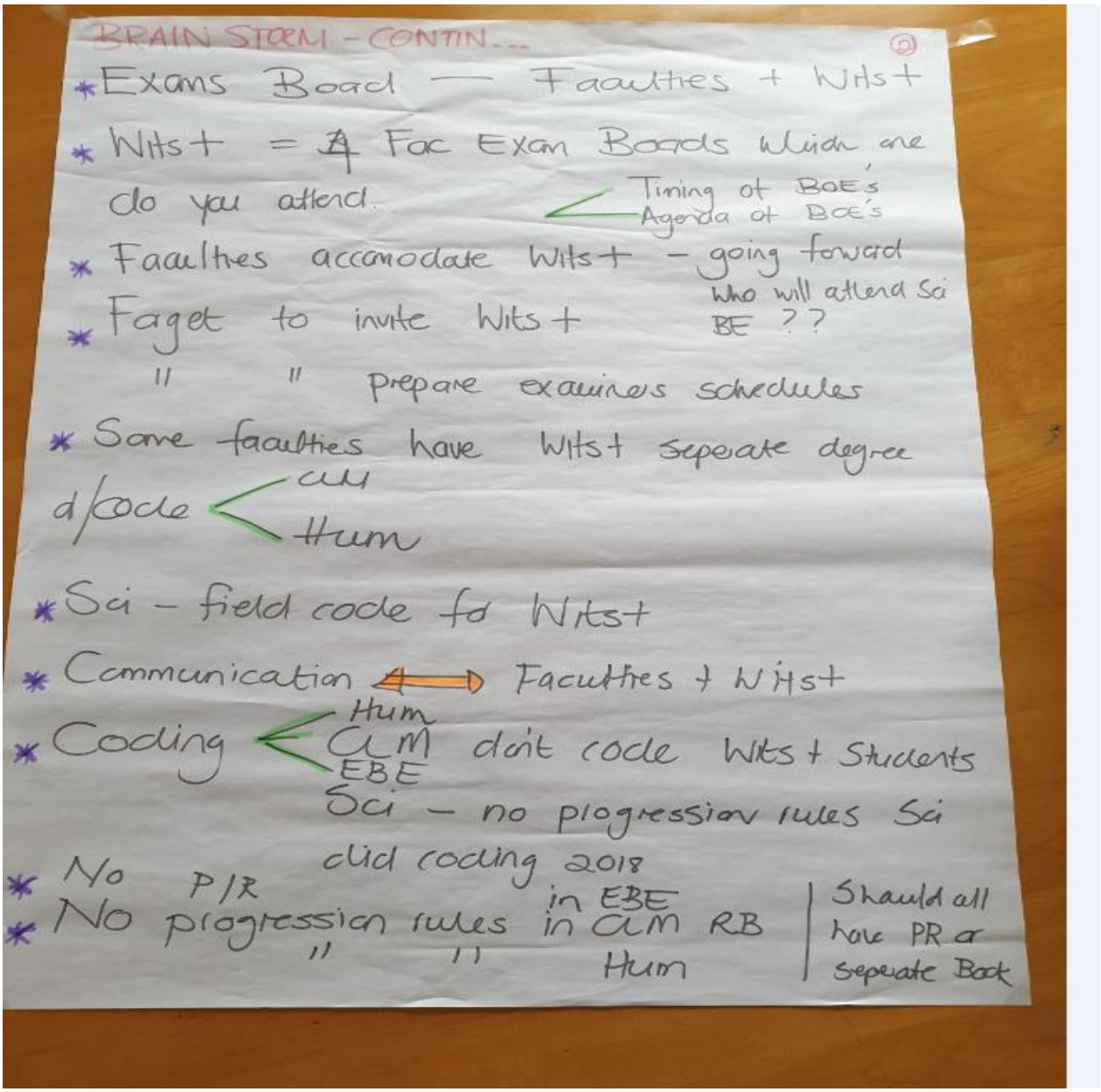
(Taken from MECN7028 Lean Manufacturing – Notes(2017))

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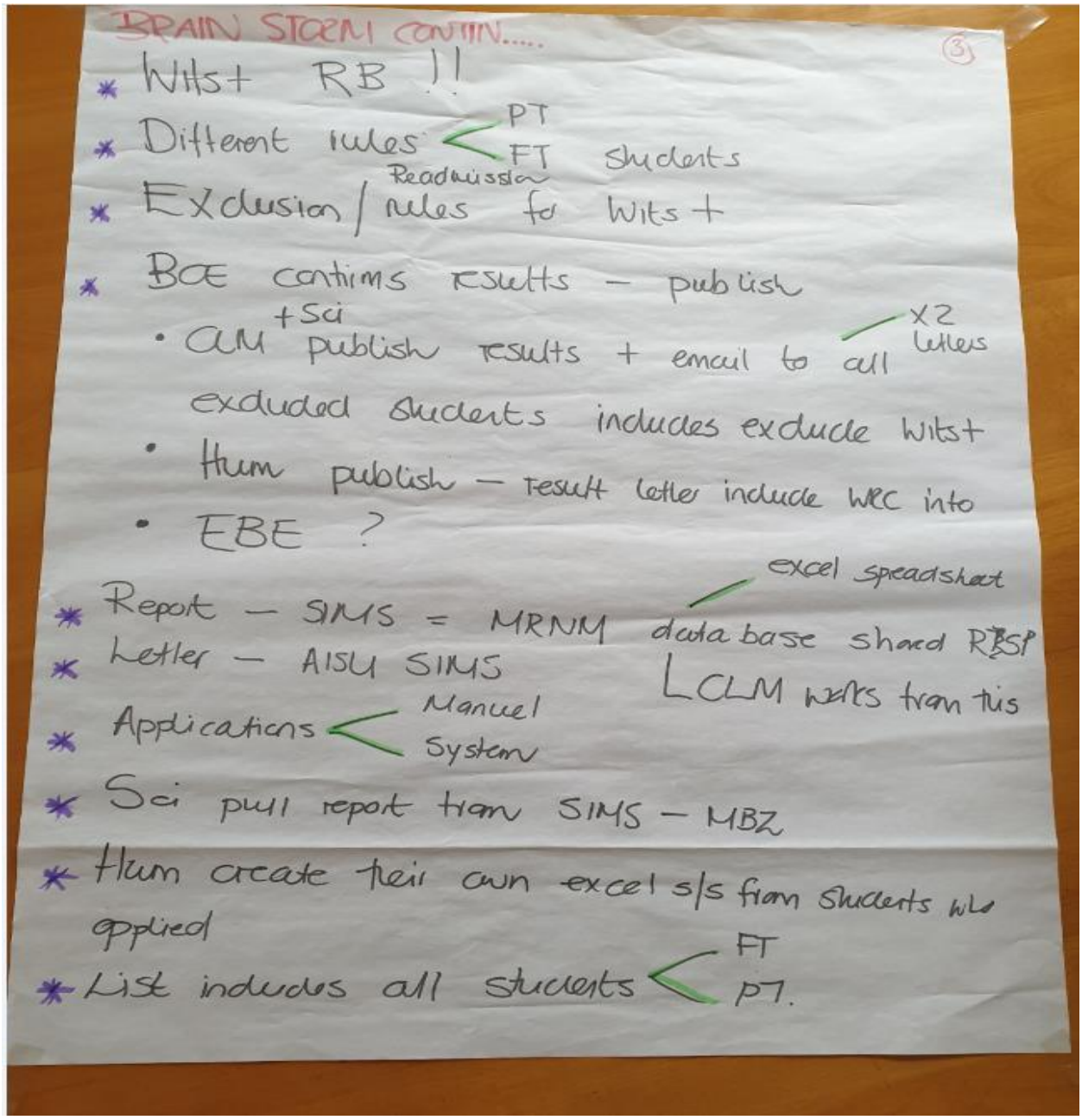
8.6 APPENDIX F:
WORKSHOP BRAINSTORMING NOTES



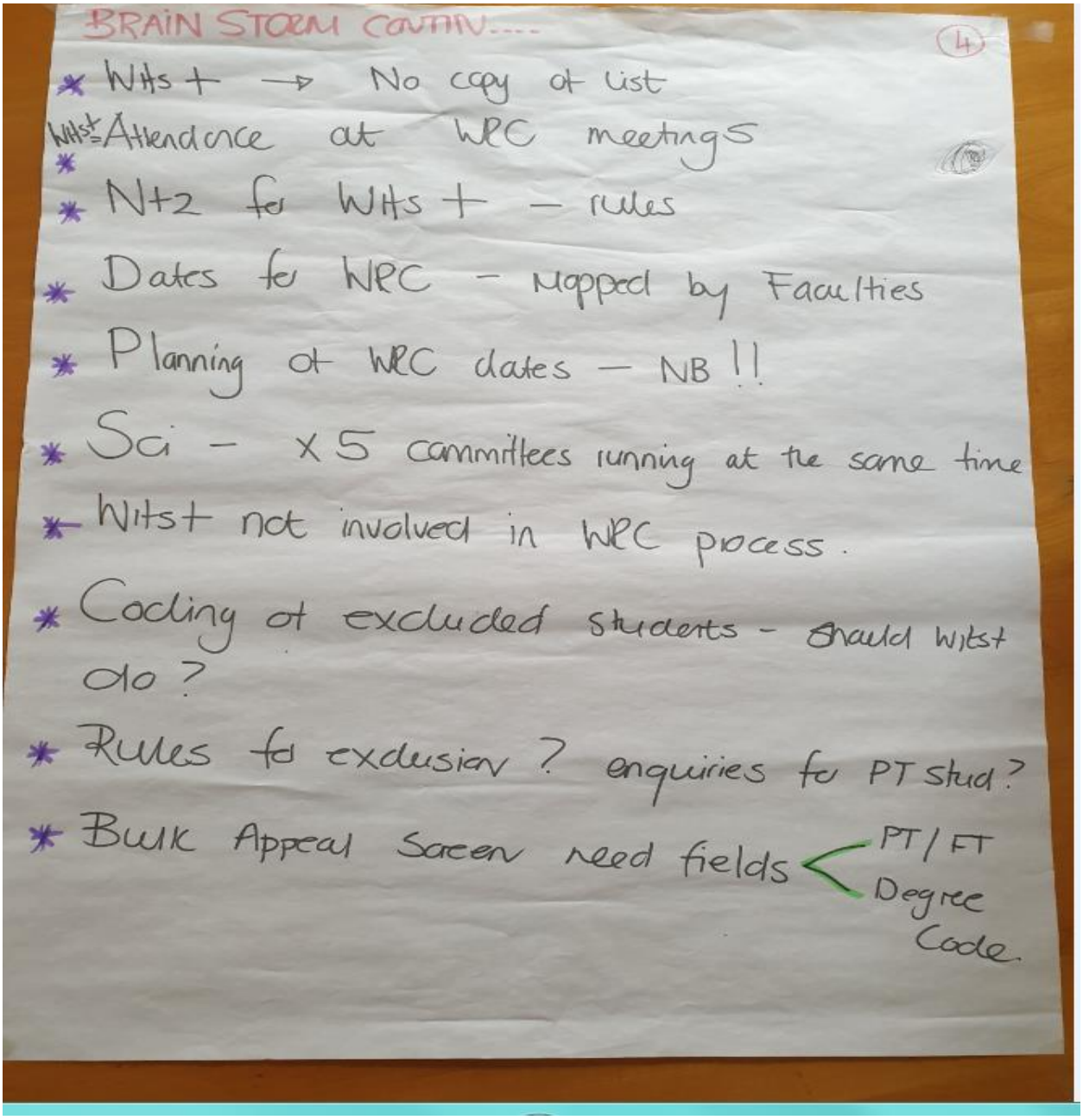
APPENDIX F: WORKSHOP BRAINSTORMING NOTES (CONTINUED)



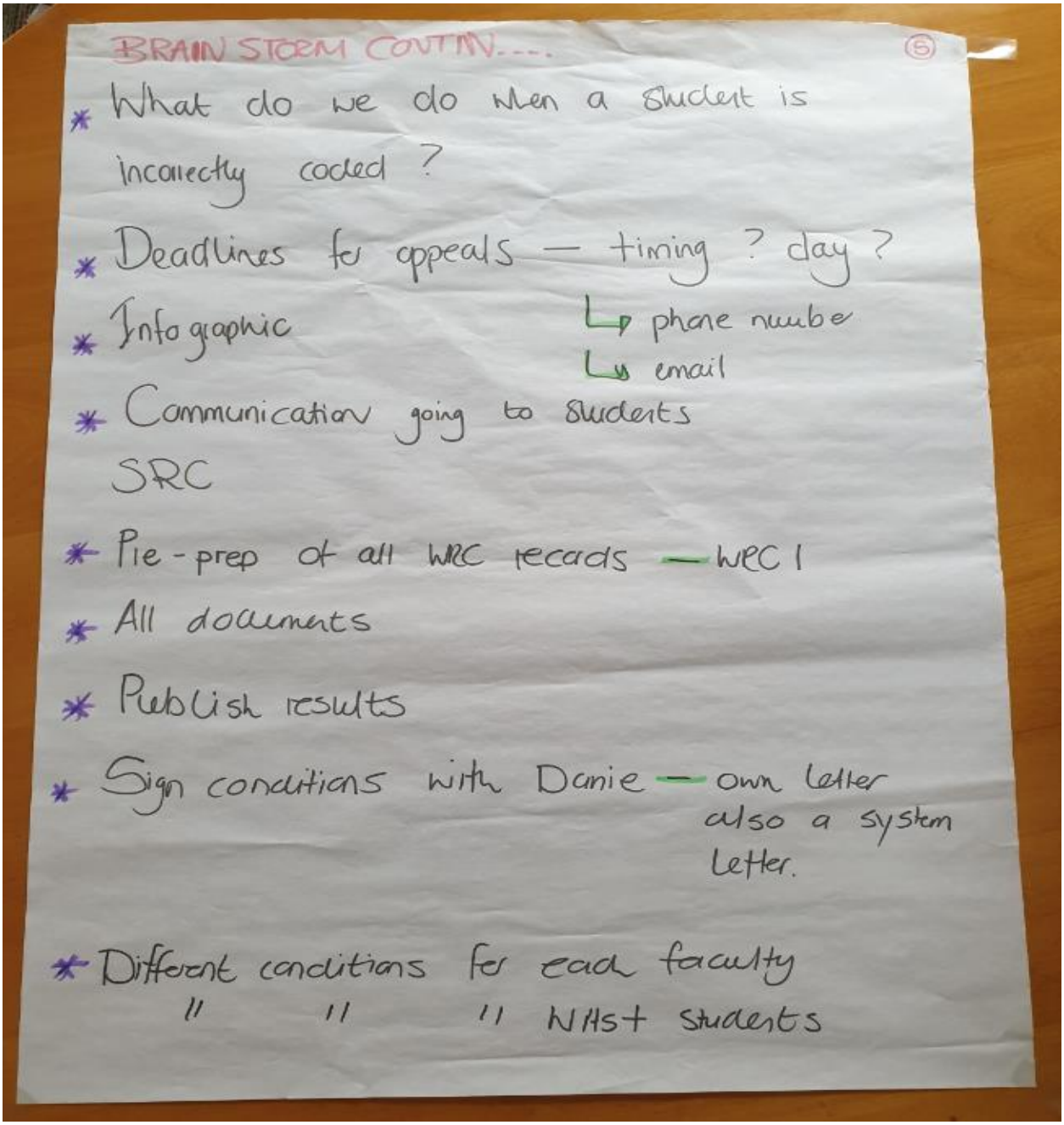
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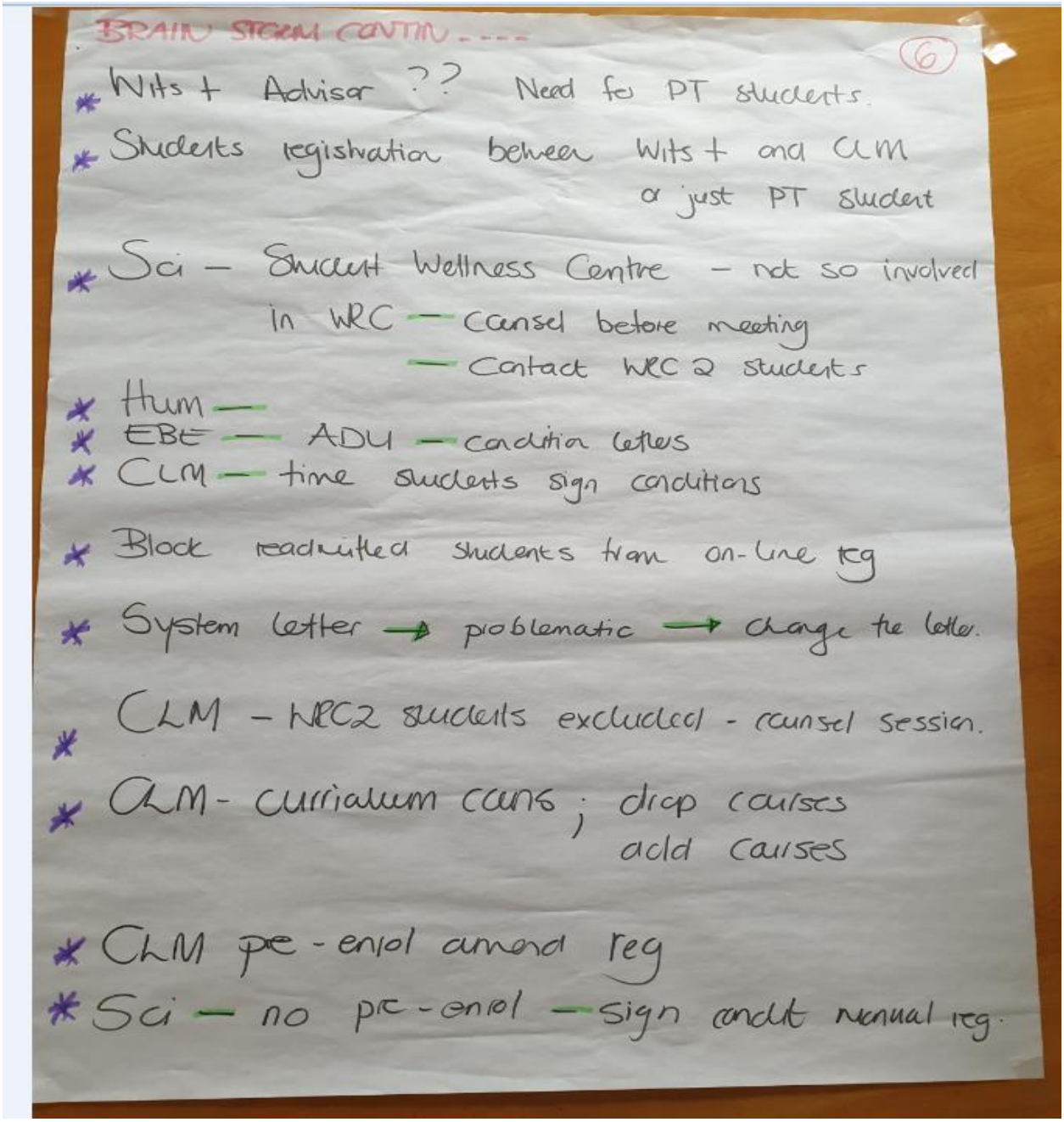
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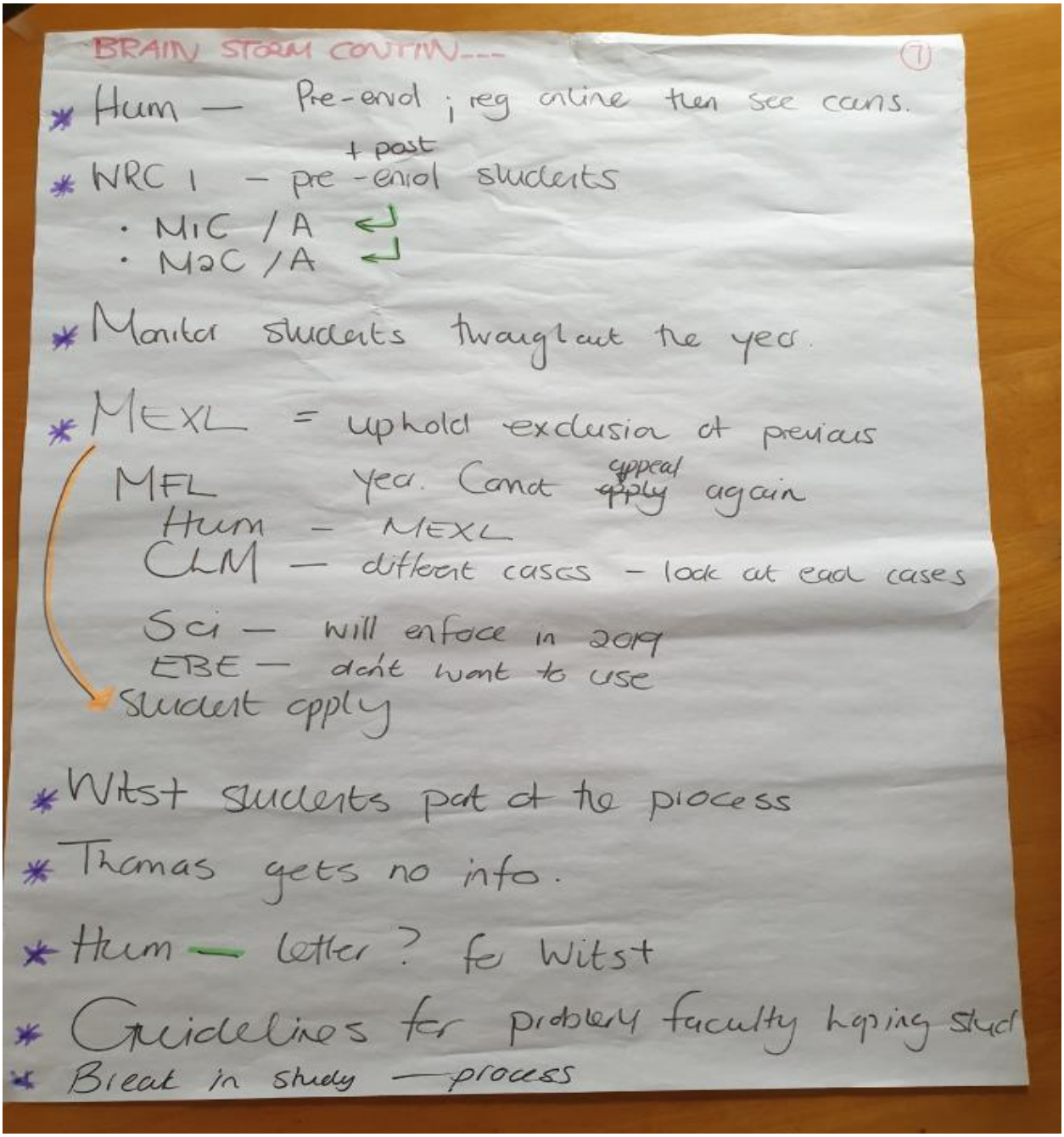
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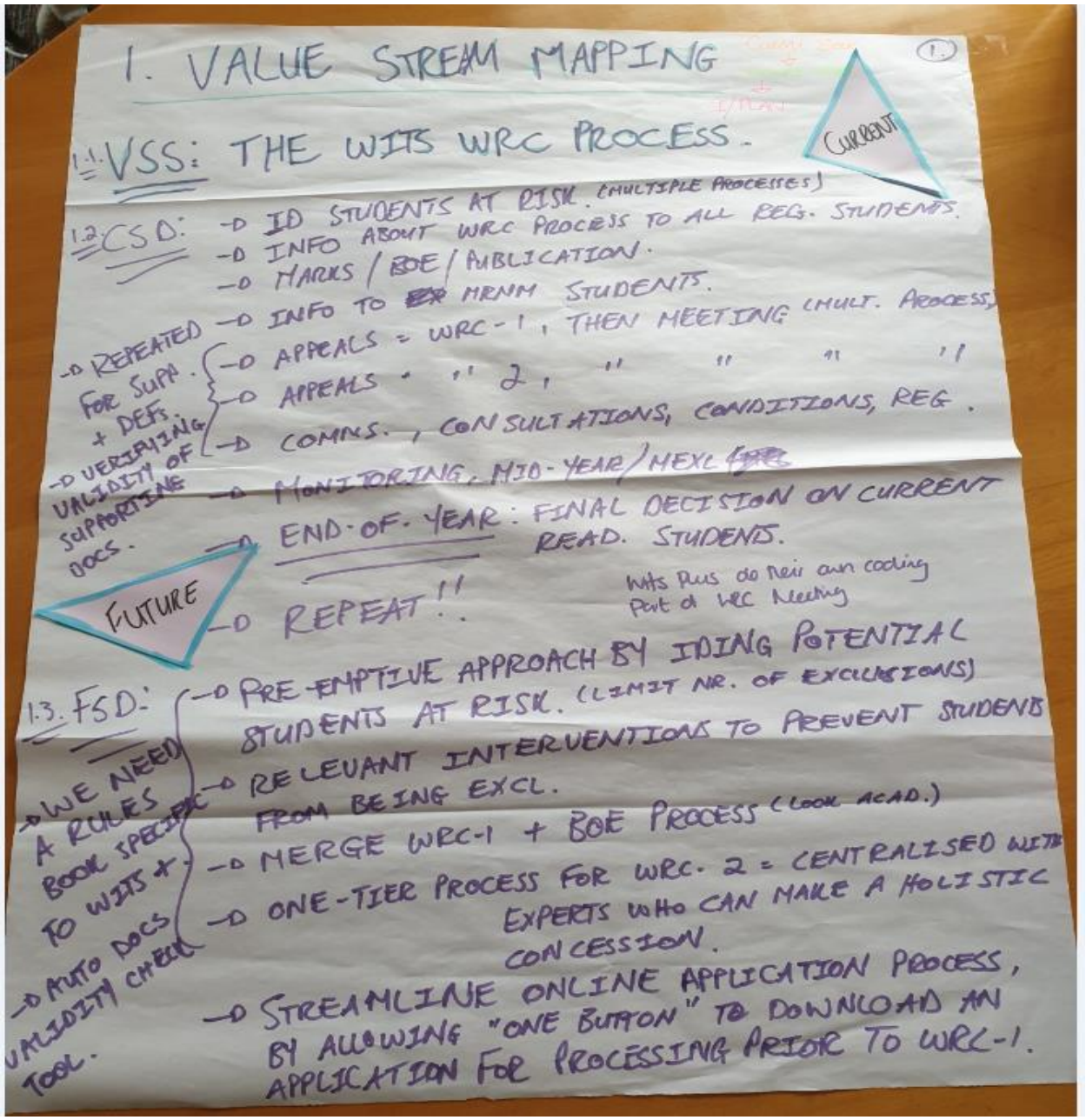
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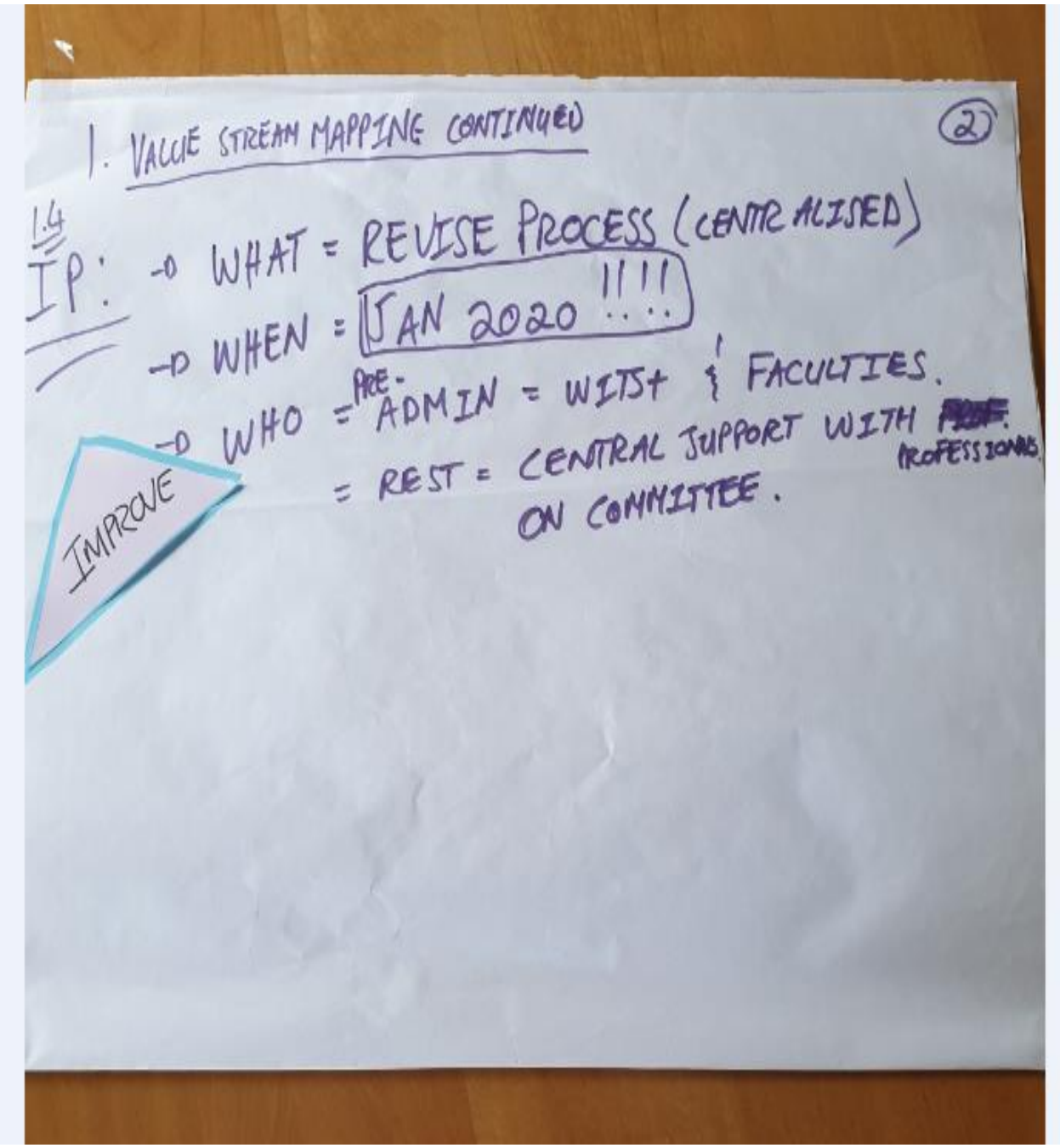
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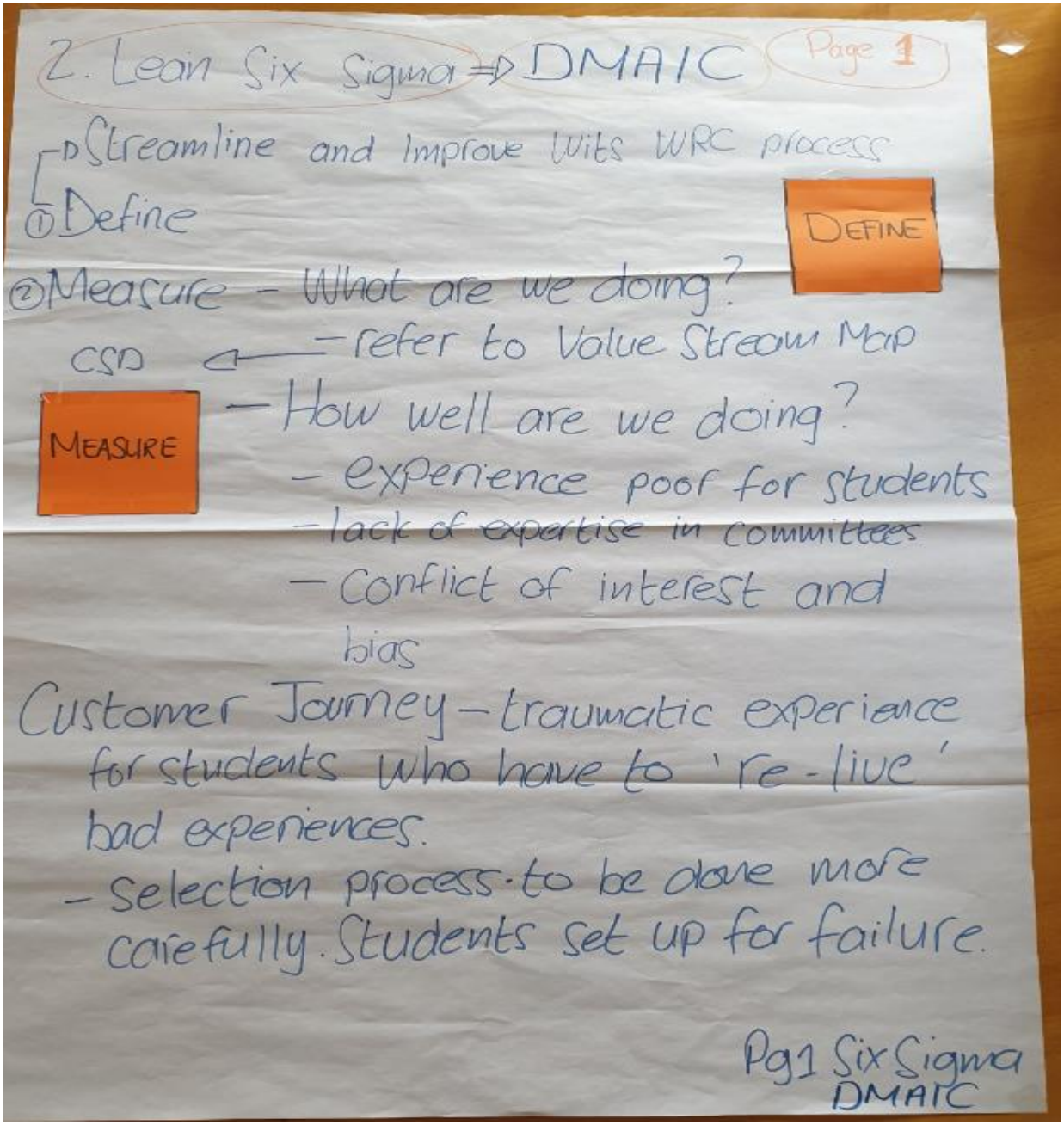
8.7 APPENDIX G:
WORKSHOP PROCESS MAPPING NOTES: VALUE STREAM MAPPING



APPENDIX G: WORKSHOP PROCESS MAPPING NOTES: VALUE STREAM MAPPING (CONTINUED)

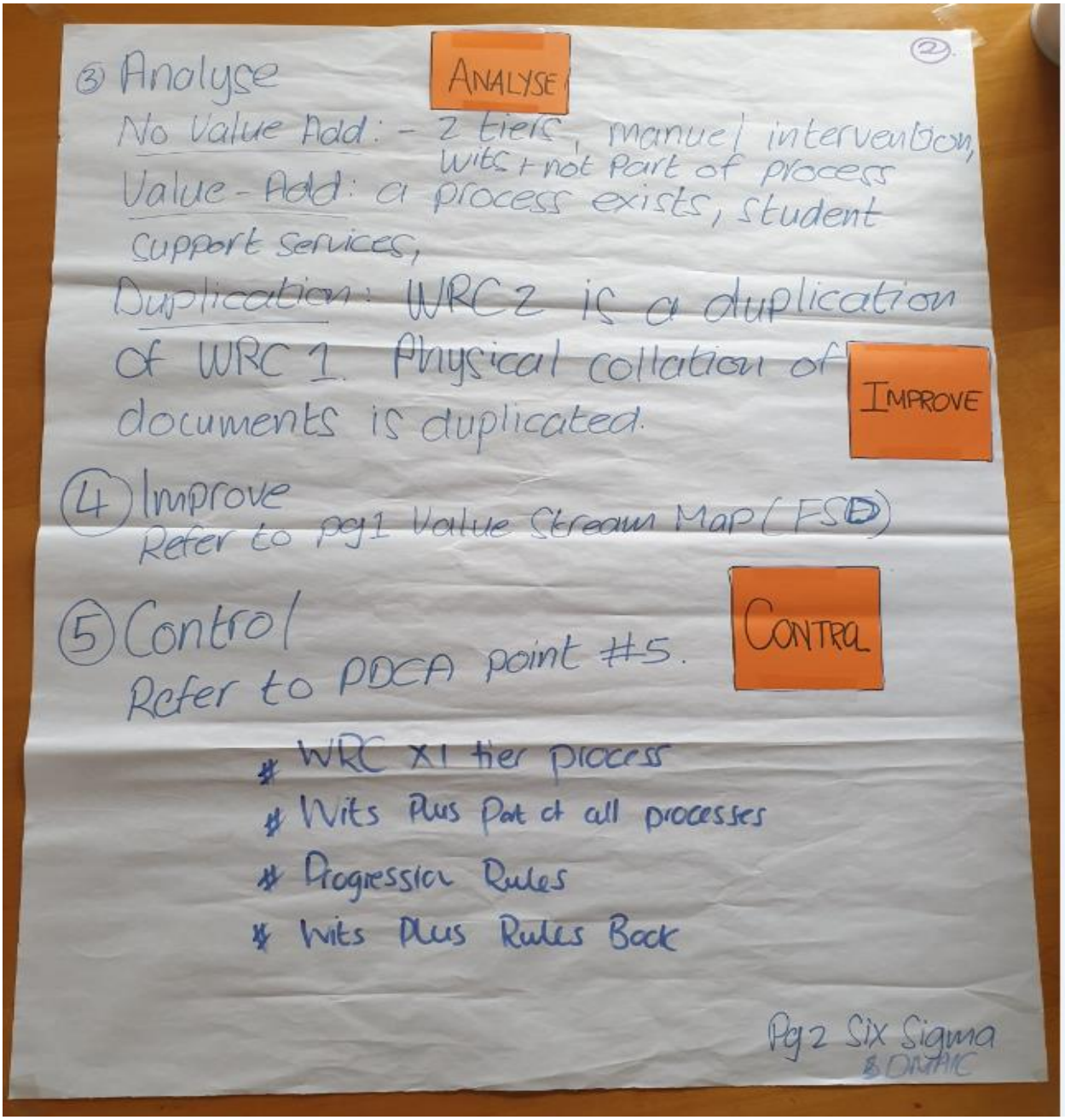


WORKSHOP PROCESS MAPPING NOTES: DMAIC (CONTINUED)

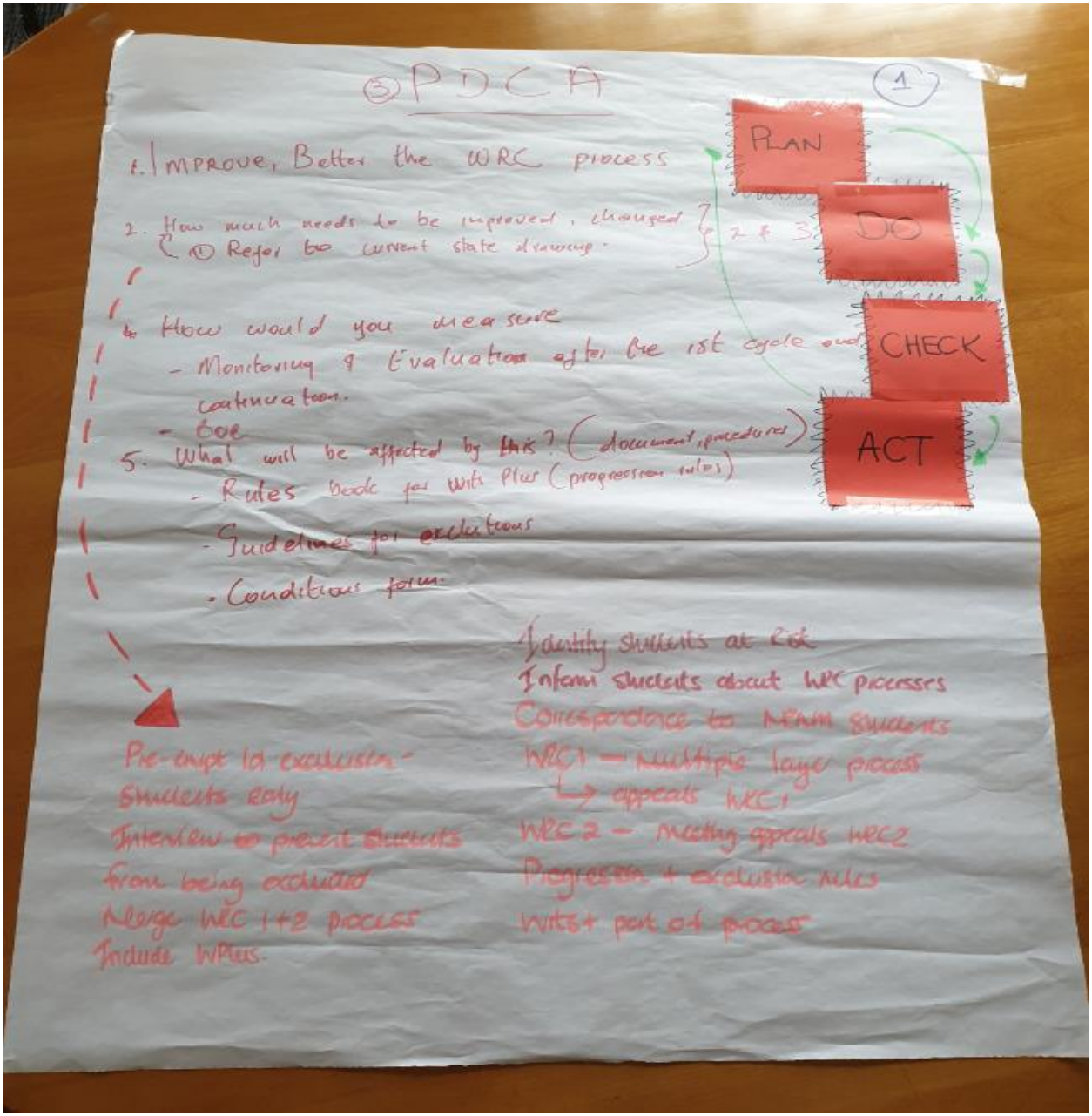


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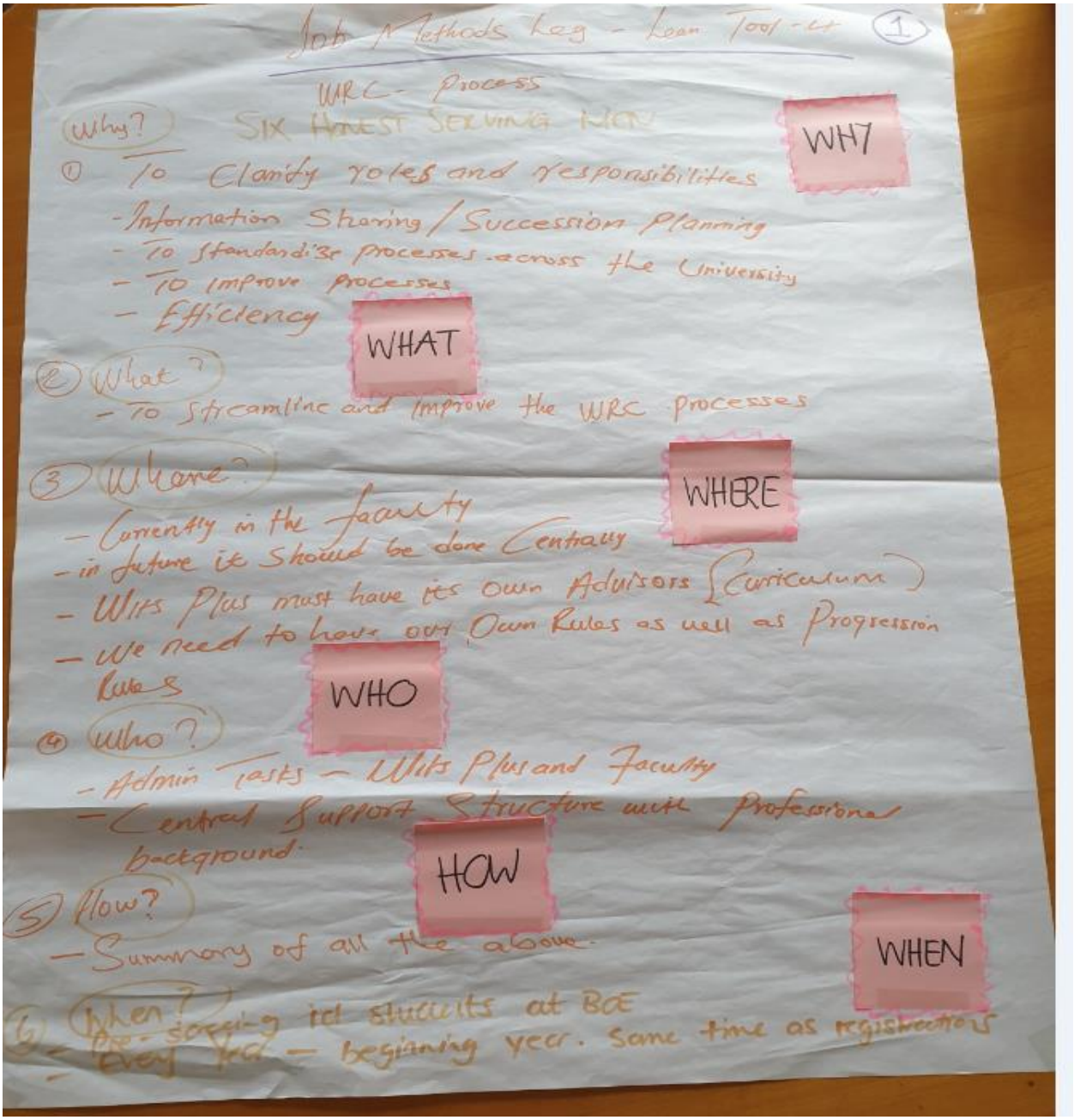
WORKSHOP PROCESS MAPPING NOTES: DMAIC (CONTINUED)



WORKSHOP PROCESS MAPPING NOTES: PDCA (CONTINUED)



WORKSHOP PROCESS MAPPING NOTES: 'SIX HONST SERVING MEN' (CONTINUED)



8.8 APPENDIX H: PROCEDURE DOCUMENT WITS PROCESS FLOW FRAMEWORK

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PROCEDURE DOCUMENT

WITS FRAMEWORK TO IMPROVE SERVICE PROCESSES WITHIN THE UNIVERSITY

1. Background

The following four-step Wits Process Framework can be seen as general advice and can serve as a guideline and starting point when service departments within the University want to streamline and map their various service processes to improve service levels to their students and other stakeholders. The framework is based on *Lean* methods as *Lean* focusses on increasing efficiencies within processes by removing waste, and unwanted steps. Melton (2005) notes that *Lean* is a revolution and it is changing the way people go about their work creating continuous flow with a difference between ideas and the development of processes.

2. Wits Process Flow Framework

The Wits process flow framework is structured into a four-step approach each with a specific focus and method to achieve the desired outcome. It is hoped that this framework will assist service departments within the university to transform their levels of service and inform managerial approaches regarding the implementing and changing processes within a service department. Figure 1 below is an illustration of the Wits Process flow framework noting the four steps to follow when using this framework.

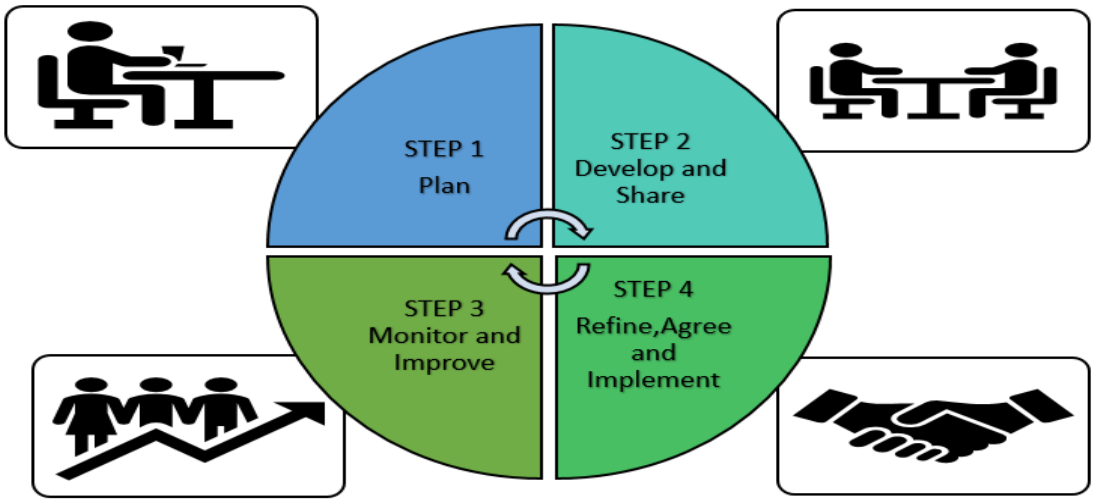


Figure 1: Wits Process Flow Framework

Figure 2 is an illustration of the four steps a service department will follow when using this framework to either introduce a new process within their department or when improving/changing a current process within the department.

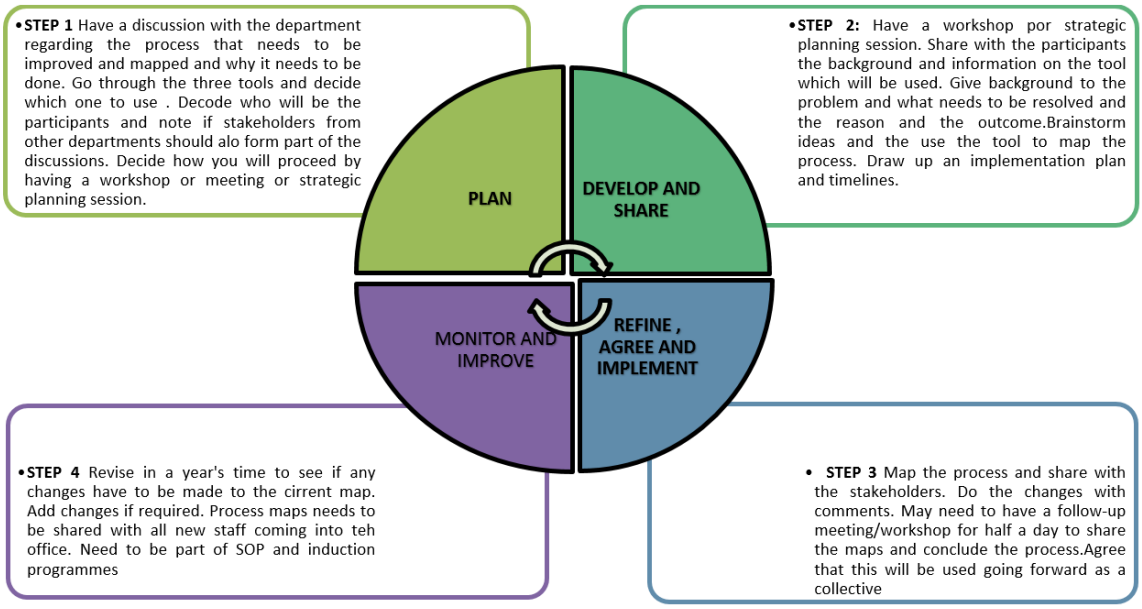


Figure 2: Wits Process Flow Framework Step by Step Guideline

STEP 1: PLAN

The Manager/ Head of a Faculty or Service department would identify a specific process that will need improvement or in the case of a new process, being introduced will need to decide on a plan of action as to how these new processes will be introduced or current process changed. For this, planning and decision-making it is suggested that use is made of the Six Honest Serving Men (refer to Figure 3 below). This tool requires the Manager or

Head to ask specific pertinent questions before starting to map out how the process will be implemented or change the current one.

There are six pertinent questions to be asked by the Manager or Head noted in the diagram below:

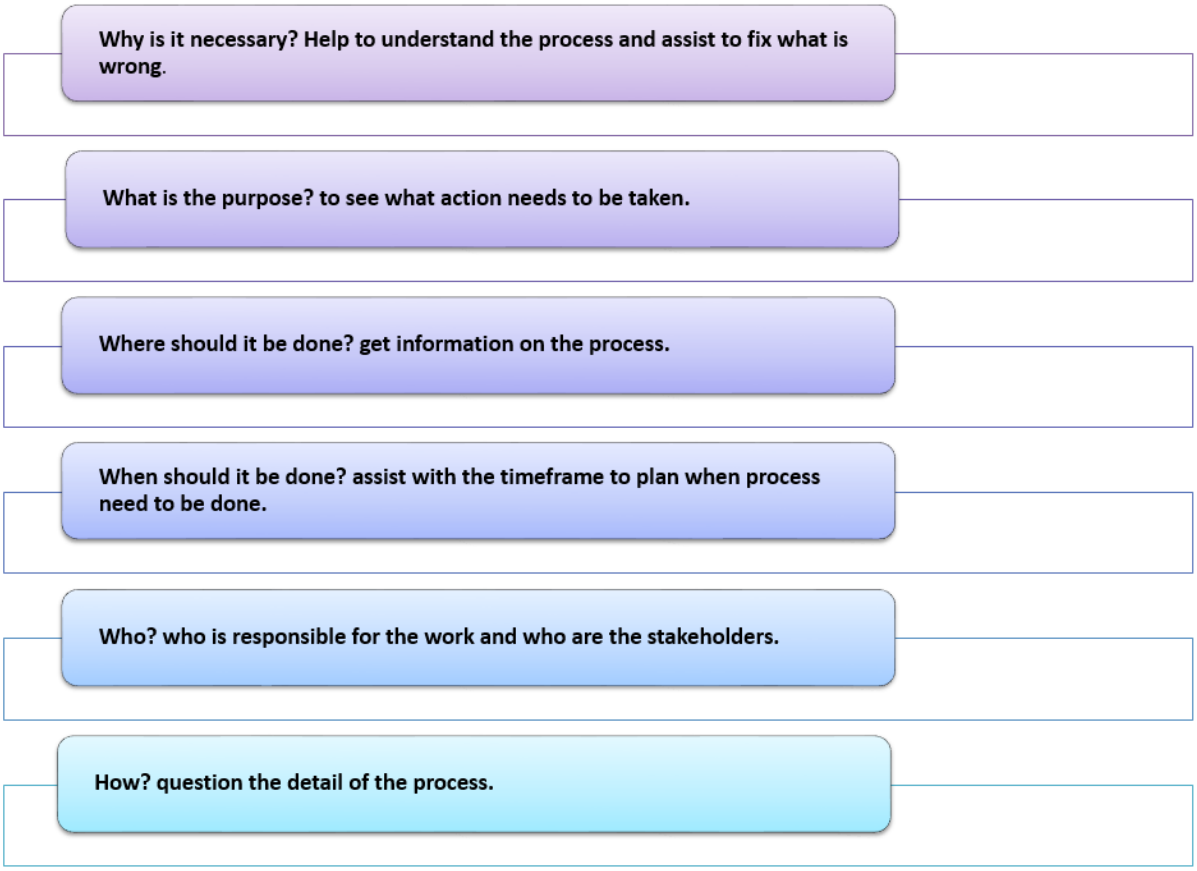


Figure 3: 'Six Honest Serving Men'

The Manager/ Head of the department can decide on how the current or new process should be mapped for it to be clear to staff regarding the steps that need to be followed in doing their daily work. To map a process it is recommended that the Manager make use of one of the following *Lean* tools namely

(3.) Value Stream Mapping (VSM), or

(4.) DMAIC (Define, Measure, Analysed, Improve, and Control).

Figures 4 and 5 are the visual illustrations of these two process maps. To assist the manager in deciding which tool to use a brief explanation is given on each tool as well as the advantages and the disadvantages of using them. These advantages and disadvantages are displayed in Tables 1 and 2.

2.1 Value Stream Mapping (VSM)

By using value stream maps, one has the opportunity of taking a process, looking at it holistically, and finding ways to better the process, identifying and tackling serious issues. It is a useful tool to identify all processes, value, or non-value ads. VSM maps both material and information maps. It takes University policies and regulations into consideration when processes maps are being drawn up.

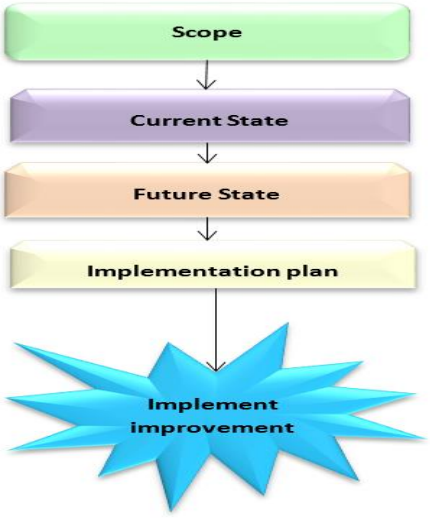


Figure 4: Value Stream Mapping (VSM)

The following advantages and disadvantages are noted by Lian and Landeghem, 2002 when using VSM.

Table 1: Advantages and Disadvantages of a Value Stream Map

Advantages of VSM	Disadvantages of VSM
VSM is a visual representation of all activities.	VSM records what happens on the floor that can limit the level of detail.
A VSM identifies value-adding steps.	A VSM can be complicated when there are too many value streams.
A VSM identifies non-value adding steps.	With a VSM, you cannot always see how it translates into reality.
A VSM identifies gaps in processes.	Limited knowledge about the tool.
Know your customer and what they value.	Value stream mapping can be time-consuming.
With a VSM, there is continuous improvement and striving for perfection.	

VSM is a valuable tool to continuously identify opportunities for improvement, adding value, eliminating waste, and improving workflows.

2.2 DMAIC

The DMAIC cycle is a method of *Lean* Six Sigma that is an improvement approach to solving problems. DMAIC improves efficiencies, quality, and to reduce costs. DMAIC may look to be complex but once you get staff accustomed to using the DMAIC the more they will look to find ways to improve the work that they do daily.

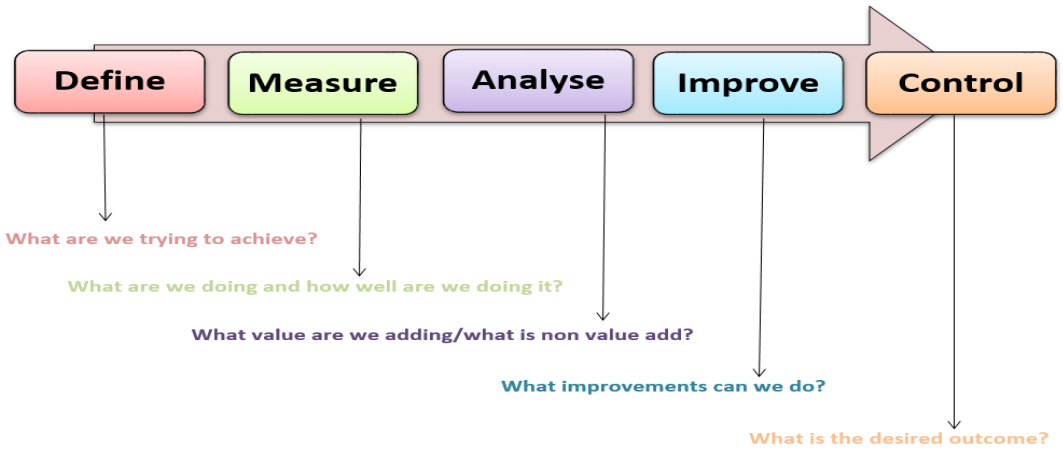


Figure 5: DMAIC

There are also certain advantages and disadvantages using DMAIC and these are illustrated in Table 2.

Table 2: Advantages and Disadvantages of using the DMAIC method

Advantages of DMAIC	Disadvantages of DMAIC
DMAIC provides structure to a process.	DMAIC can be complex.
DMAIC reduces waste.	DMAIC can be demanding.
DMAIC compliments *Lean*.	DMAIC needs time and resources for proper implementation.
DMAIC addresses a specific problem.	DMAIC needs to look more at continuous improvement.
DMAIC has a quality management approach.	Every person needs to be clear on their role when introducing this tool to improve processes in an organisation.
DMAIC ensures that there is a focus on the customer as well as the process.	There is not a specific roadmap/s.

DMAIC may look to be complex but once you get staff accustomed to using the DMAIC the more they will look to find ways to improve the work that they do daily.

STEP 2: DEVELOP AND SHARE

In this step, the Manager/ Head will convene a workshop. The Manager/ Head will explain the tool that will be used to map the process. The Head/Manager may want to use at the start of the process the Honest Six Serving Men to get as noted before the thought process going. The process will then be mapped using either the VSM or DMAIC and for this part of the framework, there will be a specific focus on the following legs of the tools:

- If **VSM** is used**:** The current and future state and an implementation plan
- If **DMAIC** is used**:** Define, Measure, Analyse and Improve

STEP 3: AGREE, REFINE AND IMPLEMENT

This step will happen after the workshop has taken place refining and finalising the mapping that took place during the workshop. The maps will be shared with staff for input and changes. The Head may want to have a meeting or smaller (2-hour) workshop to work through the maps, to agree, and conclude on the new process with all the stakeholders.

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STEP 4: MONITOR AND IMPROVE

Once the processes map/s have been introduced into the daily work of the office it needs to be monitored to see if it is assisting with the work processes to make them easier and more efficient. It is recommended that this should be done every six months to a year depending on the cycle of the particular process. If there are any changes or improvements, the process maps will need to be amended accordingly and it may sometimes mean that not the whole process is changing but only a part of it to make it efficient again. For this part of the framework, there will be a specific focus on the following legs of the tools:

- If **VSM** is used**:** Implementation and monitoring of the improvement plan
- If **DMAIC is** used**:** Control, to ensure that the suggested plan or improvements work

It is recommended that all process flow diagrams be revisited at least once a year to ensure relevance.

Nicoleen Potgieter

2019

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