

# Developing a framework to assess day hospital maturity

by  
Lizan Henning

*Thesis presented in fulfilment of the requirements for the degree of  
Master of Engineering (Engineering Management) in the Faculty of  
Engineering at Stellenbosch University*



Supervisor: Wouter Bam

Co-supervisor: Prof Corne Schutte

March 2017

# *DECLARATION*

---

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

March 2017

Copyright © 2017 Stellenbosch University

All rights reserved

# ABSTRACT

---

The development and distribution of day hospitals in South Africa is still a relatively new concept for which there are no fully-established or developed operational guidelines. In the highly competitive private hospital industry, healthcare leaders and managers require structured guidance on how to operate and manage day hospitals appropriately, in order to facilitate the realisation of organisational goals and the development of enterprise maturity and performance.

To address this need, this research study reviews best practices of the day hospital industry in order to propose a maturity model framework for day hospitals within the private healthcare sector of South Africa. The purpose of this maturity model is to provide a framework that enables day hospitals to assess and potentially advance their capability maturity in pursuit of increased efficiency, performance and profitability.

An in-depth literature study of the interconnected fields of the problem forms the foundation of the framework. The three key fields studied include: the context of the day hospital industry; the fundamentals of maturity models; and best practices within the day hospital industry. The framework is developed through integrating these three domains which are relevant to the stated research problem.

The resulting framework consists of four maturity stages portraying progressive maturity. The framework further consists out of five main focus areas constituting twenty sub-dimensions. These sub-dimensions are obtained from investigating all the various best practices of the day hospital industry.

The framework was refined and validated based on interviews and questionnaires completed by four subject matter experts within the day hospital industry. The validation process demonstrated that the framework addresses the identified problem by providing a maturity model that enable day hospitals to assess their capability maturity in pursuit of increased efficiency, performance and profitability.

Thus, this research study makes a contribution to the day hospital industry by providing a framework that enables day hospital managers to assess the maturity of their facility, and identify weaknesses that prohibits day hospital efficiency.

# OPSOMMING

---

Die ontwikkeling en verspreiding van daghospitale in Suid-Afrika is steeds 'n relatiewe nuwe konsep waarvoor daar tans nog geen ontwikkelde operasionele prosedures bestaan nie. In die hoogs kompeterende privaathospitaal bedryf benodig leiers en bestuurders in die day hospitaal bedryf, gestruktureerde riglyne rakende hoe om daghospitale te bedryf en te bestuur met die doel om die onderneming se doelwitte te bereik en om die volwassenheid en prestasie van die maatskappy te ontwikkel.

Hierdie studie bestudeer beste praktyke van daghospitale om hierdie probleem aan te spreek. Na verloop van die bestudering van beste praktyke, sal 'n vermoëns-volwassenheidmodel raamwerk wat Suid-Afrikaanse daghospitale in die privaat sektor verteenwoordig voorgestel word om sodoende die bestaande behoefte aan te spreek. Die doel van die vermoëns-volwassenheidmodel is om 'n raamwerk te ontwikkel wat daghospitale in staat sal stel hul volwassenheid te evalueer om moontlike verbeteringe aan hul vermoë volwassenheid te kan aanbring in die poging om hul doeltreffendheid, prestasie en winsgewendheid te verhoog.

'n Omvattende literatuur studie van die verwante velde van die probleem vorm die basis van die raamwerk. Die drie hoofvelde van die studie sluit die volgende in: die konteks van daghospitale in die industrie, die grondbeginsels van vermoëns-volwassenheidmodelle, en die beste praktyke in die daghospitaal industrie. Die raamwerk is ontwikkel deur die drie velde ten opsigte van die probleemstelling te integreer.

Die voorgestelde raamwerk bestaan uit vier vlakke wat progressiewe groei tot volwassenheid voorstel. Die raamwerk bestaan uit 'n verdere vyf hoof fokus-areas met twintig onder-afdelings. Deur na al die verskeie beste praktyke van die daghospitaal industrie te kyk, kon die onder afdelings bepaal word.

Die raamwerk was aangepas en gevalideer deur vier industriespesialiste vanuit die daghospitaalbedryf wat vraelyste voltooi het en insette gelewer het tydens onderhoud. Die validasie proses wys dat die raamwerk die geïdentifiseerde probleem aanspreek deur 'n vermoëns-volwassenheidmodel te verskaf wat daghospitale in staat stel om hul vermoëns-volwassenheid te assesser terwyl hulle hul doeltreffendheid, prestasie en winsgewendheid probeer verhoog.

Die studie lewer dus 'n bydra aan die daghospitaal industrie deur 'n raamwerke te ontwikkel wat hospitaal bestuurders in staat stel om die vermoëns-volwassenheid van hulle fasiliteit te assesser en swakhede wat daghospitaaleffektiwiteit verhoed uit te wys.



# ACKNOWLEDGEMENTS

---

I would like to extend my sincerest gratitude to all those who have supported me through last two years. You have all contributed to the successful completion of my research. I thank you.

Firstly, I am very grateful to Wouter Bam. Thank you for your constant guidance, advice and patience during the process of completing my thesis. I would further like to thank you for broadening my horizons beyond the scope of my research and exposing me to opportunities and other domains of industrial engineering. My sincerest gratitude.

To my family and friends, thank you for all your love, support and understanding. I am deeply indebted to my family, Johan, Lize, and Johan-Malan. Your constant encouragement and unwavering support is what kept me focused and motivated to successfully complete this thesis to the best of my abilities. Without you my life would be infinitely poorer.

I further extend my greatest gratitude to Pieter Lotz for becoming a mentor to me in the past two years. You never wavered in providing me with direction when I needed it; without your guidance and expert knowledge I would not have been able to produce my research in its current form. The generous time and effort you have invested in me does not go unrecognized; I deeply appreciate it.

I would also like to thank Dirk Kotzé for the time he invested in the validation of my thesis. I would further like to thank you for also becoming a mentor who provided me with guidance, not only during the last two years, but also during my undergraduate studies. I appreciate your inputs, guidance and all the time you have set aside for me.

To Johan Stadler and Yvette Jordaan, I thank you very much for the time and energy you have dedicated to the validation of my thesis. I realize that it is a time-consuming process, you have my sincerest gratitude.

Lastly, I would like to thank the Department of Industrial Engineering at Stellenbosch University for providing me with the necessary time and resources to complete this thesis.

# TABLE OF CONTENTS

Declaration.....	ii
Abstract.....	iii
Opsomming.....	iv
Acknowledgements.....	v
Table of contents .....	vi
Table of figures .....	xiv
List of tables.....	xvii
List of acronyms and abbreviations .....	xix
Glossary.....	xxi
Chapter 1 Introduction .....	1
1.1 Background .....	2
1.2 Problem statement .....	3
1.3 Research questions .....	3
1.3.1 Main research aim .....	3
1.3.2 Main research questions.....	3
1.3.3 Sub-questions.....	4
1.4 Limitations and delimitations .....	5
1.4.1 Delimitations.....	5
1.4.2 Limitations.....	5
1.5 Research methodology .....	5
1.5.1 Research strategy.....	5

1.5.2	Research approach.....	6
1.6	Ethical implications of research .....	8
1.7	Document outline .....	8
1.8	Chapter conclusion .....	12
Chapter 2	Industry dynamics .....	13
2.1	Day surgery dynamics .....	14
2.1.1	Day surgery landscape .....	14
2.1.2	Day surgery facilities .....	15
2.1.3	Day surgery procedures .....	18
2.2	Day hospital industry in South Africa.....	21
2.3	Barriers to day surgery growth .....	24
2.3.1	Absence of support from medical aid schemes.....	24
2.3.2	Lack of physician buy-in .....	24
2.3.3	Competition from larger hospital groups .....	25
2.3.4	Government licensing policy.....	26
2.3.5	Safety of day quality.....	26
2.4	Chapter conclusion .....	26
Chapter 3	Theoretical foundation .....	27
3.1	Enterprise Engineering concepts, tools & methodologies.....	28
3.1.1	Enterprise Engineering.....	28
3.1.2	Enterprise life cycle.....	28
3.1.3	Enterprise architecture frameworks.....	30
3.2	Maturity Model introduction.....	31
3.2.1	Historical overview of maturity models.....	32

---

3.2.2	Defining Maturity & Capability .....	34
3.2.3	Maturity model characteristics.....	35
3.3	Fixed-level maturity models.....	37
3.3.1	Staged fixed-level maturity models .....	37
3.3.2	Continuous fixed-level maturity models.....	38
3.3.3	Staged vs continuous fixed-level maturity models .....	40
3.4	Focus area maturity models.....	42
3.4.1	Elements of the focus area maturity model .....	43
3.4.2	Structure of focus area maturity model .....	43
3.5	Comparing maturity model types .....	45
3.6	Designing & developing maturity models.....	45
3.6.1	Design-science research approach .....	46
3.6.2	General design principles framework for maturity models.....	50
3.7	Developing maturity models.....	53
3.7.1	Generic development framework for maturity models.....	53
3.7.2	Design proposition for situational maturity models.....	58
3.7.3	Generic procedure model for the design of maturity models.....	62
3.7.4	Development roadmap for maturity grids.....	65
3.7.5	Generic method for developing focus area maturity models.....	69
3.8	Business Process Maturity models.....	72
3.8.1	Business Process Maturity Model components.....	72
3.8.2	Capability area framework for BPMM .....	76
3.9	Generic Business Process Maturity Models.....	79
3.10	Business process maturity models in healthcare.....	81

3.10.1	Hospital Process Orientation (HPO) Measurement Tool .....	81
3.10.2	CMM for Hospital Process Management.....	83
3.11	Lean Principles .....	86
3.11.1	Customer value .....	88
3.11.2	Value Stream Mapping.....	88
3.11.3	Concept of Waste.....	91
3.11.4	Employee involvement .....	92
3.11.5	Standardised work .....	93
3.11.6	Plan-Do-Check-Act Cycle.....	93
3.11.7	Define–Measure–Analyse–Improve–Control .....	94
3.12	Chapter conclusion .....	95
Chapter 4	Research Methodology .....	97
4.1	Research aim and objectives overview.....	98
4.1.1	Research aim.....	98
4.1.2	Research objectives .....	98
4.2	Research design .....	98
4.2.1	Applied versus fundamental research .....	98
4.2.2	Purpose of inquiry.....	99
4.2.3	Research reasoning.....	100
4.2.4	Research approach.....	100
4.3	Research methodology .....	101
4.3.1	Research strategy.....	101
4.3.2	Data collection & analysis procedures.....	102
4.3.2.1	Phase I & Phase II.....	102

4.3.2.2	Phase III .....	103
4.3.2.3	Phase IV .....	105
4.3.2.4	Phase V .....	105
4.4	Chapter conclusion .....	105
Chapter 5	Day hospital best practises .....	106
5.1	Determine focus areas .....	107
5.2	Patient Flow Pathway .....	107
5.2.1	Pre-admission phase .....	111
5.2.2	Preoperative phase .....	113
5.2.3	Operative phase .....	114
5.2.4	Postoperative phase .....	115
5.2.5	Post-discharge phase .....	116
5.3	Patient flow best practises .....	116
5.3.1	Pre-admission phase .....	117
5.3.2	Preoperative phase .....	127
5.3.3	Operative phase .....	136
5.3.4	Postoperative phase .....	150
5.3.5	Post-discharge phase .....	154
5.3.6	General .....	156
5.4	Chapter conclusion .....	160
Chapter 6	Framework development .....	161
6.1	Chapter introduction .....	162
6.2	Phase I .....	162
6.2.1	Problem definition .....	162

6.2.2	Define aim .....	162
6.3	Phase II .....	162
6.3.1	Identify & scope functional domain.....	163
6.3.2	Identify stakeholders & audience .....	163
6.3.3	Comparison of existing models.....	163
6.4	Phase III .....	164
6.4.1	Determine dimensions of maturity model.....	164
6.4.2	Determine maturity levels .....	164
6.4.3	Formulate cell text of maturity model.....	165
6.5	Chapter conclusion .....	175
Chapter 7	Framework discussion.....	176
7.1	Framework overview .....	177
7.2	Framework elements .....	177
7.2.1	Framework main focus areas.....	177
7.2.2	Maturity phases .....	178
7.2.3	The maturity model structure.....	178
7.3	The maturity model framework for day hospitals.....	179
7.4	Framework use and example.....	190
7.5	Chapter conclusion .....	191
Chapter 8	Framework validation .....	192
8.1	Introduction to validation .....	193
8.1.1	Validity .....	193
8.1.2	Reliability.....	194
8.2	Types of validation .....	194

8.2.1	Interviews with subject matter experts.....	195
8.2.2	Implementation .....	196
8.2.3	Case studies.....	196
8.2.4	Result .....	196
8.3	Interviews with subject matter experts.....	197
8.3.1	Interviewees.....	197
8.3.2	Evaluation process .....	198
8.3.3	Interview questions.....	198
8.4	Expert evaluation feedback .....	199
8.4.1	Research methodology related questions .....	199
8.4.2	Framework related questions .....	200
8.5	Validation conclusion .....	202
8.6	Chapter conclusion .....	203
Chapter 9	Conclusion & Future work.....	204
9.1	Overview .....	205
9.2	Addressing the research questions.....	206
9.3	Limitations.....	209
9.4	Recommendations for future work .....	210
References	.....	211
Appendix A	.....	224
Appendix B	.....	225
Appendix C	.....	228
Appendix D	.....	238
Appendix E	.....	240



Appendix F ..... 242

# TABLE OF FIGURES

Figure 1: Research questions.....	4
Figure 2: Research strategy.....	6
Figure 3: Main research sections .....	7
Figure 4: Document outline.....	8
Figure 5: Appropriate healthcare facility for surgical procedures .....	18
Figure 6: Percent distribution of day procedures by facility type in the United States .....	20
Figure 7: Day surgeries versus inpatient surgeries performed by body system in 2012 .....	20
Figure 8: Day hospital vs general hospital distribution in South Africa’s private healthcare sector .....	22
Figure 9: Day hospital vs general hospital distribution in Australia’s private healthcare sector	23
Figure 10: Day hospital versus general distribution per country .....	24
Figure 11: Enterprise Engineering solution space .....	29
Figure 12: Generic Enterprise Life Cycle .....	29
Figure 13: Capability Maturity Model (SW-CMM®) structure.....	33
Figure 14: Three perspectives of maturity .....	36
Figure 15: Generic maturity level structure.....	38
Figure 16: Capability levels of a continuous fixed-level maturity model.....	39
Figure 17: Visual representation of fixed-level maturity models.....	41
Figure 18: Visual comparison of maturity model types .....	45
Figure 19: Design-Science Research Methodology Process Model.....	47
Figure 20: Information Systems Research Framework with Design-science research cycles .....	50
Figure 21: Framework of general design principles for maturity models.....	51
Figure 22: Generic maturity model development framework.....	54

Figure 23: Development procedure for situational maturity models.....	59
Figure 24: Basic structure of a situational maturity model .....	60
Figure 25: Maturity levels of Situational maturity model .....	61
Figure 26: Procedure model for developing Maturity Models.....	62
Figure 27: Maturity grid development roadmap.....	65
Figure 28: Development method for focus area maturity models .....	70
Figure 29: The funnel structure of components in business process maturity models.....	73
Figure 30: Conceptual framework & classification of capability areas for business process maturity.....	77
Figure 31: Conceptual basis from which capability areas for hospital process management model.....	84
Figure 32: Lean principles .....	87
Figure 33: Value stream mapping process as proposed by (Henrique et al., 2015).....	90
Figure 34: Format of the value stream map .....	91
Figure 35: PDCA cycle.....	93
Figure 36: DMAIC cycle.....	95
Figure 37: The conceptual framework for the research methodology and strategy of the study .....	102
Figure 38: Main patient flow pathway phases of patient undergoing surgical day procedure ..	104
Figure 39: Main patient flow pathway phases of patient undergoing surgical day procedure ..	108
Figure 40: Location of patient flow pathway phases.....	109
Figure 41: Layout indicating patient flow within South African context .....	110
Figure 42: Activities of pre-admission phase.....	111
Figure 43: Activities of preoperative phase.....	113
Figure 44: Activities of the operative phase.....	114
Figure 45: Activities of the postoperative phase.....	115

Figure 46: Activities of Post-discharge phase.....	116
Figure 47: Strategies for medical directors to maintain .....	133
Figure 48: Three systems for scheduling procedures within day hospital settings .....	141
Figure 49: Main focus areas of the maturity model framework for day hospitals .....	177
Figure 50: Maturity levels defined for the maturity model framework for day hospitals .....	178
Figure 51: Structure of the maturity model framework for day hospitals .....	179
Figure 52: Typical example of a day hospital assessing itself with the maturity model framework .....	190
Figure 53: Day hospital maturity structure that day hospitals should strive for reaching .....	191
Figure 54: A CMM for Hospital Process Management.....	224
Figure 55: Research approach .....	225
Figure 56: Conceptual framework analysis.....	225
Figure 57: San Francisco General Hospital endoscopy centre patient flow.....	228
Figure 58: The Hotel-Dieu Hospital (Kingston, Ontario) endoscopy unit workflow.....	229
Figure 59: Description of an ambulatory surgical pathway .....	230
Figure 60: Endoscopy centre workflow processes.....	231
Figure 61: Flow chart of a typical patient in an ambulatory surgery centre .....	232
Figure 62: Patient flow in the specialist outpatient clinic .....	233
Figure 63: An ideal day surgery pathway.....	234
Figure 64: Pre-surgery process in the ambulatory unit.....	235
Figure 65: Surgery process in the operating theatre.....	235
Figure 66: Flow of patients through the North-western Department of Urology ambulatory clinic .....	236
Figure 67: Simplified process map of the organisation's typical outpatient surgery preoperative process and the data collection methods used.....	237

# LIST OF TABLES

Table 1: Benefits & drawbacks of day ward facility (Beaussier et al., 2015; Castoro et al., 2007; Dodaro, Grifasi, Lo Conte, & Romagnuolo, 2013).....	16
Table 2: Benefits & drawbacks of integrated day bed facility (Beaussier et al., 2015; Dodaro et al., 2013).....	16
Table 3: Benefits & drawbacks of a free-standing day hospital facility (Australian Day Hospital Association, 2015; Beaussier et al., 2015; Brökelmann, 2012; Hollenbeck et al., 2015).....	17
Table 4: Benefits & drawbacks of office-based facility (Lemos et al., 2006; Urman, Punwani, & Shapiro, 2012) .....	18
Table 5: Comparison of Maturity and Capability concepts as stated by Van Looy et al. (2011) ..	34
Table 6: Comparison of staged fixed-level maturity models versus continuous fixed-level maturity models Compiled from: (SEI CMMI Product Team, 2002, 2005; van Steenbergen, Bos, Brinkkemper, van de Weerd, & Bekkers, 2013) .....	41
Table 7: Definitions of focus area maturity model concepts (van Steenbergen, 2011) .....	43
Table 8: Structure of a focus area maturity model for the functional domain of enterprise architecture (van Steenbergen, 2011).....	44
Table 9: Summary of maturity model types (van Steenbergen, 2011) .....	45
Table 10: Design-science research guidelines as defined by (Hevner et al., 2004) .....	47
Table 11: General design principles for maturity models as stated by (Pöppelbuß & Röglinger, 2011) .....	52
Table 12: Comparison of fixed-level and focus area maturity models with regards to design principles (van Steenbergen et al., 2013).....	52
Table 13: Requirements of the procedure model necessary for developing maturity models (Becker et al., 2009) .....	63
Table 14: Description of theoretical components in business process maturity models (Van Looy et al., 2011).....	74
Table 15: Conceptual framework & classification of capability areas for business process maturity.....	77
Table 16: Generic Business Process Maturity Models referred to in the literature & their capability dimensions (Tarhan et al., 2016).....	80

Table 17: Components of the HPO measurement tool (Gemmel et al., 2007).....	83
Table 18: Capability dimensions of hospital process management maturity model (Cleven et al., 2014) .....	85
Table 19: Description of maturity stages of the CMM for hospital process management (Cleven et al., .....2014) 85	85
Table 20: Phases of DMAIC cycle .....	95
Table 21: Day hospital facilities observed .....	103
Table 22: Description of patient pathway phases of patient undergoing surgical day procedure .....	109
Table 23: Components of pre-anaesthesia evaluation as stated by (Tinkham, 2012).....	119
Table 24: Leading causes of late cancellations within day hospital setting.....	122
Table 25: Best practices of pre-admission phase.....	125
Table 26: Best practises of preoperative phase.....	134
Table 27: White Fast-Track Scoring system (Rice et al., 2015).....	140
Table 28: KPI's of a well-functioning day hospital (Macario, 2006) .....	142
Table 29: Best practises of the operative phase .....	148
Table 30: Discharge checklist for day surgery (British Association of Day Surgery, 2009).....	150
Table 31: Best practises of postoperative phase .....	153
Table 32: Best practises of post-discharge phase .....	155
Table 33: General best practises .....	159
Table 34: Formulation of cell text for maturity model framework for day hospitals .....	166
Table 35: Maturity model framework for day hospitals .....	180
Table 36: Concepts of validity (Kothari, 2004; Rupp & Pant, 2007) .....	193
Table 37: Interviewee background summary and reason for inclusion in research evaluation	198
Table 38: Matching maturity model development literature phases of the research strategy to develop the maturity model framework for day hospitals .....	226

---

# *LIST OF ACRONYMNS AND ABBREVIATIONS*

---

ASC	Ambulatory Surgical Centres
SME	Subject Matter Expert
OR	Operating Room
DoH	South African Department of Health
EAR	Enterprise Reference Architecture
EA	Enterprise Architecture
EAF	Enterprise Architecture Framework
MM	Maturity Model
SW-CMM®	Capability Maturity Model® for software
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
KPI	Key Performance Indicator
IS	Information Systems
DSRM	Design Science Research Methodology
DP	Design Principle
HSRM	Hospital Supplier Relationship Management
BPMM	Business Process Maturity Models
BP	Business Process
BPM	Business Process Management

BPO	Business Process Orientation
IT	Information Technology
SLA	Service Level Agreement
HPO	Hospital Process Orientation
VSM	Value Stream Mapping
PDCA	Plan-Do-Check-Act cycle
DMAIC	Define-Measure-Analyse-Improve-Control cycle
PACU	Post Anaesthesia Care Unit
PONV	Postoperative Nausea and Vomiting
OSA	Obstructive Sleep Apnea
RTLS	Real-time locating systems
IR	Infrared
GPS	Global Positioning System



# GLOSSARY

---

---

Inpatient	A patient admitted to a healthcare facility for a stay of 24 hours or more (Australian Day Hospital Association, 2015).
Outpatient	A patient admitted to a healthcare facility for treatment that requires less than 24 hours hospitalisation (Castoro, Bertinato, Baccaglini, Drace, & Mckee, 2007).
Day surgery	Non-urgent, elective surgical procedures undertaken during the period of a normal working day, followed by patient discharge before the end of the day (Abusalem, 2012; Gilliard, Egli, & Halfon, 2006). Day surgery is also referred to as ambulatory surgery and/or outpatient surgery.
Elective surgery	Surgery that can be scheduled in advance to be performed on a chosen date (Abusalem, 2012).
General hospital	Traditional healthcare facilities that perform both inpatient and outpatient procedures (E. Weber, 2014). In this type of facility patients typically require an overnight stay. General hospitals further have the resources to deal with medical emergencies, and therefore has a department dedicated to dealing with these type of emergency cases.
Day hospital	Limited-service healthcare facility for exclusively treating outpatient surgery and patients not requiring an overnight stay (Carey, Burgess, & Young, 2011). Day hospitals are also referred to as Ambulatory Surgery Centres (ASCs), or day clinics.
Outpatient setting	Setting in which day surgeries are performed namely general hospitals, day hospitals and office-based facilities.
Ophthalmology	Branch of medicine focused on the anatomy, physiology and diseases of the eye.

Gastroenterology      Branch of medicine focused on the digestive system and its disorders.

---

Orthopaedics          Branch of medicine focused on diseases and injuries of the musculoskeletal system.

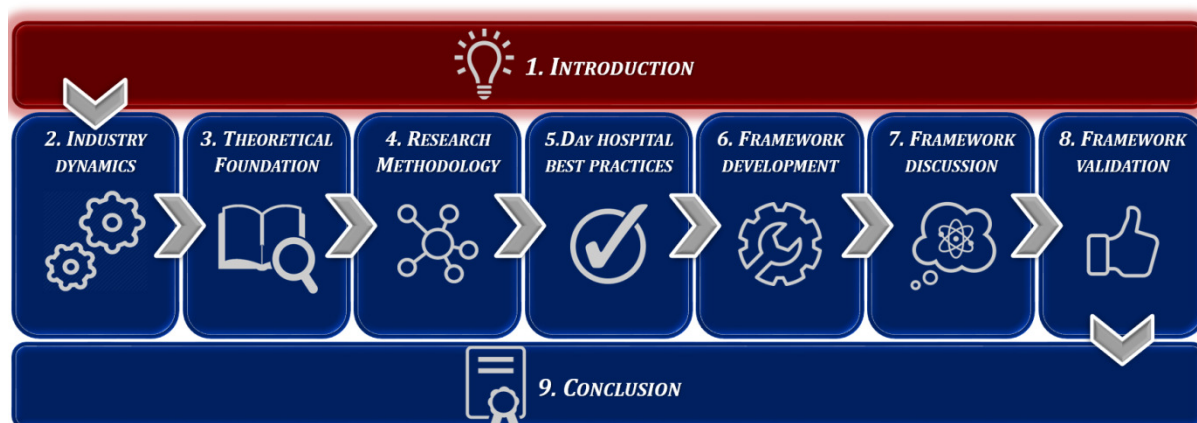
---

Operating room        Location within a healthcare facility dedicated to the performance of surgery and procedures.

---

# Chapter 1 INTRODUCTION

This research study develops a framework that will enable day hospitals, within the private healthcare industry, to self-assess their maturity on various dimensions to facilitate continuous improvement. This chapter aims to familiarise the reader with the research presented in this thesis by providing an overview of the research field and the process of the research study. The chapter introduces the background and context of the research that led to the problem statement. The established background will derive the research questions, aims and objectives, followed by the specific research approach, strategy and methodology of the research. The scope and the ethical implications of the study will also be discussed. Lastly, the document outline and illustrative chapter key will also be introduced, providing a condensed reference for the content of this document.



---

## 1.1 BACKGROUND

---

The cost of private healthcare in South Africa has reached such high levels that the majority of South Africa's population is not able to afford the services offered by this sector of the healthcare industry (Competition Commission, 2014; C. Smith, 2015). According to a recent article by Fin24, the private health sector in South Africa only serves 17% of the population (C. Smith, 2015). This statistic implies that 83% of South Africa's population relies on the heavily overburdened public healthcare system which has been majorly criticised for providing lower quality healthcare due to the major strain on limited resources.

This imbalance, of the majority of South Africans relying on the healthcare sector with the great minority of the total available healthcare resources, is mainly due to the high costs of private healthcare in South Africa. Thus, there is a major need to reduce the cost of private healthcare services, so as to relieve the major strain on the public healthcare system. Additionally, high quality healthcare needs to be more accessible to more South Africans.

Due to the pressing need for improved healthcare services, caused by a growing and aging population, healthcare expenditures are soaring. South Africa is also faced with decreasing healthcare quality in the public sector, demanding the private healthcare industry to offer quality healthcare services at more affordable prices. Consequently, healthcare organisations have been under severe pressure to improve quality for their patients and this requires doing more with less.

Private hospitals are one of the central economic institutions that endorse and contribute to these high costs associated with private healthcare in South Africa (Burger, Bredenkamp, Grobler, & van der Berg, 2012). Consequently, free-standing day hospitals, also known as Ambulatory Surgical Centres (ASCs) or day clinics, have seized the opportunity in the market for lower healthcare costs. Day hospitals have also innovatively combined lower costs with the major technological advances in surgical procedures that allows for a patient to undergo a procedure and be discharged on the same day (Munnich & Parente, 2014).

Day hospitals are considered to be disruptive within the healthcare industry as they offer the same existing healthcare services as traditional general hospitals, but offer these services of similar quality at a lower intensity and at highly reduced prices (L. R. Burns, David, & Helmchen, 2011). These day hospitals further create competition for existing general hospitals, as they are able to offer these services with increased customer convenience, and ultimately increased quality (L. R. Burns et al., 2011).

These day hospitals have been newly developed and implemented in South Africa in an attempt to offer surgical day procedures, also known as outpatient procedures, at more affordable prices. A number of these privately-owned day hospitals have been developed and operated throughout South Africa.

Although various day hospitals are already operational throughout South Africa they are still applying general hospital principles. Ashish Jha (2011) encapsulates this accurately by stating that "...we deliver 21st Century medicine using 19th Century practises" (Castano, 2014). It is therefore critical that these processes and practises applied in general hospitals be appropriately adapted to suit day hospitals with its unique enterprise structure. Process improvement strategies must be devised to guide day hospitals on how to offer quality day surgeries at reduced prices. This will be achieved through the application of various improvement principles focused on improving the efficiency and overall performance of day hospitals.

It is of utter importance that healthcare services should be safe, effective, patient-focused, timely, efficient, and equitable (Kim, Spahlinger, Kin, & Billi, 2006). Steered by increased consumer demands for easily

accessible, high quality, cost-effective, and efficient health services, day hospitals are required to redesign and standardise their operational processes.

Research in the healthcare and enterprise engineering fields is thus required to consider and integrate the relevant elements constituting day hospital operation; and subsequently offer appropriate guidelines on how to manage day hospitals efficiently with a focus on increased performance and profitability.

## **1.2 PROBLEM STATEMENT**

---

---

The development and distribution of day hospitals in South Africa is still a relatively new concept for which there are no fully established or developed operational guidelines. In the highly competitive private hospital industry, healthcare leaders and managers require structured guidance on how to operate and manage day hospitals appropriately. Thus, facilitating the realisation of organisational goals and development of enterprise maturity and performance.

Operational guidelines should provide an integrative, holistic approach that considers the multitude of elements comprising a day hospital. These guidelines should furthermore take into consideration the particular enterprise structure of a day hospital with its own unique components, elements, processes, practises and organisational goals. The development of a holistic framework is thus required to assess and advance the capability maturity of day hospitals in pursuit of increased performance, efficiency and profitability.

## **1.3 RESEARCH QUESTIONS**

---

---

The section is arranged into a main research aim that is supported by primary and sub-questions.

### **1.3.1 MAIN RESEARCH AIM**

---

The main research aim of this research is to:

***Develop a framework that will enable day hospitals within the private healthcare industry of South Africa to assess and potentially advance their capability maturity in pursuit of increased performance, efficiency and profitability.***

---

### **1.3.2 MAIN RESEARCH QUESTIONS**

---

The key research questions are of a qualitative nature. The five main research questions supportive to the main research aim of this thesis are summarised in Figure 1.

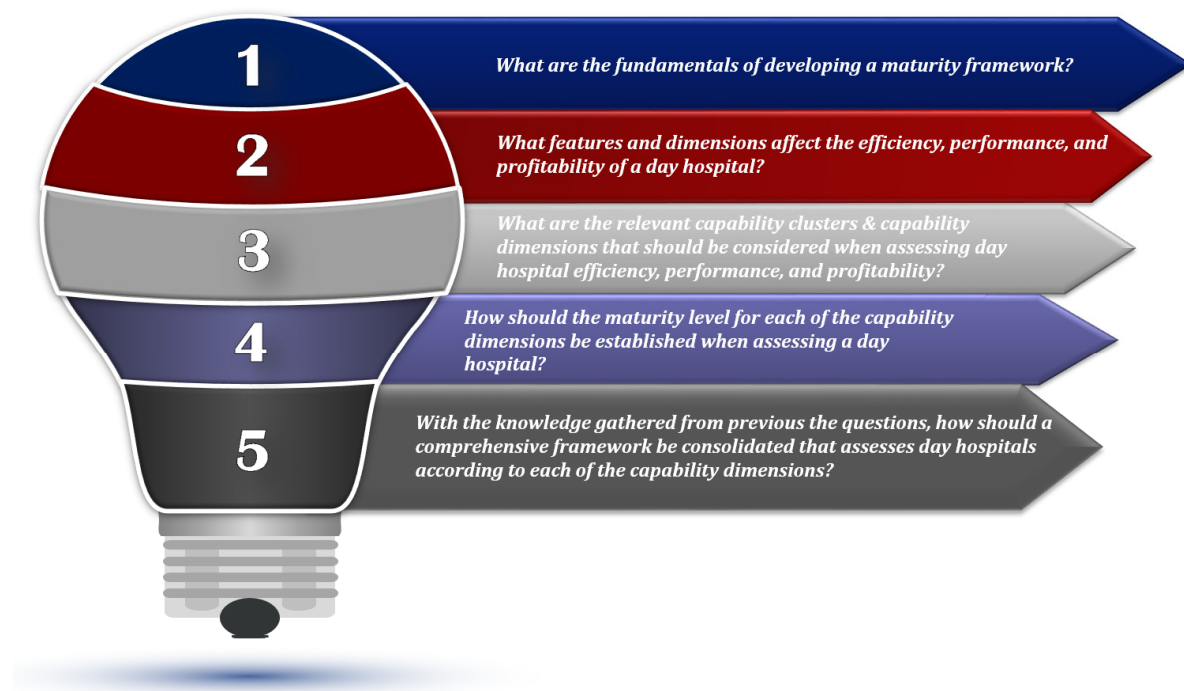


FIGURE 1: RESEARCH QUESTIONS

### 1.3.3 SUB-QUESTIONS

The sub-questions supportive to the main research questions previously stated are:

1. **What are the fundamentals of developing a maturity framework?**
  - a. What are the enterprise engineering concepts, tools and methodologies applicable in framework development?
  - b. What is the appropriate methodology for developing a new maturity framework?
  - c. What maturity frameworks, developed for the hospital industry, currently exist?
2. **What features and dimensions affect the efficiency, performance, and profitability of a day hospital?**
  - a. What is the current context of the day hospital industry?
  - b. What appropriate techniques should be followed to identify dimensions affecting day hospital efficiency, performance, and profitability?
3. **What are the relevant capability clusters and capability dimensions that should be considered when assessing day hospital efficiency, performance, and profitability?**
  - a. What are all the various elements involved in the operation of a day hospital?
  - b. Which of these elements have a significant impact on day hospital efficiency, performance and profitability?
  - c. Which of these elements should be included in the framework as dimensions that should be considered when assessing day hospital efficiency, performance and profitability?
4. **How should the maturity level for each of the capability dimensions be established when assessing a day hospital?**
  - a. What is the criteria, in terms of the identified capability dimensions, that define a mature day hospital?
  - b. How can day hospitals establish which level of maturity they have reached in each of the capability dimensions?

5. **With knowledge gathered from previous questions, how should a comprehensive framework be consolidated that assesses day hospitals according to each of the capability dimensions?**
- How should the final maturity framework be structured that integrates all the various and relevant components of day hospital operation and management?
  - How can this proposed framework be validated?
  - Does this proposed framework prove valid when evaluated by subject matter experts within the day hospital industry?

## **1.4 LIMITATIONS AND DELIMITATIONS**

---

---

In order to clearly establish the scope of the project, the scope is broken down into limitations and delimitations. These limitations and delimitations emphasise the aspects that will be focused on in this research, as well as those aspects that will not be addressed.

### **1.4.1 DELIMITATIONS**

---

The delimitations of the research study include that:

- The research will aim to develop maturity framework; that will
- enable day hospitals within the private healthcare industry of South Africa;
- to assess their maturity level in relevant capability dimensions; to ultimately
- increase and improve day hospital efficiency, maturity and performance.

### **1.4.2 LIMITATIONS**

---

The limitations of the research study include that:

- The framework is only validated through four subject matter experts (SME's) within the day hospital industry;
- the framework is only applicable for developing the maturity of day hospitals; and
- that although some features of the developed framework might be relevant beyond South African context and applicable within the public healthcare sector, the framework is primarily developed with the focus on advancing day hospital efficiency within the private healthcare sector of South Africa.

## **1.5 RESEARCH METHODOLOGY**

---

---

### **1.5.1 RESEARCH STRATEGY**

---

Execution of this study is done in five elementary phases which constitute the overall research strategy. The adopted research strategy is illustrated in Figure 2.

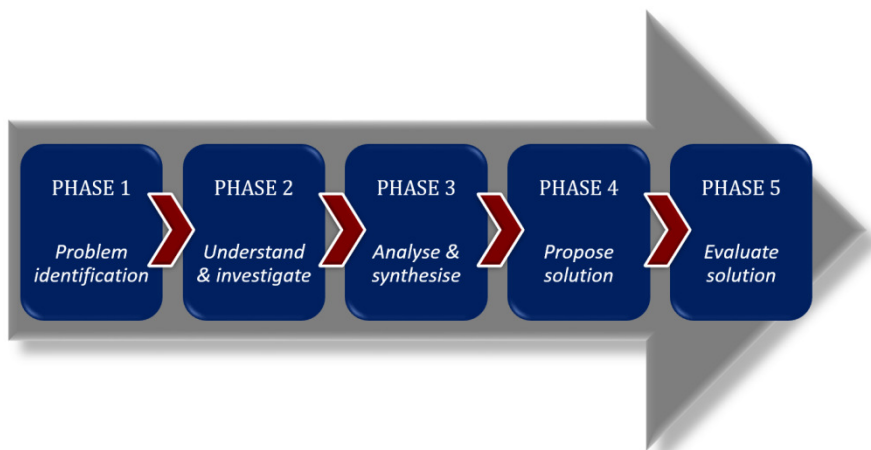


FIGURE 2: RESEARCH STRATEGY

The research strategy of this study, as depicted in Figure 2, starts with the first phase of identifying the research problem to be addressed. Proposing a solution (Phase 4) to the problem identified in Phase 1, requires that the context and literature relevant to the problem to be fully investigated and understood (Phase 2).

This knowledge gained in Phase 2 can then be analysed and synthesised (Phase 3) to propose an accurate solution to the problem identified in Phase 1. The final step of the research strategy to be adopted, is the evaluation of the proposed solution (Phase 5). This final step ensures that the research produces an accurate, valid solution to the identified problem.

The methodology and approach with regards to this research study is elaborated on comprehensively in Chapter 4.

### **1.5.2 RESEARCH APPROACH**

With the research strategy (Figure 2) as a departure point, the study can be further separated into three main sections of note namely, the *Literature Review*, *Framework Development*, and *Framework Validation*. These sections of the research strategy can be seen in Figure 3, and is elaborated on below.



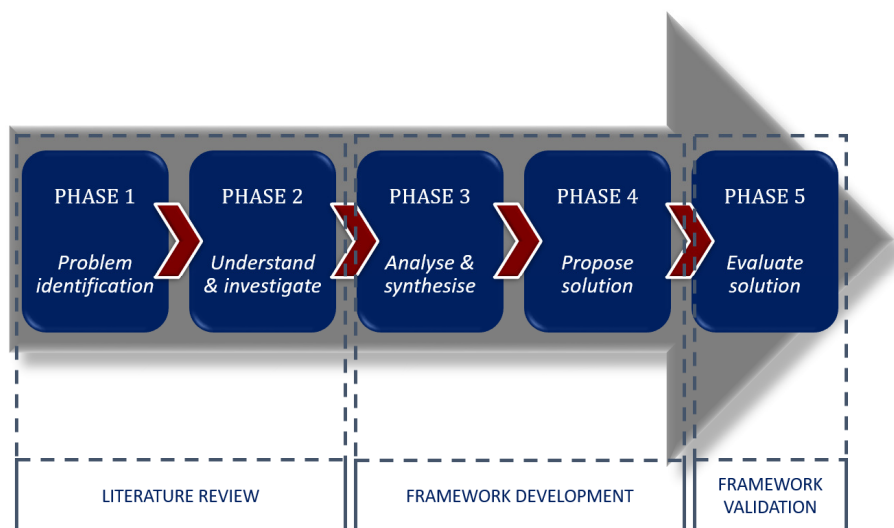


FIGURE 3: MAIN RESEARCH SECTIONS

### **LITERATURE REVIEW**

The first section is the *Literature Review*. Initial consultation and discussions with industry experts and partners led the author to identify the need for hospitals, in particular day hospitals, to advance their maturity in pursuit of increased efficiency, performance and profitability.

In order to further investigate and understand the context of the identified problem, the relevant literature on this topic was studied. From this literature review it was established that the identified problem can be addressed through developing a maturity model framework. Further, the investigation concluded that the development of a maturity framework is a viable solution to advance day hospital maturity in pursuit of increased efficiency, performance and profitability. This resulted in the problem statement for this research study.

### **FRAMEWORK DEVELOPMENT**

The second section, *Framework Development*, involves analysing the knowledge gathered from the literature study, and subsequently synthesising the relevant information to propose a solution to the identified problem. The literature supporting the development of the framework addresses the hospital industry dynamics, the principles and tools of Enterprise Engineering, as well as the fundamentals of maturity frameworks. The proposed framework is established by consolidating the appropriate information and synthesising relevant elements into a structured framework.

The development of this maturity framework further involved establishing what capability dimensions need to be included in the framework, as well as defining the criteria requirements for the different maturity levels.

## **FRAMEWORK VALIDATION**

The final section of the study, *Framework Validation*, aimed to evaluate to what degree the proposed solution solved the identified problem. The maturity framework was validated through interviews with four SME's within the day hospital industry. These subject matter experts were subsequently asked to complete a questionnaire aimed at establishing the validity of the maturity model framework for day hospitals. This validation process is comprehensively discussed in Chapter 8.

## **1.6 ETHICAL IMPLICATIONS OF RESEARCH**

This research study has been deemed not to involve aspects that would bring the ethics of the research into question. This study has received ethical clearance through the formal university ethics approval process and the study has been classified as low-risk by the ethics committee of the University of Stellenbosch.

It should however, be noted that some of the data provided by a partner organisation could be considered to be of a sensitive nature as the data captures the organisation's competitive advantage and strategy. This research thesis will therefore be classified as confidential for three years by the University of Stellenbosch as to not compromise the confidentiality of the data provided by the organisation. If the organisation wishes to extend the confidentiality period after three years, if so inclined, a request may be directed to the University.

## **1.7 DOCUMENT OUTLINE**

The purpose of this section is to establish the document structure that led to achieving the outcome of this dissertation. A systematic approach was employed in the execution of this research which ensured that the final result was conceived through the application of concrete concepts and methods.

The layout of this document will be guided by the chapter outline depicted in Figure 4. This document structure enables the reader to understand the structure of the study and the sequential order which it follows.



FIGURE 4: DOCUMENT OUTLINE

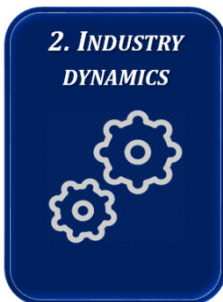
The following provides a short description of the document structure and chapter content:

### Chapter 1: Introduction



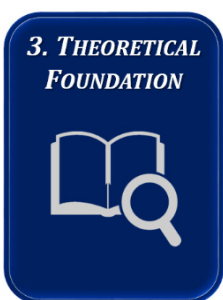
Chapter 1 introduces the study by establishing the background and problem statement of the research. This chapter further describes the research aim, questions and objectives of the study followed by the specific research approach and methodology of the research. Lastly, the scope and ethical implications of the study are discussed. The document outline and illustrative chapter key is also introduced in this chapter.

### Chapter 2: Industry dynamics



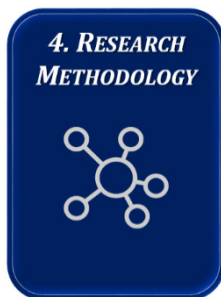
This chapter presents the first part of the literature review, and introduces the day hospital landscape, paving the way for a literary discussion of why it is critical to develop and improve day hospital maturity within the private healthcare industry of South Africa. This chapter further investigates the various types of day hospital procedures and facilities. Chapter 2 concludes by investigating the main contributors that are responsible for current day hospital immaturity.

### Chapter 3: Theoretical foundation



Chapter 3 addresses the second part of the literature study. This chapter initially explores the Enterprise Engineering field along with its key concepts, tools and methodologies. The chapter then shifts its focus to comprehensively investigating the fundamentals of maturity model development. Various types of maturity models are investigated, as well as their development methods. Chapter 3 then further investigates the concept of Business Process maturity models, along with some existing maturity model. This chapter concludes with a review of lean principles, as well as the fundamentals of continuous improvement relevant within the healthcare industry.

#### Chapter 4: Research Methodology



This chapter details the approach that will be followed in the development of the maturity model framework for day hospitals. Thus, Chapter 4 covers the research methodology of the dissertation. The main purpose of this chapter is to present the research methodology and methods used in this study to address the identified research problem. The reasons for the choice of methodology used in this research study will also be clarified in this chapter. The discussion in this chapter outlines the research design and approach, the research strategy, the research method that will be followed, and the methods of data collection.

#### Chapter 5: Day hospital best practices



subject matter expert.

The purpose of Chapter 5 is to investigate and identify all the various dimensions that should be included in the maturity model framework for day hospitals. Initially, the chapter investigates the elements involved in day hospital operation with significant impact on day hospital efficiency, performance and profitability. These dimensions are identified through formulating a conceptual patient flow pathway, and subsequently investigating all the relevant best practises associated with each of the patient flow phases. This conceptual patient flow strategy followed, in order to identify the dimensions of the maturity model framework for day hospitals, was validated as being representative of day hospital practises within the industry by a

#### Chapter 6: Developing the framework



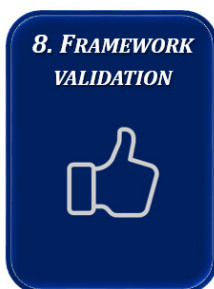
The purpose of Chapter 6 is to formulate the criteria that the various dimensions identified in Chapter 5 should meet to reach a specific maturity level. For the sake of comprehensiveness; this chapter also re-iterates and elaborates on the research strategy steps that should be completed in the development of a maturity model. Therefore, this chapter addresses the first three phases of the research strategy as outlined in Chapter 4, excluding the final step of Phase III, namely, grouping the identified dimensions into main focus areas. This final step is addressed in Chapter 7.

## Chapter 7: Framework discussion



Chapter 7 presents and proposes the final solution to the stated research problem. This chapter draws on all the knowledge gained from Chapter 3; investigating all the elements of maturity models, and Chapter 5, investigating all the different dimensions affecting the efficiency of day hospitals. Subsequently, this chapter consolidates and integrates all the knowledge acquired thus far to establish the final maturity model framework for day hospitals. Hence, the final maturity model framework for day hospitals is presented in this chapter. Chapter 7 further comprehensively discusses the elements of proposed framework for assessing and growing the capability maturity of day hospitals. These elements discussed include: the main focus areas of the model, the various maturity levels, as well as the structure of the model. Finally, this chapter concludes by presenting an example which presents how this model can be used.

## Chapter 8: Framework validation



The objective of Chapter 8 is to validate the maturity model framework proposed in Chapter 7 with regards to its potential of meeting the addressed problem in Chapter 1 and its functional correctness. This chapter focuses on the evaluation of the research done during this study. The focus of this chapter is to validate the maturity model, highlight shortcomings and test the response of industry leaders and subject matter experts within the healthcare and industrial engineering field. This chapter sets out with an introduction and the presentation of validation considerations leading to the determination of the validation approach for this study. Both the validation approach and its outcomes are then described in detail. Finally, the undertaken framework improvements resulting from the validation are presented.

## Chapter 9: Conclusion



The final chapter of the study concludes the research by presenting a concise summary of the research. The purpose of this chapter is to conclude the research and findings found in this project by confirming that all the project objectives as set out in Section 1.3, have been indeed been met in the development of a day hospital maturity model. This chapter also discusses opportunities and recommendations for future project expansion.

## **1.8 CHAPTER CONCLUSION**

---

---

The purpose of this chapter was to introduce the reader to the research presented in this thesis by providing an overview of the research field and the process of the proposed research study. This research study proposes a framework that will enable day hospitals within the private healthcare industry to assess and improve their capability maturity in pursuit of increased efficiency, performance and profitability. This chapter initially presented the background and context of the research that led to the problem statement.

The established background derived the research questions, aims and objectives, followed by the specific research approach and methodology to be applied. The scope and the ethical implications of the study was also discussed. Lastly, the document outline and illustrative chapter key was presented. This chapter key will be used as a visual reference throughout this thesis to guide the reader through the document.

# Chapter 2 *INDUSTRY*

## *DYNAMICS*

Chapter 2 presents the first part of the literature review and introduces the day hospital landscape, paving the way for a literary discussion about why it is critical to develop and improve day hospital maturity within the private healthcare industry of South Africa. This chapter further investigates the various types of day hospital procedures and facilities. Chapter 2 concludes by investigating the main contributors that are responsible for current the day hospital immaturity.



---

## 2.1 DAY SURGERY DYNAMICS

---

### 2.1.1 DAY SURGERY LANDSCAPE

---

The landscape of healthcare service delivery has dramatically changed over the past thirty years; largely due to great advances in technological developments (Munnich & Parente, 2014). One of these changes has resulted in a major shift; from delivering healthcare services in an inpatient setting, to delivering these services in an outpatient setting (Carey et al., 2011; Hollenbeck et al., 2014; Munnich & Parente, 2014).

Technological advancements in anaesthesiology and laparoscopic surgery initiated this change as it made it possible for patients to be discharged on the same day as their surgery was performed. Whereas previously patients would have to spend several days in the hospital recovering in an inpatient setting (Munnich & Parente, 2014).

*Outpatient surgery*, or day surgery, is based on the premise of performing non-urgent, elective surgical procedures, undertaken during the period of a normal working day, followed by patient discharge before the end of the day (Abusalem, 2012; Gilliard et al., 2006). Day surgeries are not expected to have any major complications, and therefore it is expected that the patient will be well enough to go home the same day that the procedure is performed. *Elective surgery* refers to a surgical procedure that can be scheduled in advance to be performed on a chosen date (Abusalem, 2012).

The substantial advances in outpatient surgical procedures have resulted in a wide array of significant benefits to patients. The most noteworthy benefits of outpatient surgery include (Australian Day Hospital Association, 2015; Bragg, Vanbalen, & Cook, 2005; Brökelmann, 2012; Day Hospital Association of South Africa, 2016b):

- Patients generally experience less post-operative pain due to the majority of day surgeries performed being minimally invasive;
- shorter hospital stays for patients;
- decreased hospitalisation costs for patients;
- shorter recovery periods after discharge due to minimally invasive surgery; as well as
- decreased recovery- and hospitalisation periods allow for patients to return to work much faster, thus minimising income loss as a result of work absence.

Since the 1980's, the volume of outpatient procedures performed has grown considerably (Hollenbeck et al., 2015). In the United States there are currently nearly 35 million outpatient procedures per year (Cullen, Hall, & Golosinskiy, 2009; Suskind et al., 2015). Simultaneously, a change in the settings for these procedures have taken place; from outpatient units in general hospitals to day hospitals, also known as ambulatory surgery centres (Hollenbeck et al., 2015). In the United States the number of procedures performed in day hospitals now exceeds those done on an inpatient basis (Cullen et al., 2009; Edwards & Slawski, 2016).

*Day hospitals* only offers a limited range of healthcare services, and solely treats outpatient surgery patients not requiring an overnight stay (Carey et al., 2011). In general, these day hospitals offer only a single type of procedure; which is mainly specialised surgeries in gastroenterology, orthopaedics and ophthalmology (Carey et al., 2011).



*General hospitals* are traditional healthcare facilities that provide a wide range of complex services including: inpatient services, outpatient services, as well as emergency services (Munnich & Parente, 2014; E. Weber, 2014); in comparison with day hospitals that exclusively provide outpatient surgeries (Munnich & Parente, 2014).

Day surgery offers a more affordable alternative to surgery performed in an inpatient setting, as these surgical procedures performed as day surgery typically requires a less than 24-hour hospital stay. Additionally, surgery executed in day hospital settings have lower administrative overhead costs than general hospitals (Lucas, 2013). Through offering only a limited range of procedures, day hospitals are able to achieve increased efficiencies at decreased costs. This is in contrast to general hospitals that offer a wide range of procedures (Carey et al., 2011). General hospitals characteristically cross-subsidise loss-making service lines with service lines that makes profits (Castano, 2014). This implies that their sustainability is largely dependent on this compensatory scheme that distributes the heavy overhead burden (Castano, 2014).

It is argued that through providing a limited range of procedures, day hospitals can transform the hospital industry by setting a new competitive benchmark that promotes cost efficiency, while still upholding high-quality care (Carey et al., 2011). This notion is supported by Hollenbeck et al. (2015) whose research found that day hospitals can safely perform day surgery procedures in a less expensive setting, without sacrificing high-quality care (Hollenbeck et al., 2015).

### **2.1.2 DAY SURGERY FACILITIES**

---

General hospitals have to compete with day hospitals for outpatient surgery patients within the local markets they serve (Carey et al., 2011). Day hospitals allow patients to flow through the system more efficiently at a lower cost which results in a reliable and predictable patient flow (Lloyd, Lockhart, Sisak, & Middleton, 2012). This improved efficiency has allowed day hospitals to offer identical surgical procedures performed by general hospitals at a reduced cost; bringing about major competition for these general hospitals (Carey et al., 2011).

With this rising competition, knowledge of the various facilities offering day surgeries is required; so as to gain a better understanding of the competitive dynamics between these facilities. Investigating and comparing day surgery facilities reveals the competitive advantages and weaknesses of all the players in the industry.

Day surgery can be performed in three primary healthcare facilities that offer surgical services. Day surgery services are mainly provided in general hospital settings, day hospital settings, and within office-based facilities (Grobler & Potgieter, 2009; Winter, 2003). Each of these are detailed and considered below:

#### **2.1.2.1 GENERAL HOSPITAL**

As mentioned before, general hospitals offer a range of services, including inpatient and outpatient surgical services (Brökelmann, 2012; Carey et al., 2011). This mix of day surgeries and conventional surgeries offered by general hospitals results in a structure in which available operating rooms (ORs) must be shared amongst these two types of surgeries (Beaussier, Marchand-Maillet, Dufeu, & Sciard, 2015). This implies that day surgery cases are performed within the same operating rooms as other conventional surgical cases.

The beds dedicated to patients undergoing day surgery can be situated in different locations within a general hospital, resulting in two different kinds of setups within this type of facility. Each of these are discussed below:

### Day ward

The location of the beds dedicated to day surgery cases is largely dependent on the size and resource capacity of a general hospital. Day surgery patients are ideally placed in a dedicated unit reserved exclusively for patients not requiring an overnight stay (Beaussier et al., 2015). This unit is typically referred to as a day ward. The benefits and drawbacks of this type of facility is described in Table 1.

TABLE 1: BENEFITS & DRAWBACKS OF DAY WARD FACILITY (BEAUSSIER ET AL., 2015; CASTORO ET AL., 2007; DODARO, GRIFASI, LO CONTE, & ROMAGNUOLO, 2013)

BENEFITS	DRAWBACKS
No need to manage day cases with overnight cases within the same ward, as unit is dedicated exclusively to planned day surgeries.	Due to day case surgeries being performed in the same operating theatres as other general surgeries, the problem of operating room shortage arises.
Allows for adjustments to be easily made regarding resources such as nursing staff, and other activities. For example, if the hospital is at capacity the beds in the day ward can be utilised for conventional overnight cases.	Costs for day surgery in general hospitals is more expensive than in day hospitals.
Surgeons can remain in the same operating room to perform day surgeries, as well as general surgeries without having to move from one facility to another.	There exists the risk of hospital-related infections and diseases due to close proximity to other wards treating more serious cases.

### Integrated day beds

This type of setup is also a variation of the general hospital facility. Integrated centres typically have limited size and capacity constraints, and are thus required to integrate day case patients and inpatient cases within the same unit. Therefore, beds dedicated to day case surgeries are generally located within general surgery wards (Beaussier et al., 2015). Table 2 mentions the main benefits and drawbacks of this type of facility.

TABLE 2: BENEFITS & DRAWBACKS OF INTEGRATED DAY BED FACILITY (BEAUSSIER ET AL., 2015; DODARO ET AL., 2013)

BENEFITS	DRAWBACKS
This type of structure is flexible as this system allows for adjustments in resources and activities.	This type of structure requires that operating rooms be shared amongst conventional procedures and day procedures which limits the availability of operating rooms and staff.
Surgeons can remain in their classical operating room environment as all surgeries are performed in the same operating rooms.	There exists the risk of providing a lower quality of care as interferences in providing care may occur due to conventional and day cases sharing resources but following various processes.

### 2.1.2.2 FREE-STANDING DAY HOSPITAL

The second primary type of facility is a free-standing day hospital; in which only day surgeries are performed completely independent of a general hospital facility (Beaussier et al., 2015). These day hospitals are generally smaller than general hospitals (Pallardy & Becker, 2013)

The majority of day hospitals are highly-specialised facilities that only offer a limited number of specific surgical services (Beaussier et al., 2015; Carey et al., 2011). Most of the surgical procedures performed are relatively uncomplicated, and therefore do not require patients to spend the night (Beaussier et al., 2015). Table 3 outlines the benefits and drawbacks of a free-standing day hospital facility.

TABLE 3: BENEFITS & DRAWBACKS OF A FREE-STANDING DAY HOSPITAL FACILITY (AUSTRALIAN DAY HOSPITAL ASSOCIATION, 2015; BEAUSSIER ET AL., 2015; BRÖKELMANN, 2012; HOLLENBECK ET AL., 2015)

BENEFITS	DRAWBACKS
Free-standing day hospitals typically only perform dedicated highly specialised surgeries that are relatively uncomplicated. This allows for procedures to be optimally designed.	Constrained by having limited adaptive potential due its smaller size and resource pool.
Unplanned admissions are less frequently observed in free-standing facilities than in general hospital-based day wards. Resulting in more accurate scheduling and permits more effective use of staff and facilities.	Free-standing facilities are isolated in nature from conventional general hospitals. Therefore, a larger risk exists; should perioperative problems occur and the patient be required to transfer to a general hospital located some distance away.
Costs for day surgery in free-standing day hospitals are less expensive than in general hospitals.	Surgical evolution and the development of new innovative procedures are considered more difficult within independent free-standing day hospitals than in a conventional hospital structure.
This type of facility is dedicated primarily to planned day surgeries; therefore, eliminating the need to manage day cases with overnight cases.	Limited access to specialty physicians and ancillary services that may be required for more complicated day surgery cases.

### 2.1.2.3 OFFICE-BASED FACILITY

The final primary type of facility in which day surgeries are performed is the office-based facility. In this type of facility day surgeries are performed within specialised physicians' offices that typically have only one operating theatre in which day procedures are performed (Brökelmann, 2012).

Office-based surgery is formally defined as "operations or procedures carried out in medical practitioners' professional premises which provide appropriately designed, equipped and serviced rooms for their safe performance" (Lemos, Jarrett, & Philip, 2006). Office-based facilities are in general much smaller in size than free-standing day hospital facilities.

The benefits and drawbacks of this type of facility are indicated in Table 4.

TABLE 4: BENEFITS & DRAWBACKS OF OFFICE-BASED FACILITY (LEMONS ET AL., 2006; URMAN, PUNWANI, & SHAPIRO, 2012)

BENEFITS	DRAWBACKS
Improved access and convenience for patients.	Limited access to specialty physicians and ancillary services that may be required should complications arise for surgical patients undergoing day procedures.
Typically, more cost-effective than general hospitals and even larger free-standing day hospitals offering surgical day procedures.	Quality of care issues may arise due to proper regulations, licensing and accreditation programmes not yet being fully in place for this type of facility, as is for day hospitals and general hospitals.

### 2.1.3 DAY SURGERY PROCEDURES

Day surgery encapsulates a wide range of surgical procedures-, including all surgical specialties, from operations under local anaesthesia to complicated operations under general anaesthesia. This raises another important aspect of day surgery to consider, regarding the severity and complexity of the procedure to be performed. Some of the day surgery facilities mentioned before are more suitable to perform and provide adequate care for certain procedures than other types of facilities. This is illustrated in Figure 5, which indicates that the severity of the surgical procedure, and the level of postoperative care required dictates which facility is most appropriate to perform the procedure.

SERVICE	FACILITY		
Minor procedure	<b>OFFICE-BASED FACILITY</b>	<b>DAY HOSPITAL</b>	
Minor surgery			
Major surgery		<b>GENERAL HOSPITAL</b>	

FIGURE 5: APPROPRIATE HEALTHCARE FACILITY FOR SURGICAL PROCEDURES  
COMPILED FROM (NOBLE, 2015)

There are three levels of surgery, Level I-III, that refer to the complexity of anaesthesia and surgical procedures performed (Grobler & Potgieter, 2009).

Level I refers to minor surgery that requires only topical or local anaesthesia, but does not involve drug-induced alteration of consciousness. As there is no alteration of consciousness; minimal to none postoperative monitoring is required. This level of surgery may, however, involve minimal sedation utilising preoperative anti-anxiety drugs (Grobler & Potgieter, 2009; Massachusetts Medical Society, 2011).

Level II refers to surgical procedures that require mild to moderate oral or intravenous sedation anaesthesia to be performed. This level of surgery requires postoperative monitoring (Grobler & Potgieter, 2009; Massachusetts Medical Society, 2011).

Level III refers to surgical procedures that require deep sedation and analgesia, general anaesthesia or major support of vital bodily functions (Massachusetts Medical Society, 2011). Intensive postoperative monitoring is vital for patients undergoing Level III surgery.

The complexity and severity of surgical procedures that can be performed and treated within office-based settings and day hospital settings are increasing at unprecedented levels due to the major advances in anaesthesiology and laparoscopic surgery (Massachusetts Medical Society, 2011).

From Figure 5 it can be seen that day hospitals are most appropriate for Level II-type minor surgeries, but that technological advances are continually allowing day hospitals to perform increasingly complex surgeries as day surgeries. Research in the United States and the United Kingdom has shown that over 70% of all surgical procedures can be safely carried out in day hospitals (Day Hospital Association of South Africa, 2016a).

South Africa is however lagging behind in terms of utilising the available technology to perform surgeries as day procedures. It is estimated that only 7% of all operations in South Africa are performed in day hospitals (Advanced Health, 2014). This issue can be addressed by the development and distribution of day hospital facilities throughout South Africa that will promote the performance of surgical procedures as day surgery rather than inpatient surgery requiring over-night hospitalisation.

In the United States the development of free-standing day hospitals have successfully reduced the cost of a range of outpatient procedures, including those surgical procedures that were previously only performed in general hospitals (Hukins, Richter, & van Staden, 2001). Consequently, the healthcare industry in the United States experienced rapid growth in the number of free-standing day hospitals; making these day hospitals the preferred facility for surgical day procedures (Hukins et al., 2001).

According to the 2006 National Survey of Ambulatory Surgery (NSAS) performed in the United States, a total of 53,3 million (53 329 000) elective surgical and non-surgical procedures were performed in inpatient and outpatient settings (Cullen et al., 2009). In 2006, 34,7 million (34 738 000) of these total procedures were performed in an outpatient setting namely, day procedures performed in general hospitals, free-standing day hospitals, and office-based facilities. This indicates that 65,14% of day procedures are performed in outpatient settings, thus supports the notion that there is a major shift to surgical procedures performed in outpatient settings as opposed to the traditional inpatient setting.

This survey further designated that 42,8% of these outpatient procedures were performed in free-standing day hospitals and office-based facilities, as depicted in Figure 6.

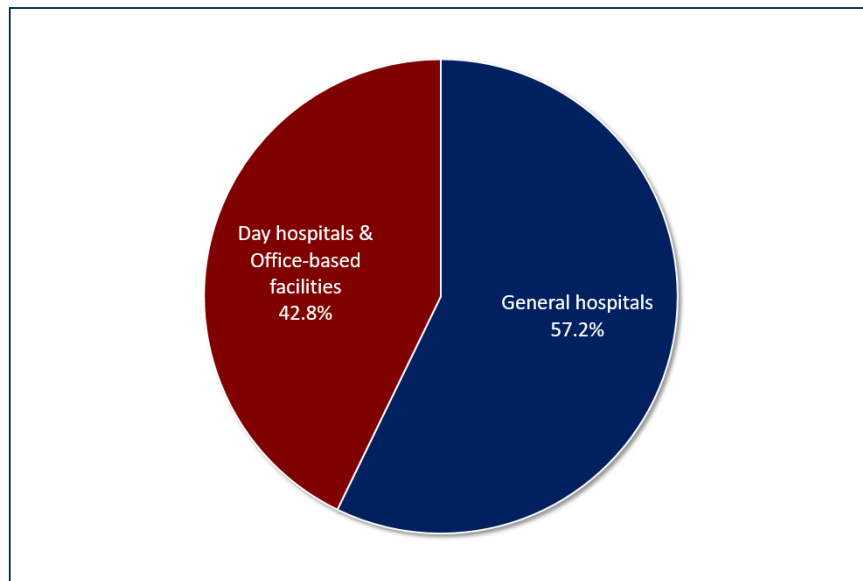


FIGURE 6: PERCENT DISTRIBUTION OF DAY PROCEDURES BY FACILITY TYPE IN THE UNITED STATES  
COMPILED FROM (CULLEN ET AL., 2009)

A study performed in 2012, across 28 states in the USA, indicated that nearly all eye-related surgeries were performed as day surgeries in an outpatient setting (Wier, Steiner, & Owens, 2015). Figure 7 indicates the distribution of surgeries by body system that were performed as day surgeries versus as inpatient surgeries in 2012.

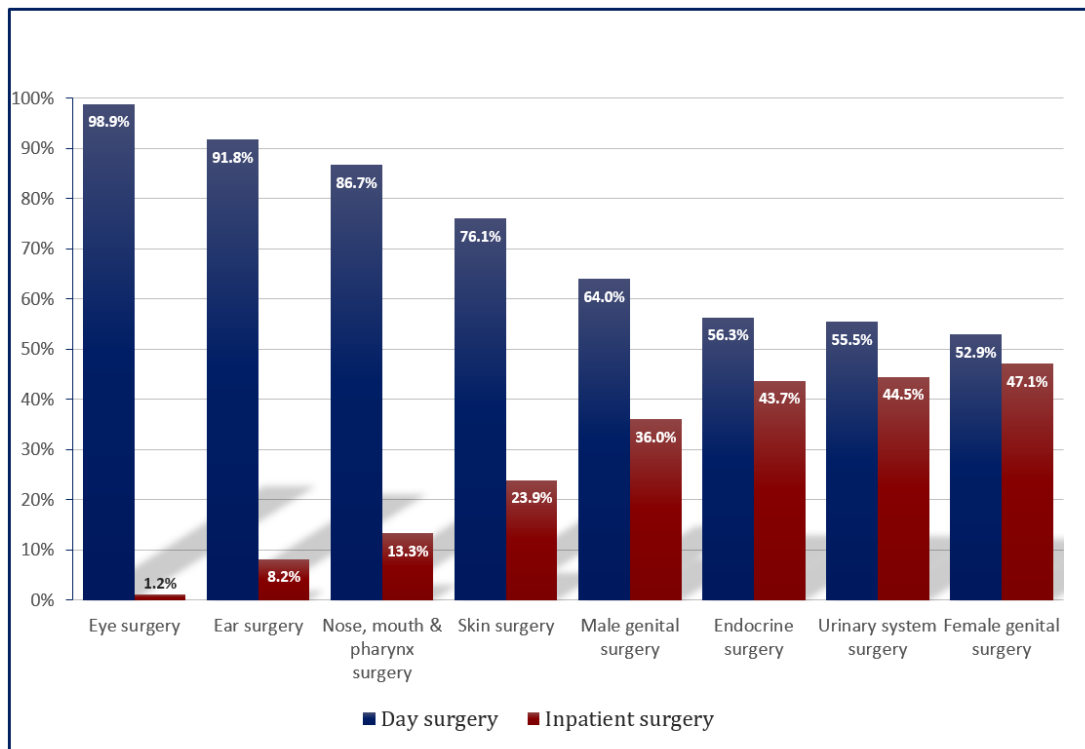


FIGURE 7: DAY SURGERIES VERSUS INPATIENT SURGERIES PERFORMED BY BODY SYSTEM IN 2012  
COMPILED FROM (WIER ET AL., 2015)

As can be seen from Figure 7, the outpatient setting was the most common for the majority of surgeries performed on the ear (91,8%); nose, mouth and pharynx (86,7%); and skin (76,1%). Of the most common surgical procedures included (Wier et al., 2015):

- Lens and cataract procedures;
- Cholecystectomy/common duct exploration;
- Excision of semilunar cartilage of knee;
- Hernia repair;
- Lumpectomy; as well as
- Decompression of peripheral nerve.

## **2.2 DAY HOSPITAL INDUSTRY IN SOUTH AFRICA**

South Africa's healthcare delivery system is divided into private and public sector which exist in parallel. Despite the fact that there are presently large inequities between these two sectors (that need to be addressed), the private healthcare industry in South Africa is a national asset. This asset plays a crucial role in aiding the government to meet its constitutional obligation of providing quality healthcare services to all citizens (Econex, 2013).

The private healthcare sector has proven to provide excellent quality healthcare that is highly regarded at an international level (Econex, 2013). These world-class healthcare services are however, accessible to only 16,6% of South Africa's population who are able to afford private medical aid cover (Econex, 2013). The remaining 83,4% of South Africa's population relies on the heavily overburdened public healthcare system; which has been majorly criticised for providing lower quality healthcare due to the major strain on limited resources.

It must be recognised that given the needs of South Africa in terms of healthcare delivery for all, the landscape of the private sector in its current form may not necessarily provide a sustainable solution (Econex, 2013). The primary problem with South Africa's healthcare delivery system is thus that "prices in the private healthcare sector are at levels that only a minority of South Africans can afford" (Competition Commission, 2014).

Rapid rises in healthcare costs is not restricted to only South Africa's healthcare industry. This rising healthcare costs is a challenge faced by the global healthcare industry. The main driver of South Africa's healthcare inflation is the cost of hospitalisation (Day Hospital Association of South Africa, 2016c). The magnitude of hospital cost increases within South Africa's private healthcare industry is well documented, and the steep escalation in private hospital expenditure over the past decade has raised concern in both private and public sectors (Advanced Health, 2014). In an effort to prevent hospitalisation costs from further dramatic increases, South Africa has followed international suit and adopted the development of day hospitals that can offer accessible and affordable private healthcare to a broader public.

The private hospital industry in South Africa is currently dominated by three large JSE-listed hospital groups namely, Mediclinic International, Netcare and Life Healthcare (Econex, 2013). Of the total 34 572 private beds in South Africa, Netcare has 9 444 beds, Life Healthcare has 8 647 beds, and Mediclinic has 7 885 beds (MediClinic, 2016). Collectively these three players account for 75% of the private hospital market; indicating that the private hospitalisation market is controlled by hospital groups.

These three large hospital groups have attempted to enter the day hospital industry on a big scale, but have been encountering difficulties with the Competition Commission in acquiring hospitals. This has allowed for new smaller hospital groups to enter the market (Makholwa, 2014). The relevant role players within the private day hospital industry are listed below:

- Netcare;
- Life Healthcare;
- MediClinic;
- Cure Day Clinics;
- Advanced Health; and
- Intercare.

The larger hospital groups do, however, pose as major competition for the smaller entrants into the day hospital industry. These groups are able to further reduce costs through their co-location model. This type of model is based on the premise of locating a day hospital facility in close proximity to an existing general hospital. This enables them to reduce the capital investment required to commission the day hospital, and further allows them to reduce the operational costs of the day hospital by sharing resources with the existing general hospital (Pitso, 2015).

In the beginning of 2016 there were a total of 285 day hospitals and general hospitals within the private sector of South Africa (Day Hospital Association of South Africa, 2016a). The great majority of hospitals within the private sector however remain general hospitals, with only 50 day hospitals, as can be seen Figure 8.

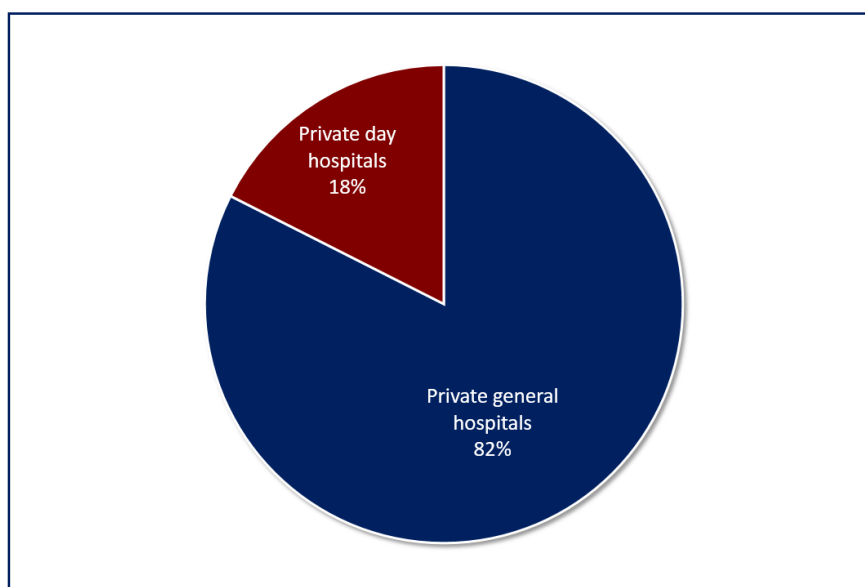


FIGURE 8: DAY HOSPITAL VS GENERAL HOSPITAL DISTRIBUTION IN SOUTH AFRICA'S PRIVATE HEALTHCARE SECTOR (DAY HOSPITAL ASSOCIATION OF SOUTH AFRICA, 2016A)

Hendrik Hanekom, CEO of Intercare Medical & Dental Centres, states that the cost of undergoing a surgical procedure in a day hospital is between 26% and 50% lower when compared to the cost of undergoing the day same procedure in a general hospital (Makholwa, 2014). Despite this significant cost savings, only 15% of all surgery within the private sector are performed as day surgeries in South Africa, whereas more than



70% of all surgery is performed as day surgery on an international scale (Makholwa, 2014). Furthermore, it is estimated that less than 7% of these surgeries are performed in day hospital facilities (Advanced Health, 2014).

Australia is one of the leaders in day hospital development, and with a similar private-public healthcare structure to South Africa. In Australia there were 592 private hospitals, of which 311 accounted for day hospitals, and 281 for general day hospitals (Australian Institute of Health and Welfare, 2014). This can be seen in Figure 9.

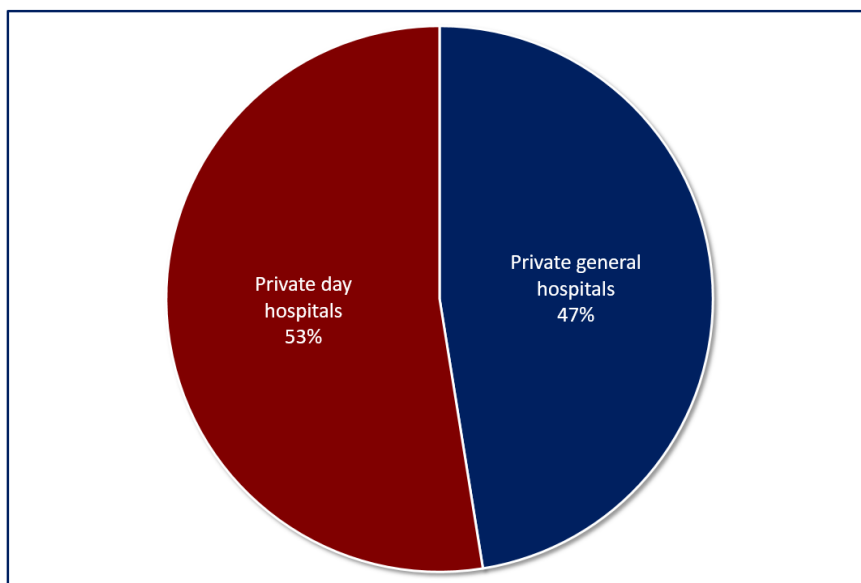


FIGURE 9: DAY HOSPITAL VS GENERAL HOSPITAL DISTRIBUTION IN AUSTRALIA'S PRIVATE HEALTHCARE SECTOR  
(AUSTRALIAN INSTITUTE OF HEALTH AND WELFARE, 2014)

Day hospitals are widely used in the rest of the world, but have not gained much traction in South Africa. As can be seen from comparing the distribution and growth of day hospital facilities in Figure 10, South Africa is lagging behind the world leaders in day hospital development. This indicates that a substantial potential exists for day hospital development in South Africa.

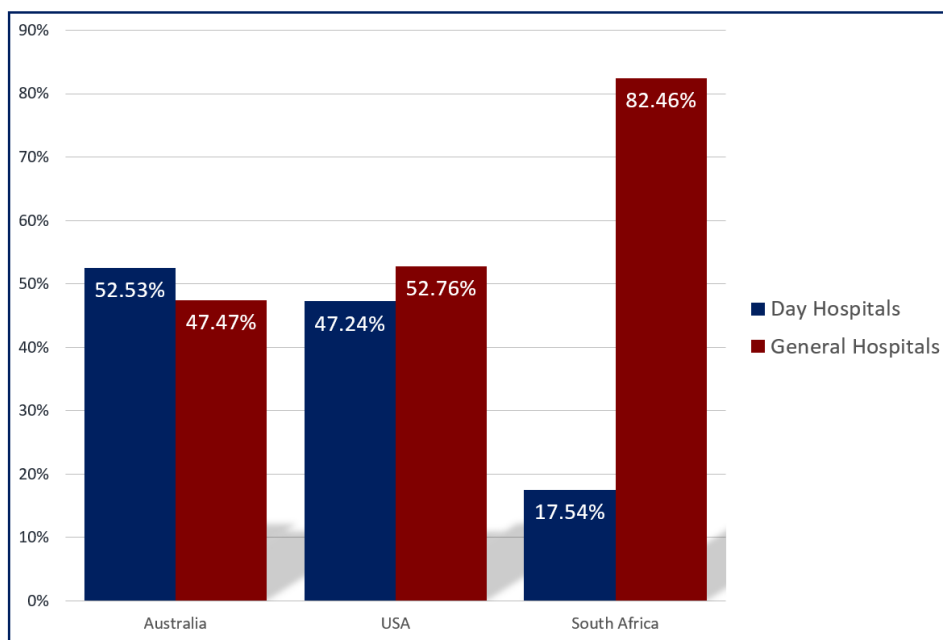


FIGURE 10: DAY HOSPITAL VERSUS GENERAL DISTRIBUTION PER COUNTRY  
(Day Hospital Association of South Africa, 2016a)

## 2.3 BARRIERS TO DAY SURGERY GROWTH

Despite having access to the same technological healthcare advances, South Africa is still lagging behind the rest of the world when it comes to day surgery and day hospital development. Comprehensive knowledge regarding the issues and barriers that hinder day hospital development in South Africa is the first step in formulating solutions and strategies to overcome these obstacles.

### 2.3.1 ABSENCE OF SUPPORT FROM MEDICAL AID SCHEMES

In many countries, the healthcare reimbursement systems stimulate the use and development of day hospitals. This has not been the case in South Africa until recently; as advances from the leading medical scheme administrator, Discovery Health, only recently announced its intention to pay surgeons an incentive if they treat patients in day hospitals (Advanced Health, 2014). This incentive, by Discovery Health, promises that it will pay surgeons a 30% surcharge on approved surgery fees for procedures performed in day hospital facilities rather than general hospitals (Advanced Health, 2014).

Discovery Health has however, been the only medical scheme thus far to offer this type of incentive; which can act as stimulus in day hospital growth. Buy-in from other leading medical aid scheme administrators such as Medscheme, Metropolitan and Momentum, are also required in order to support further growth within the day hospital industry.

### 2.3.2 LACK OF PHYSICIAN BUY-IN

General hospitals within the private hospital industry have long been offering physicians subsidised rental office-space in which to operate their practices (Advanced Health, 2014). These offices are generally

located in close proximity to the general hospitals, so as to maximise convenience for these physicians by limiting the need to travel in order to perform surgeries. By accommodating these physicians as far as possible regarding their needs and preferences, general hospitals ensure that they retain the sizable income that these physicians generate.

Due to the fact that new entrants into the day hospital industry are not able to offer physicians these extensive conveniences; physicians prefer to rather perform their surgical procedures in conveniently located general hospitals. This however, puts the patient in a disadvantaged position, as patients undergoing day procedures in general hospitals do not receive the benefit of a more cost-effective option (Advanced Health, 2014).

A small number of day hospitals have attempted to attract physicians by offering them co-ownership of the facility, and promising them the latest equipment of their choice (Pitso, 2015). However, as these new day hospitals generally do not have the capital to purchase the latest technology, they try to form relationships with suppliers that enable them to pay for the equipment on a per-usage basis (Pitso, 2015).

The buy-in of physicians is essential in the development of day surgery in South Africa. Yet, for South Africa to fully commit to the development of the day hospital industry, a mind-shift regarding the way physicians approach new undertakings is required. Physicians must be committed to the development of day surgery itself, rather than supporting this vision based on the advantages they could gain.

### **2.3.3 COMPETITION FROM LARGER HOSPITAL GROUPS**

---

The larger dominant hospital groups prohibit the growth and development of independent day hospitals in South Africa by using their resources to create major competition for day hospitals. These dominant hospital groups apply what is known as ‘cost-shifting techniques’, to maintain their utilisation rates and consequently, prevent patients from taking advantage of a more cost-effective alternative as provided by day hospitals (Day Hospital Association of South Africa, 2016c). These ‘cost-shifting techniques’ involve offering day procedures at a reduced rate, whilst reserving higher charges for patients that are hospitalised for longer periods.

Mediclinic, one of the larger hospital groups in South Africa, does however have a different perspective and acknowledges the importance of day hospital development and growth in an effort to provide a lower cost alternative for day surgery services. They have taken an anti-competitive position with regards to day cases, and aim to develop day hospitals that will allow them to (Day Hospital Association of South Africa, 2016c):

- Maintain current day cases by migrating them to their day hospital facilities that offer cost-effective, quality day surgery in a streamlined environment; thus
- preventing the migration of current day surgeries to competitors; and
- freeing up capacity within their general hospitals for more profitable longer-stay cases.

If more of the market leaders takes this type of stand with regards to day surgery cases, it would make lower healthcare services accessible to more South Africans, while still promoting the development and growth of day surgery. This would however, require medical aid schemes to reimburse patients treated in day hospitals to prevent patients from being required to pay significant out-of-pocket payments (Day Hospital Association of South Africa, 2016c).

A major concern raised with hospital groups that are entering the day hospital market, is that it creates an opportunity for perverse incentive (Kahn, 2015). A close relationship between a day hospital and a closely located general hospital under the same ownership can create an incentive for the day facility to operate on patients late in the day, so that the transfer of patients to the general facility is required for post-operative observation.

### **2.3.4 GOVERNMENT LICENSING POLICY**

---

One of the biggest hurdles for day hospitals is securing licenses from the Department of Health (DoH) (Pitso, 2015). An approved license from the DoH is required to construct and operate a day hospital facility. Without this license a hospital is not legally allowed to provide healthcare services to patients and will be shut down.

The Department of Health (DoH) approve license applications for new hospitals based on the number of existing beds within a certain perimeter (Day Hospital Association of South Africa, 2016c). This evaluation approach of the DoH does however, not consider the economic aspects. The utilisation of these existing beds is inaccessible to many of the people within the catchment area, due to the high costs associated with hospitalisation within a general hospital.

Available beds within a catchment area should initially be granted to day hospitals, so as to support the development of day surgery within South Africa (Kahn, 2015). This will create competition within the hospital industry that will promote the notion of offering cost-effective day surgery alternatives to more South Africans.

### **2.3.5 SAFETY OF DAY QUALITY**

---

As day surgery within South Africa is a relatively new concept, there still exist the fear amongst some that day surgery is unsafe (Lemos et al., 2006). Technological advancement in healthcare has however, enabled physicians to perform extensive procedures on a day basis without compromising the safety and quality of the treatment (Lemos et al., 2006).

## **2.4 CHAPTER CONCLUSION**

---

The primary purpose of this chapter was to present the first part of the literature review and introduce the concepts of day surgery and day hospitals to the reader. This chapter elaborated on why it is critical to develop and improve day hospital maturity within the private healthcare industry of South Africa. Furthermore, the chapter covered the type of day surgery facilities and the typical procedures that can be performed in these facilities. Finally, this chapter concluded by discussing the various barriers that hinder day surgery growth.

# Chapter 3 THEORETICAL FOUNDATION

Chapter 3 presents the second part of the literature study. This chapter initially explores the Enterprise Engineering field along with its key concepts, tools and methodologies. The chapter then shifts its focus to comprehensively investigating the fundamentals of maturity model development. Various types of maturity models are investigated, as well as their development methods. Further, Chapter 3 then investigates the concept of Business Process maturity models, along with some existing maturity models. This chapter concludes with a review of lean principles, as well as the fundamentals of continuous improvement relevant within the healthcare industry.



---

## 3.1 ENTERPRISE ENGINEERING CONCEPTS, TOOLS & METHODOLOGIES

---

As this research project is a study within the Enterprise Engineering field, it is appropriate to introduce the relevant enterprise engineering concepts, tools and methodologies considered in this thesis. These tools are applied as mechanisms to evaluate the operation of day hospitals, as well as in the development of the framework.

### 3.1.1 ENTERPRISE ENGINEERING

---

Unpredictable and constantly changing competitive environments, necessitates enterprise engineers to continually devise strategies to address the following vital challenge, as posed by Liles, Johnson, & Meade(1995) of: “How to design and improve all elements associated with the total enterprise through the use of engineering and analysis methods and tools to more effectively achieve its goals and objectives?”

This question encapsulates the paradigm of Enterprise Engineering, which is defined by Liles et al., (1995) as, “that body of knowledge, principles, and practices having to do with the analysis, design, implementation and operation of an enterprise”.

Tackling the previously mentioned challenge first requires a comprehensive understanding of what comprises an enterprise. According to du Preez, Essman, Louw, Schutte, & Marais (2009) an enterprise can be defined as “a complex system of cultural, process, and technological components that interact to accomplish strategic goals, under the ownership or control of an organisation, which ultimately strives to create wealth for its stakeholders, and operates at one or several locations”.

The purpose of this research study is to provide day hospitals with a framework that allows them to assess and grow their maturity amidst the continually changing and unpredictable competitive environment. This framework provides guidelines as to how day hospitals can be optimally managed and operated. It is thus clear that the enterprise that is focused on and being studied in this thesis is a day hospital.

Enterprise Engineering provides some guidance as to how enterprises, such as day hospitals, can be designed and improved. Some Enterprise Engineering concepts and principles are elaborated on below:

### 3.1.2 ENTERPRISE LIFE CYCLE

---

An important concept to consider when dealing with an enterprise, is its *life cycle*. The life cycle concept is based on the notion that a specific dynamic entity goes through the same series of stages during its lifetime, from inception to final termination (du Preez et al., 2009).

This life cycle concept is applied to all Enterprise Engineering activities, and provides the basis for the development of a methodology for designing, planning, deploying, operating, or modifying an enterprise (du Preez et al., 2009).

In general, there exists three life cycles relevant to Enterprise Engineering. These three life cycles include:

- The Product life cycle;
- the Enterprise life cycle; and
- the Technology life cycle.

Any changes or improvement ventures within an enterprise can be viewed from a life cycle's perspective with regards to all three of the life cycles (du Preez et al., 2009). These three life cycles are integrated within the Enterprise Engineering Solution Space, as depicted in Figure 11.

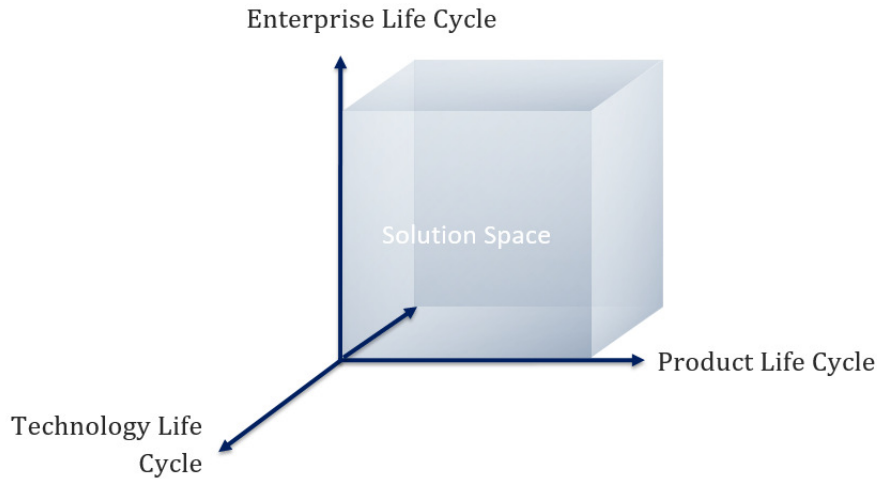


FIGURE 11: ENTERPRISE ENGINEERING SOLUTION SPACE  
COMPILED FROM (DU PREEZ ET AL., 2009)

This solution space provides a way to understand and conceptualise the progress of an enterprise that is undergoing change; such as being newly developed or re-engineered, by not only considering the product, technology and enterprise on an individual level, but on an integrated level (du Preez et al., 2009). The specific phases in which each of the life cycles finds itself can be plotted relative to each other on the three-dimensional solution space.

Viewing an enterprise from an integrated perspective allows for the continual identification of improvement opportunities and changes that are required to maintain and advance the competitive advantage of an enterprise (du Preez et al., 2009). Although there exist three life cycles, the Enterprise life cycle is the most significant for this research. The Enterprise life cycle and the phases that are typically included are illustrated in Figure 12.

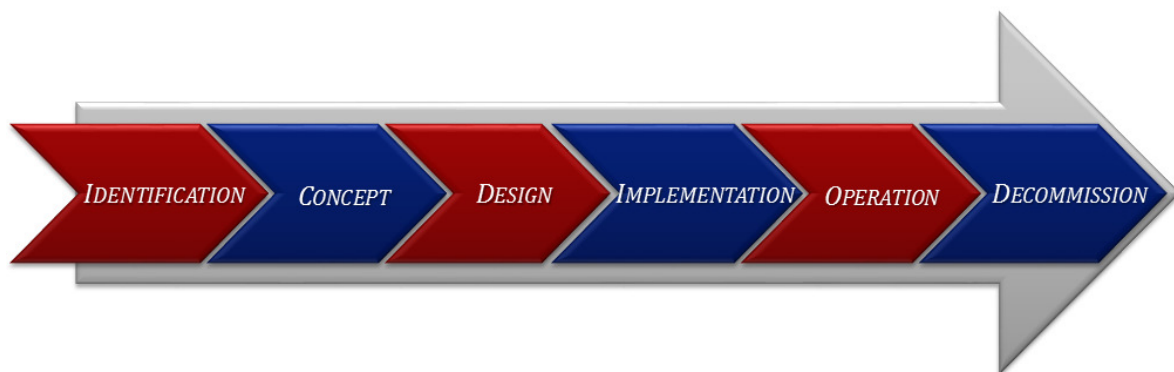


FIGURE 12: GENERIC ENTERPRISE LIFE CYCLE  
COMPILED FROM (DU PREEZ ET AL., 2009)

The Enterprise life cycle serves as the basis for the majority of the Enterprise Reference Architectures (ERAs), and also serves as a decent model for the application of various methodologies which accompany the architecture to form a complete set of aids for the Enterprise Engineer (Williams, Li, Bernus, Uppington, & Nemes, 1999).

### **3.1.3 ENTERPRISE ARCHITECTURE FRAMEWORKS**

---

The purpose of this section is to introduce the concept of ERAs before Enterprise Frameworks are considered.

Enterprises today are under immense pressure to meet ever-changing market demands in order to survive in highly competitive environments. Consequently, enterprises are required to undergo continuous internal change in order to meet these market demands which are continuously changing. These internal changes that enterprises experience must be effectively managed to ensure the success of these complex improvement endeavours.

Consequently, designing or re-designing an organisation requires an in-depth understanding of the various integrated components that constitute an enterprise. Managers often require an overview that allows them to gain an understanding of how these components fit together within an organisation. This insight regarding the integral structure of the processes, information distribution and technological infrastructure of an enterprise can be gained through the EA discipline that provides an integrated view of the organisation (van Steenberg, 2011). Enterprise level initiatives are focused on strategy, architecture, process governance, as well as process measurement systems (Rosemann & Brocke, 2015).

The term EA refers to, “a coherent whole of principles, methods and models that are used in the design and realisation of an enterprise’s organisational structure, business processes, information systems, and infrastructure” (Lankhorst et al. 2005). In short, an EA is a depiction of the process and/or method that describes how an enterprise is defined and structured.

EA enhances strategic business outcomes because it helps increase the effectiveness of business processes, applications, data and infrastructure through standardisation (Van Der Raadt & Van Vliet, 2008).

An EA ensures that enterprise goals and objectives are pursued in a holistic way across all organisational projects, through continually taking an enterprise-wide perspective across all domains and processes of an organisation (Triegaardt, 2013). Based on the vision, mission and strategy of the enterprise, the EA discipline provides guidelines on how to structure processes, information systems and supporting technology in such a way as to enable the realization of the strategy (van Steenberg, 2011).

EA provides a design and roadmap for managing business components within an organisation. The Enterprise Architecture Framework (EAF) is a framework that models the EA. The Cambridge Dictionary states that a *framework* is, “a system of rules, ideas or beliefs that is used to plan or decide something or a supporting structure around which something can be built” (Cambridge Dictionary, 2016).

A number of EAFs exist in the industry to address the different basic challenge of assessing, aligning, and organising or defining technical and operational structures (Triegaardt, 2013). The most common frameworks include the Zachman Enterprise Framework (ZEF), The Open Group Architecture Framework (TOGAF), Federal Enterprise Architecture (FEA), The Gartner Methodology (GF), and Maturity Models (MMs).



The Maturity Model Architecture is an EAF that can be viewed as a descriptive framework that guides a system from an ad hoc to an optimised state. To fully understand the concept and purpose of a model, the following definitions are provided:

- “A model is a simplified representation of the world” (SEI CMMI Product Team, 2002);
- “models use constructs to represent a real world situation” (Hevner, March, Park, & Ram, 2004);
- “models generally represent a formal description of some aspects of the physical or social reality for the purpose of understanding and communicating” (Mettler & Rohner, 2009); and
- “models aid problem and solution understanding, and frequently represent the connection between problem and solution components enabling exploration of the effects of design decisions and changes in the real world” (Hevner et al., 2004).

In an effort to provide a comprehensive, yet simple and user-friendly descriptive framework that applies to all day hospitals within the private healthcare sector of South Africa, the MM Architecture is considered an appropriate framework to assess day hospital maturity. For the purpose of this research the MM Architecture provides a comprehensive theoretical foundation and basis on which the intended framework can be constructed.

### 3.2 MATURITY MODEL INTRODUCTION

---

In today’s highly competitive world, organisations are constantly under immense pressure to decrease costs, advance quality and cut lead time in order to maintain a competitive advantage. Pursuing these targets requires continuous change and transformation within an organisation, that need to be effectively managed to ensure the success of these improvement ventures. MMs have been designed to provide organisations guidance on how to effectively manage these complex improvement endeavours.

So as to comprehend the present positioning and competitive advantage of an enterprise compared to its competitors, as well as enterprises in other industries, it is necessary to determine the capability maturity of the enterprise in terms of a specific domain of practice. MMs provide such a means to measure and improve the maturity of functional domains (van Steenbergen, 2011).

To better understand the concept of MMs, a definition of maturity is required. In general, Simpson & Weiner (1989) defines *maturity* as, “the state of being complete, perfect, or ready”. Mettler & Rohner (2009) further adds that maturity thus implies, “an evolutionary progress in the demonstration of a specific ability, or in the accomplishment of a target from an initial to a desired or normally occurring end stage”.

Another definition, as provided by Essmann (2009), defines maturity as, “a system assessed to be optimally fit for its purpose, as described by its designer”. This latter definition views maturity from an organisational and domain perspective, and will therefore be used throughout this thesis.

The purpose of a MM is thus to establish the capability maturity of a specific domain within an organisation; and furthermore, provide guidance on establishing an improvement course best suited to the enterprise and that complies with the prescribed best practices of the domain (Essmann, 2009). A *domain of practice* is a specific area of business activity that can either refer to a core competence of an organisation, or it can refer to a business unit within an organisation required to perform business activities (Essmann, 2009).

MMs describe the typical stages in the development of organisational capabilities by distinguishing various maturity levels that an organisation consecutively progresses through (van Steenberg, 2011). These stages, or maturity levels, form an expected, logical path from an initial phase to a desired state of maturity (Tonia de Bruin, Rosemann, Freeze, & Kulkarni, 2005). With regards to improving process maturity, a *maturity level* is more formally defined as, “a well-defined evolutionary plateau of process improvement toward achieving a mature process” by the SEI CMMI Product Team (2005).

MMs subsequently enable organisations to evaluate the maturity of a specified domain based on a group of identified criteria (Srai, Alinaghian, & Kirkwood, 2013). The capability maturity of a specific domain is most commonly evaluated according to a five-point Likert scale; in which a rating of five represents the highest level of maturity (Tonia de Bruin et al., 2005). Subsequently, these MMs provide an approach on how to increase the capability of a specific area or domain within an organisation (Tonia de Bruin et al., 2005). MMs are widely employed in various domains and settings to measure, plan, monitor, and benchmark the progression of systems within organisations.

There exist a variety of MMs of which some will be discussed more comprehensively in the sections to follow. All these different MMs are however, based on the same notion of delineating a number of dimensions at numerous maturity levels, with a description of characteristic performance at these established maturity levels (Mettler & Rohner, 2009).

A MM thus consists of a few basic components that include (Brooks, El-Gayar, & Sarnikar, 2013; Mettler & Rohner, 2009; van Steenberg, 2011):

- A number of overall *maturity levels* (usually three to six);
- a distinguishing *descriptor* at each level providing the intent of the relevant maturity level;
- a description of each of the *maturity level's characteristics*;
- a number of specific *dimensions* (also referred to as *process areas*; *focus areas*; or *capability areas*) that can be developed along predefined evolutionary path to achieve the defined maturity levels;
- a number of *elements* or activities specified for each dimension; and
- a *description of each element* or activity on the evolutionary path as it might be performed at each defined level of maturity.

### 3.2.1 HISTORICAL OVERVIEW OF MATURITY MODELS

The concept of measuring maturity was first introduced by the Software Engineering Institute at Carnegie Mellon University with the Capability Maturity Model® for software (SW-CMM®). The majority of Capability Maturity Models (CMM) are grounded on this original SW-CMM®.

The Capability Maturity Model® (CMM®) is a framework that describes the key elements of an effective software process (Paulk, Weber, Garcia, Chrissis, & Bush, 1993). This model was initially developed as a reference model for assessing and evaluating software process maturity and as a normative model to guide organisations on transforming disordered, informal processes to well-organised, controlled software processes (Srai et al., 2013).

The CMM® comprehensively addresses and provides guidance for planning, engineering, and managing software development and maintenance that enable organisations to increase their aptitude to achieve objectives for cost, schedule, functionality and product quality (Paulk, Weber, et al., 1993).

The basic structure and idea on which the CMM® is based can be seen in Figure 13. The CMM® consists of five maturity levels, of which each act as a layer in the foundation for continuous process improvement. The maturity levels of the CMM® are defined in terms of the degree of process management, i.e. initial; repeatable; defined; managed; and optimising (van Steenberg, 2011).

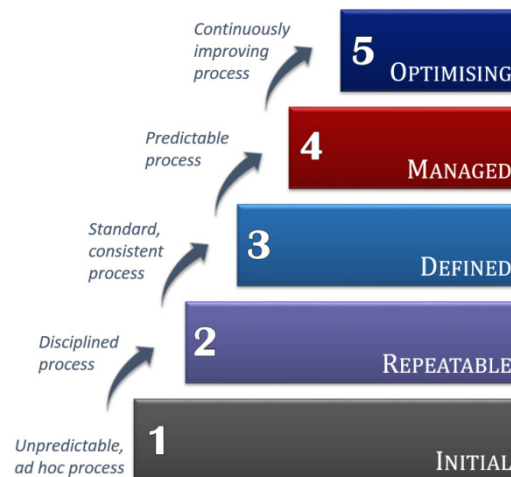


FIGURE 13: CAPABILITY MATURITY MODEL (SW-CMM®) STRUCTURE  
COMPILED FROM (PAULK, WEBER, ET AL., 1993)

A maturity level for this model comprises of several key process areas, which are problem areas in an organisation that must be improved to attain a maturity stage (Paulk, Weber, et al., 1993). Each main process area delineates a collection of associated activities that, when performed jointly, achieve a set of objectives considered important for establishing process capability at that maturity stage. Process capability refers to the range of expected results that can be achieved by following a process (Paulk, Weber, et al., 1993). The typical process capability at each maturity level is depicted in Figure 13.

Since the development of the CMM®, maturity models have since widely diffused in various industries into domains of practise such as: Project Management; Product Development; Knowledge Management; Systems Engineering; as well as Software Development (Brooks et al., 2013). This wide adoption of maturity models however, led to a multitude of different CMMs developing independently from one another.

The Capability Maturity Model Integration® (CMMI®) project was subsequently launched to solve the problem of applying various capability maturity models by developing a single integrated, improvement framework that is appropriate for organisations of any structure, focused on guiding enterprise-wide process improvement (SEI CMMI Product Team, 2002; van Steenberg, 2011). This model is a consolidation of the following domains of practise (SEI CMMI Product Team, 2002):

- Software Development;
- Systems Engineering;
- Integrated Product & Process Development; and
- Supplier Sourcing.

Industry approval and support for this model is widespread and is applied in numerous industries, and in organisations of variable size.

There exist two variants that have been developed under the CMMI<sup>®</sup>, that are both based on the same generic five-level structure as the CMM<sup>®</sup> previously discussed. These two representations namely, the *staged maturity model* and the *continuous maturity model* provide two different process improvement paths depending on organisational needs and goals (SEI CMMI Product Team, 2002). The *staged maturity model* and the *continuous maturity model* are both of the fixed-level maturity model type that is discussed in Section 3.3. The Capability Maturity Model Integration (CMMI<sup>®</sup>), which is developed to solve the problem of applying various capability maturity models by providing a single improvement framework, distinguishes both a staged and a continuous representation (SEI CMMI Product Team, 2002; van Steenberg, 2011).

### 3.2.2 DEFINING MATURITY & CAPABILITY

The concepts of ‘maturity’ and ‘capability’ are often used interchangeably, causing confusion when dealing with various maturity models. It is important to note that the differences between these two concepts are significant. A deep understanding of these concepts is required when investigating and comparing maturity models.

*Maturity* can be viewed as a broader concept than *capability*. *Maturity* focuses on the whole assessment unit and the organisational strategy by taking into account all basic components. Whereas, *capability* refers to the associated parts and their specific purposes by improving an individual component (Van Looy, De Backer, & Poels, 2011). Consequently, the terms ‘organisational maturity’ and ‘process area capability’ can be used to properly stress this difference in scope.

The differences between these two concepts are summarised in Table 5, as stated by Van Looy et al. (2011):

TABLE 5: COMPARISON OF MATURITY AND CAPABILITY CONCEPTS AS STATED BY Van Looy et al. (2011)

	MATURITY	CAPABILITY
WHAT	The degree to which an organisation has explicitly and consistently deployed processes, according to the business objectives.	The ability or competence (e.g. skills and knowledge) of an organisation to achieve the targeted results by following a certain process or process area. Capability needs an organisation that is mature enough to sustain it.
FOCUS	Organisation-based (across all processes or process areas).	Process-based (within an individual process or process area).
HOW	Realised by prioritising continuous improvements that range from departmental to cross-departmental, or cross-organisational.	Realised by institutionalisation (or routine) due to policies, standards, training, organisational culture and structure, etc.
RESULTS	Achievement of the business objectives and strategy KPIs (Key Performance Indicators).	Achievement of the process purpose.

	MATURITY	CAPABILITY
OUTCOME	<ul style="list-style-type: none"> <li>• Quality and process</li> <li>• Organisational performance.</li> </ul>	<ul style="list-style-type: none"> <li>• Control: stability regarding the variation in actual results.</li> <li>• Predictability: Certainty in cost and performance.</li> <li>• Effectiveness: reaching accurately the targeted results.</li> <li>• Efficiency: raising the targeted results.</li> </ul>

### 3.2.3 MATURITY MODEL CHARACTERISTICS

Maturity models have a number of distinguishing characteristics. These characteristics should all be noted when considering a maturity model.

#### 3.2.3.1 MATURITY MODEL NATURE

When considering various EAFs to identify the most suitable framework, the purpose for which the framework is to be designed should be kept at the forefront. In the case of the MM Architecture, the key purpose of a MM is to give guidance and offer a mechanism with which to measure and advance the maturity of functional domains of practise (Mettler & Rohner, 2009; van Steenberg, 2011).

Maturity frameworks can however, differ in purpose ranging from descriptive, prescriptive and comparative in nature. When considering various frameworks, the core purpose for which the model is being developed must be taken into consideration, as well as whether the resultant maturity evaluation is descriptive, prescriptive or comparative (Tonia de Bruin et al., 2005).

If a model is purely *descriptive*, the application of the model would be seen as single point encounters. As a result, a snapshot of an enterprise's performance at a certain point is provided, but with no provision for advancing maturity or providing relationships to performance (Tonia de Bruin et al., 2005). A maturity grid is an example of a descriptive model which describes the typical behaviour of an enterprise at a number of maturity levels. Maturity grids assesses various dimensions of an enterprise in order to establish the overall maturity level of the enterprise (Triegaardt, 2013). A typical maturity grid is used for self-assessment purposes, and not as an improvement tool.

A purely *prescriptive* model places emphasis on the domain relationships to business performance. Additionally, it specifies how to approach maturity advancement in order to have a positive effect on business value i.e. enables the development of a roadmap for improvement (Tonia de Bruin et al., 2005; Essmann, 2009).

The MM is therefore, a descriptive and prescriptive guide which if applied across enterprises or industries through benchmarking, it also becomes a *comparative* framework (Triegaardt, 2013). Benchmarking refers to, "a process used in strategic management, in which organisations evaluate various aspects of their processes in relation to best practise. This then allows organisations to develop plans on how to adopt such best practise, with the aim of increasing some aspect of performance" (du Preez et al., 2009).

These three framework types can be viewed as representative of the evolutionary phases of a model's lifecycle (Tonia de Bruin et al., 2005). Initially, a model is descriptive in nature so as to gain a more comprehensive understanding of the as-is domain situation (Tonia de Bruin et al., 2005). Subsequently, a

model can then evolve into being prescriptive as it is only through a deep comprehension of the current situation that significant, repeatable improvements can be made (Tonia de Bruin et al., 2005). Finally, for a model to be used comparatively it must be applied in a varied range of organisations; in order to attain adequate data to permit valid comparison (Tonia de Bruin et al., 2005).

### 3.2.3.2 MATURITY DIMENSION

Business processes designate how organisations function, and have a major impact on how organisations perform (Van Looy, De Backer, Poels, & Snoeck, 2013). Thus, maturity models, including the initial Capability Maturity Model® (CMM), aim to obtain mature business processes in pursuit of increased performance.

The concept of maturity is in most instances reflected on an one-dimensional manner by the constituent literature (Mettler, Rohner, & Winter, 2009). Most maturity models focus only on this one dimension of the functional domain, namely the process dimension (Mettler & Rohner, 2009; van Steenberg, 2011). Maturity within an organisation can however be viewed from the three primary perspectives, as can be seen in Figure 14. Maturity concepts can be distinguished by:

- *Process maturity* refers to the degree that a specific business process is defined, managed, controlled, and effective (Mettler & Rohner, 2009; Paulk, Curtis, Chrissis, & Weber, 1993);
- *Technology or Object maturity* refers to the extent that a physical object achieves a predefined level of sophistication (Gericke et al., 2006; Mettler & Rohner, 2009); or
- *People or workforce capability* describes the extent that the workforce is able and willing to enable knowledge creation and improve aptitude (Mettler & Rohner, 2009).

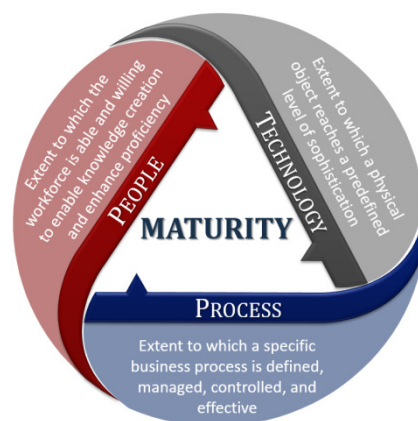


FIGURE 14: THREE PERSPECTIVES OF MATURITY

Fixed-level maturity models mostly focus only on one dimension; often the process dimension (van Steenberg, 2011). The majority of popular maturity models solely use a process perspective to evaluate organisations, arguing that the process perspective adequately encompasses socio-technical facets (Mettler & Rohner, 2009). In general, however, performing a specific function involves more dimensions. Therefore, the people, process, and object perspectives should also be considered when assessing maturity of organisational designs (Mettler & Rohner, 2009). Focus area maturity models provide a means through which the three maturity perspectives can be combined with domain-specific dimensions; in order to assess and improve a functional domain.

### 3.2.3.3 MATURITY GROWTH STRUCTURE

Many models adopt the generic five maturity levels defined by CMM, with or without adaptations. While others define their own maturity levels. Typically, the number of maturity levels ranges between three and six (van Steenberg, 2011). Each level has a label and, usually, a description of the characteristics of the level as a whole. Achievement of a level is measured either by having an aspect of the domain fully implemented (fixed-level approach), or by having an aspect of the domain implemented to the extent required by the maturity level (continuous approach). The nature of the levels differs according to the focus of the model.

The underlying rationale on which a maturity model is based, defines what constitutes progressive maturity for the scoped functional domain. This can be as a whole, as well as for each of the distinguished focus areas constituting the functional domain (van Steenberg, 2011). The choices made in an actual maturity model depend largely on the underlying rationale and conceptual model on which the maturity model is based. Making explicit the underlying rationale for a maturity model is essential to obtaining theoretical rigor (van Steenberg, 2011).

The following two sections, Section 3.3 and Section 3.4, distinguish between three basic types of architecture maturity models. Initially, *staged fixed-level models* and *continuous fixed-level models* will be discussed. Both of these maturity model types fall into the *fixed-level maturity models* category and are based on the generic five-level maturity model used by the CMM®. Subsequently, the last type of maturity model type to be discussed is *focus area maturity models*. This type of model defines focus areas, which each consist out of a number of specific maturity levels, and thus departs from the generic five-maturity level idea.

## 3.3 FIXED-LEVEL MATURITY MODELS

The two types of models to be addressed in this section are both fixed-level maturity models which is based on the generic five-level maturity model used by the CMM®. The use of a generic maturity level structure causes this model to only address one dimension of a functional domain. In most cases this is generally the process dimension (van Steenberg, 2011). Accordingly, both the staged fixed-level model and the continuous fixed-level model provide ways of implementing process improvement to achieve business goals (SEI CMMI Product Team, 2005).

### 3.3.1 STAGED FIXED-LEVEL MATURITY MODELS

Staged fixed-level maturity models distinguish five generic levels of maturity. For each maturity level a number of focus areas (also known as process areas) are demarcated specific to that stage. These focus areas have to be implemented satisfactorily for the organisation to achieve that specific maturity stage (van Steenberg, 2011). Consequently, achievement of a maturity level is measured by having a focus area fully implemented. The best-known staged fixed-level maturity model is the CMM for Software (van Steenberg, 2011).

Figure 15 depicts a generic structure of maturity levels which is commonly observed in a staged fixed-level maturity model. Maturity levels of the staged fixed-level maturity model apply to an organisation's overall maturity.



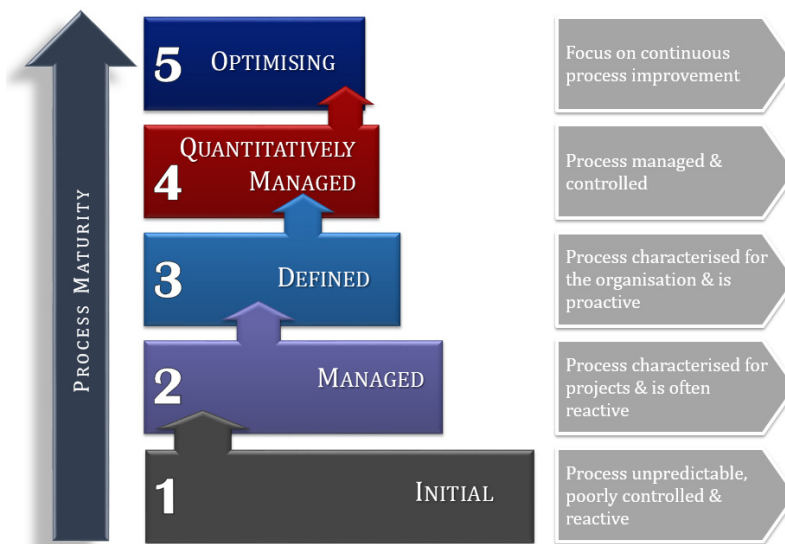


FIGURE 15: GENERIC MATURITY LEVEL STRUCTURE  
COMPILED FROM (SEI CMMI PRODUCT TEAM, 2005)

The SEI CMMI Product Team (2005) describes each of these maturity levels:

Level 1 serves as the launch pad for successive levels and does not imply that any maturity requirements have been met. An enterprise does not necessarily start at maturity level one. It is rather benchmarked against the capability maturity descriptions of each level and is then assigned the appropriate level, on the condition that it continues to fulfil the requirements as stated in the description for that level. When assigning a specific level, it is also assumed that all the requirements for the previous levels have been met. To have attained maturity level 4, for example, all the requirements of levels 2, 3 and 4 must have been continuously fulfilled and institutionalised. Hence, it is of vital importance that maturity levels should not be skipped (SEI CMMI Product Team, 2005).

### 3.3.2 CONTINUOUS FIXED-LEVEL MATURITY MODELS

In continuous fixed-level models, process areas are not attributed to a maturity level. The generic maturity levels are rather distinguished within each process area (van Steenberg, 2011). The continuous fixed-level model clusters process areas by affinity groups and labels capability levels for process advancement within each process area (SEI CMMI Product Team, 2002). Capability levels focus on progressing an organisation's capability to perform, control, and improve its performance in a process area. Capability levels build on each other, providing a suggested order for approaching process improvement within each process area. More formally, as defined by the SEI CMMI Product Team (2002), "capability level is a well-defined evolutionary plateau describing the organisation's capability relative to a specific process area".

Achievement of a maturity level is measured by having a focus area implemented to the extent required by the relevant maturity level (van Steenberg, 2011). Equivalent staging is used to relate the process areas' capability levels to the staged representation's maturity levels.



The continuous fixed-level maturity model utilises six capability levels, designated by the numbers 0 through 5, to measure process improvement. These capability levels are depicted in Figure 16.



FIGURE 16: CAPABILITY LEVELS OF A CONTINUOUS FIXED-LEVEL MATURITY MODEL

The typical capability levels of a continuous fixed-level maturity model are detailed by the SEI CMMI Product Team (2002) below:

#### **Capability Level 0: Incomplete**

An incomplete process is a process that is either not performed or partially performed. As a result, one or more of the specific goals of the process area are not satisfied (SEI CMMI Product Team, 2002).

#### **Capability Level 1: Performed**

A performed process is a process that satisfies the specific goals of the process area. A critical distinction between an incomplete process and a performed process is that a performed process satisfies all of the specific goals of the process area (SEI CMMI Product Team, 2002).

#### **Capability Level 2: Managed**

A managed process is a performed (capability level 1) process that is also planned and executed in accordance with policy, employs skilled people, having adequate resources to produce controlled outputs, involves relevant stakeholders; is monitored, controlled, and reviewed; and is evaluated for adherence to its process description (SEI CMMI Product Team, 2002).

A critical distinction between a performed process and a managed process is the extent to which the process is managed. A managed process is planned and the performance of the process is managed against the plan. Corrective actions are taken when the actual results and performance deviate significantly from the plan. A managed process achieves the objectives of the plan and is institutionalised for consistent performance (SEI CMMI Product Team, 2002).

#### **Capability Level 3: Defined**

A defined process is a managed (capability level 2) process that is tailored from the organisation's set of standard processes according to the organisation's tailoring guidelines, and contributes work products, measures, and other process-improvement information to the organisational process assets (SEI CMMI Product Team, 2002).

A critical distinction between a managed process and a defined process is the scope of application of the process descriptions, standards, and procedures. For a managed process, the process descriptions, standards, and procedures are applicable to a particular project, group, or organisational function. As a result, the managed processes for two projects within the same organisation may be very different (SEI CMMI Product Team, 2002).

#### **Capability Level 4: Quantitatively Managed**

A quantitatively managed process is a defined (capability level 3) process that is controlled using statistical and other quantitative techniques. Quantitative objectives for quality and process performance are established and used as criteria in managing the process. The quality and process performance are understood in statistical terms and are managed throughout the life of the process (SEI CMMI Product Team, 2002).

The quantitative objectives are based on the capability of the organisation's set of standard processes, the organisation's business objectives, and the needs of the customer, end users, organisation, and process implementers, subject to available resources (SEI CMMI Product Team, 2002).

A critical distinction between a defined process and a quantitatively managed process is the predictability of the process performance. A defined process only provides qualitative predictability (SEI CMMI Product Team, 2002).

#### **Capability Level 5: Optimising**

An optimising process is a quantitatively managed (capability level 4) process that is changed and adapted to meet relevant current and projected business objectives. An optimising process focuses on continually improving the process performance, through both incremental and innovative technological improvements. Process improvements that would address root causes of process variation and measurably improve the organisation's processes are identified, evaluated, and deployed as appropriate. These improvements are selected based on a quantitative understanding of their expected contribution to achieving the organisation's process-improvement objectives versus the cost and impact to the organisation. The process performance of the organisation's processes is continually improved (SEI CMMI Product Team, 2002).

A critical distinction between a quantitatively managed process and an optimising process is that the optimising process is continuously improved by addressing common causes of process variation. A quantitatively managed process is concerned with addressing special causes of process variation and providing statistical predictability for the results. Though the process may produce predictable results, the results may be insufficient to achieve the established objectives. In a process that is optimised, common causes of process variation are addressed by changing the process in a manner that will lead to a shift in the mean or a decrease in variation when it is brought back to stability. These changes are intended to improve process performance and achieve the organisation's established process-improvement objectives (SEI CMMI Product Team, 2002).

### **3.3.3 STAGED VS CONTINUOUS FIXED-LEVEL MATURITY MODELS**

---

The differences between staged fixed-level maturity models and continuous fixed-level maturity models are best represented in Figure 17. Knowledge regarding the difference between the 'maturity' concepts and the 'capability' concept is required to compare staged fixed-level maturity models and continuous fixed-level maturity models. Section 3.2.2 elaborates on these two concepts.

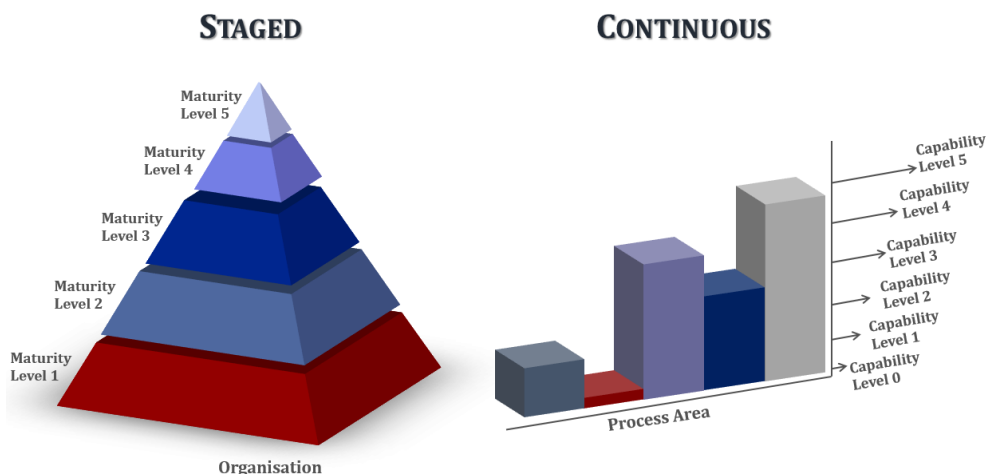


FIGURE 17: VISUAL REPRESENTATION OF FIXED-LEVEL MATURITY MODELS

Table 6 provides a summarised comparison of the two types of fixed-level maturity models as compiled from (SEI CMMI Product Team, 2002).

TABLE 6: COMPARISON OF STAGED FIXED-LEVEL MATURITY MODELS VERSUS CONTINUOUS FIXED-LEVEL MATURITY MODELS COMPILED FROM: (SEI CMMI Product Team, 2002, 2005; van Steenberg, Bos, Brinkkemper, van de Weerd, & Bekkers, 2013)

STAGED FIXED-LEVEL MATURITY MODEL	CONTINUOUS FIXED-LEVEL MATURITY MODEL
Focuses on improving <i>organisational maturity</i> . Organisational maturity relates to the maturity of a group of processes across an organisation.	Focuses on improving <i>process area capability</i> . Process area capability relates to the maturity of a particular process area across an organisation. Improvement of process areas can occur at different rates.
<i>Maturity levels</i> are used to measure process improvement.	<i>Capability levels</i> are used to measure process improvement.
Maturity level refers to the extent of process improvement across a predefined group of process areas.	A capability level refers to the achievement of process improvement within an individual process area.
Maturity levels apply to an organisation's overall maturity.	Capability levels apply to an organisation's process-improvement achievement for each process area.
Each maturity stage encompasses a predefined group of process areas.	Each capability level corresponds to a generic objective and a group of generic and specific practices.
Achievement of a level is measured by having an aspect of the domain fully implemented.	Achievement of a level is measured by having an aspect of the domain implemented to the extent required by the capability level.
Provides proven sequence of process improvements developing through a predefined path of sequential levels, each serving as a foundation for the next level.	Order of process improvement is flexible, allowing organisation to select order of improvement based on business objectives.
Overall results of organisation summarised in a single maturity level rating, allowing comparisons across and among organisations	Comparing capability levels relative to a specific process area enable comparisons across and among organisations

Fixed-level maturity models are well-suited to assess the maturity of an existing functional domain, but have limitations when it comes to guiding incremental development of a functional domain (van Steenbergen, 2011). Further, criticisms of fixed-level maturity models include that (Mettler et al., 2009; Pöppelbuß & Röglinger, 2011; Rosemann & de Bruin, 2005; van Steenbergen et al., 2013):

- Fixed-level maturity models seem to be primarily useful for assessing maturity, rather than guiding step-by-step development to a higher level of maturity;
- many fixed-level maturity models do not provide guidance in selecting and prioritising actual improvement measures;
- there is an apparent lack of theoretical foundation regarding fixed-level maturity models, as the nature of these models has not been theorised well in the literature; and finally
- fixed-level maturity models are often difficult to implement as it lacks step-by-step guidance on improving maturity.

In reaction to these criticisms of the fixed-level maturity model, the focus area maturity model was developed as an alternative type of maturity model (van Steenbergen et al., 2013). The focus area maturity model takes a more in-depth approach to advancing maturity, and provides more detailed guidance to developing and improving an existing functional domain, rather than merely assessing the current maturity of the relevant domain (van Steenbergen, 2011).

### **3.4 FOCUS AREA MATURITY MODELS**

---

The focus area maturity model originates in the domain of software testing which led to the development of focus area maturity models for the functional domains of EA and Software Product Management (van Steenbergen, Bos, Brinkkemper, van de Weerd, & Bekkers, 2010). The focus area maturity model adds to the existing maturity model concept by focusing on the development part of developing Information System (IS) functions instead of just the measuring part. It allows for the fact that different parts of an IS function may have different paces and stages of development, while at the same time there are dependencies between the development paths of these parts. By doing so, it provides more guidance in improving IS functions step-by-step (van Steenbergen et al., 2013).

The focus area maturity model is well-suited to support incremental development of functional domains as it departs from the concept of defining a fixed number of generic maturity levels (van Steenbergen et al., 2010). Focus area maturity models are based on the notion of defining a number of distinct maturity levels for each focus area. This allows the overall maturity of an enterprise to be expressed as a combination of the maturity levels of these focus areas (van Steenbergen, 2011).

In contrast, other models are typically distinguished by a fixed number of generic maturity levels which restricts this model to only address one dimension of a functional domain. In most cases maturity models exclusively use a process perspective to assess organisations (Mettler & Rohner, 2009; van Steenbergen, 2011). In general, however, performing a specific function involves more dimensions; like people and technology (Mettler & Rohner, 2009; van Steenbergen, 2011). Therefore, focus area maturity models distinguishes more than one dimension and defines maturity levels for each dimension (van Steenbergen et al., 2013).

As the focus area oriented model allows for the identification of more than five maturity levels, smaller steps between the levels are observed, and more dependencies between focus areas can be expressed (van

Steenbergen, 2011). This allows the focus area maturity model to propose a more detailed direction to setting priorities in developing a specific domain of practise (van Steenbergen, 2011).

### 3.4.1 ELEMENTS OF THE FOCUS AREA MATURITY MODEL

A focus area maturity model is used to establish the *maturity* of an organisation in a specific *functional domain*. A specific functional domain is constituted by a set of *focus areas*. Each focus area is associated with a set of *capabilities* that are positioned against each other in a *maturity matrix*. Based on the positioning of the capabilities in the matrix, a number of *maturity levels* can be distinguished (van Steenbergen, 2011). To guide the organisation in incremental development of the functional domain, *improvement actions* are associated with the capabilities.

The various elements and concepts of the focus area maturity model are defined with regards to development of a maturity matrix in Table 7.

TABLE 7: DEFINITIONS OF FOCUS AREA MATURITY MODEL CONCEPTS (van Steenbergen, 2011)

CONCEPT	DEFINITION
Maturity	Maturity indicates the degree of development within a domain of practise.
Functional domain	A functional domain refers to all activities, responsibilities and actors involved in the fulfilment of a well-defined function within an organisation.
Focus area	A focus area is a well-defined subset of a functional domain.
Capability	A capability generally refers to the ability or capacity to achieve a predefined outcome or goal.
Maturity matrix	A maturity matrix provides a partial ordering of capabilities within a functional domain across focus areas over a sequence of maturity levels.
Maturity level	A maturity level is a well-defined evolutionary plateau within a functional domain.
Maturity profile	A maturity profile is a specific set of capabilities within a functional domain that has been achieved by an organisation.
Improvement action	An improvement action is an activity that is expected to result in achieving a specific capability.

The number of capabilities within each focus area typically ranges from three to six. Each capability has five qualities as stated by van Steenbergen(2011), including:

- *Name*, describing the capability in a few words;
- *Goal*, which describes what purpose the capability serves and it indicates the advantage of executing the capability;
- *Action* refers to what must be done in order to meet the requirements of the capability;
- *Prerequisites*, as some capabilities require that one or more other capabilities be achieved first. This relation is described by listing all the capabilities that have to be implemented first; and
- optional *references* describe related literature which can aid in understanding and implementing the capability, thus having a supporting role.

### 3.4.2 STRUCTURE OF FOCUS AREA MATURITY MODEL

A focus area maturity model defines a series of progressively mature capabilities for each of its focus areas. A capability generally refers to an organisation's ability or capacity to deploy available resources in a way that enables the organisation to achieve predefined outcomes or goals (Srai et al., 2013). An incremental

development path is then defined by juxtaposing all capabilities of all focus areas relative to each other in a matrix (van Steenberg, 2011). Maturity grids or matrices aim at illustrating a number of levels of maturity in a simple, textual manner (Mettler et al., 2009).

An example of a focus area maturity model for the functional domain of enterprise architecture is given in Table 8. This example is provided by van Steenberg (2011) to explain how focus area maturity models work. In this example, the focus areas have been established by identifying eighteen key areas of the enterprise architecture domain. These focus areas are in the left column of the maturity matrix (van Steenberg, 2011). The letters (A to D) to the right of the focus areas, depict the progressively mature capabilities related to each of the focus areas (van Steenberg, 2011). Each capability is associated with a number of checkpoints. The positioning of the letters in the matrix indicates the order in which the capabilities of the different focus areas can be implemented to develop the enterprise architecture functional domain in a balanced manner (van Steenberg, 2011).

The maturity matrix can be used to set priorities for improvement, as the first A's to be encountered in the matrix are the first focus areas that need to be addressed if a specific functional domain is to be developed (van Steenberg, 2011). The maturity matrix is a very useful instrument in assessing the strengths and weaknesses of a specific domain, and providing insight on where to focus improvement actions (van Steenberg et al., 2010; van Steenberg, 2011).

TABLE 8: STRUCTURE OF A FOCUS AREA MATURITY MODEL FOR THE FUNCTIONAL DOMAIN OF ENTERPRISE ARCHITECTURE (van Steenberg, 2011)

FOCUS AREA	MATURITY LEVEL													
	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Development of architecture		A			B				C					
Use of architecture			A			B				C				
Alignment with business		A				B				C				
Alignment with the development process			A				B		C					
Alignment with operations					A			B			C			
Relationship to the as-is state					A				B					
Roles and responsibilities				A		B					C			
Coordination of developments							A			B				
Monitoring				A		B		C		D				
Quality management								A		B			C	
Maintenance of the architectural process							A		B		C			
Maintenance of architectural deliverables					A			B					C	
Commitment and motivation		A					B		C					
Architectural roles and training				A		B			C			D		
Use of an architectural method				A						B				C
Consultation			A		B				C					
Architectural tools							A				B			C
Budgeting and planning				A							B		C	

The fourteen columns in the matrix define the overall maturity levels, with level 0 being the lowest level and level 13 the highest. The rightmost column for which an organisation has achieved all focus area capabilities positioned in that column and in all columns to its left, indicates the overall maturity level of that organisation (van Steenberg, 2011). The overall maturity level of an organisation can be visualised

by colouring the cells of each row up until the first capability that has not yet been implemented. The rightmost column that does not contain any non-coloured cells, indicates the maturity level of the organisation assessed (van Steenberg, 2011).

### 3.5 COMPARING MATURITY MODEL TYPES

Table 9 provides a brief summarised description of the three maturity model types as a point of departure.

TABLE 9: SUMMARY OF MATURITY MODEL TYPES (van Steenberg, 2011)

TYPE OF MATURITY MODEL	DESCRIPTION
Staged Fixed-level Maturity Model	These models distinguish a fixed number of generic levels of maturity. Each maturity level contains a number of focus areas that have to be realised for the organisation to achieve that specific level.
Continuous Fixed-level Maturity Model	In these models, focus areas are not related to a level, but the generic maturity levels are distinguished within each focus area. A fixed number of generic maturity levels is also distinguished.
Focus Area Maturity Model	Focus area models do not distinguish a fixed number of generic maturity levels, but instead define specific maturity levels for each focus area. The overall maturity of an organisation is then expressed as a combination of the specific maturity levels. A focus area maturity model can be developed for any functional domain.

Figure 18 provides a visual comparison of the three types of maturity models. In the figure maturity levels are denoted by numbers, and various focus areas are denoted by alphabetical letters.

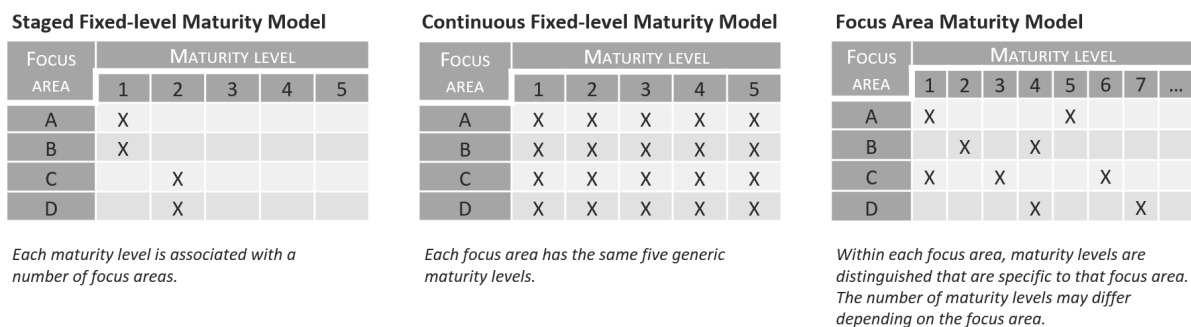


FIGURE 18: VISUAL COMPARISON OF MATURITY MODEL TYPES  
COMPILED FROM (VAN STEENBERGEN, 2011)

### 3.6 DESIGNING & DEVELOPING MATURITY MODELS

With the knowledge gained regarding the various types of maturity models, the focus shifts to how these models can be developed. The development of maturity models has its root in the IS discipline where the first maturity model was initially developed to assess and evaluate software process maturity. A vast



amount of maturity models has been developed through IS research since, resulting in the manifestation of various development methods or procedures that aim to guide to design of a new maturity model. To be able to accurately identify the development method that should be followed to design a day hospital maturity model, the various development procedures and methods should be investigated and considered.

### **3.6.1 DESIGN-SCIENCE RESEARCH APPROACH**

---

The existing literature on development methods, that describe what procedures should be followed in designing a maturity model, is mostly based on or derived from the application of the Information Systems Research Framework, and/or the Design Science Research Methodology (DSRM) process model. Thus, to fully understand and be able to develop a maturity model, comprehensive knowledge regarding these two approaches is vital.

Design-science research is applied to generate innovative artefacts. Hevner et al. (2004) states that the purpose of these artefacts is to “define the ideas, practices, technical capabilities, and products through which the analysis, design, implementation, management, and use of ISs can be successfully and effectively accomplished”. Design-science research therefore aims to advance problem-solving capabilities by creating these innovative artefacts such as constructs, models, methods and instantiations. Mettler & Rohner (2009) indicates that the unique artefact types that can be created through applying design-science research include:

- Constructs (the language to specify problems and solutions);
- models (the representation of the identified problems and future solutions);
- methods (the procedure how to solve these problems and develop the future solutions); and
- instantiations (the physical conversion as proof-of-concept of the prior artefacts).

Maturity models can be inferred as artefacts; with the purpose to address the problems of determining an organisation’s status quo of its capabilities and deriving measures for improvement therefrom. It can therefore be assumed that the development of maturity models falls within the application area for design-science research.

Developing maturity models through performing design-oriented research, implies finding solution patterns for essential unsolved problems or formulating advice in solving problems in more effective or efficient ways (Peffer, Tuunanen, Rothenberger, & Chatterjee, 2008). Design-science can be viewed as a problem solving process consisting of a sequence of expert activities that produces an innovative artefact (model) (Hevner et al., 2004).

#### **3.6.1.1 DESIGN-SCIENCE RESEARCH METHODOLOGY**

The DSRM process model was developed by Peffer et al. (2008) with the aim to design a methodology that would serve as a commonly accepted framework for carrying out research based on design-science research principles within the IS discipline (Peffer et al., 2008). This DSRM process model principally provides a conceptual process or methodology for following the seven design-science research guidelines developed by Hevner et al. (2004).

The seven guidelines were developed by Hevner et al. (2004) to serve as measures for conducting and assessing good design-science research. The primary purpose of these seven guidelines is to support



researchers, and readers to comprehend the requirements for effective design-science research. The design-science research guidelines are detailed in Table 10.

TABLE 10: DESIGN-SCIENCE RESEARCH GUIDELINES AS DEFINED BY (Hevner et al., 2004)

GUIDELINE	DESCRIPTION
Guideline 1: Design as an Artefact	Design-science research must produce a viable artefact in the form of a construct, model, method, or an instantiation.
Guideline 2: Problem Relevance	The objective of design-science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design-science research must provide clear and verifiable contributions in the areas of the design artefact, design foundations, and/or design methodologies.
Guideline 5: Research Rigor	Design-science research relies upon the application of rigorous methods in both the construction and evaluation of the design artefact.
Guideline 6: Design as a Search Process	The search for an effective artefact requires utilising available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of Research	Design-science research must be presented effectively both to technology-oriented as well as management-oriented audiences.

This DSRM process model which provides a conceptual process for following the design-science research guidelines mentioned, can be seen in Figure 19. The DSRM process methodology involves six key steps, or activities, within an iterative development process. There is an underlying understanding that research rigor is included within each step. The six activity steps of the DSRM can be seen in Figure 19.

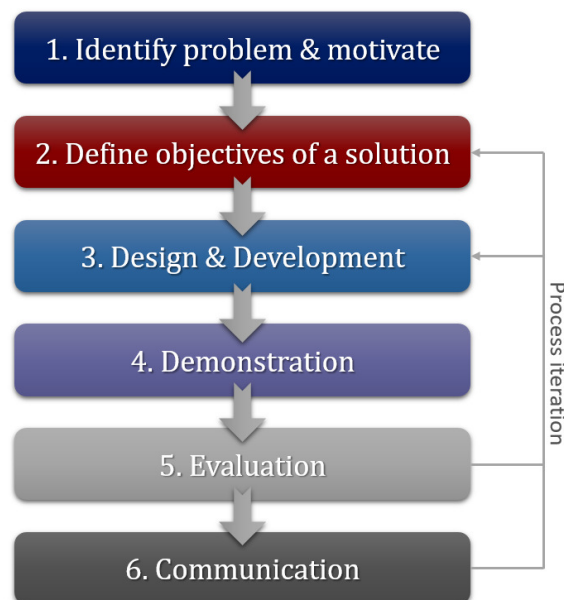


FIGURE 19: DESIGN-SCIENCE RESEARCH METHODOLOGY PROCESS MODEL  
COMPILED FROM (PEFFERS ET AL., 2008)

This process is structured in a nominally sequential order, however, there is no expectation that researchers would always proceed in sequential order from activity one through to activity six (Peppers et al., 2008). Each activity, and what it entails with regard to the production and presentation of design-science research, is discussed below as stated by Peppers et al. (2008):

**Activity 1: Problem identification and motivation**

Define the specific research problem and justify the value of a solution. Resources required for this activity include knowledge of the state of the problem and the importance of its solution.

**Activity 2: Define the objectives for a solution**

Infer the objectives of a solution from the problem definition and knowledge of what is possible and feasible. These objectives can be qualitative or quantitative. Resources required for this include knowledge of the state of problems and current solutions, if any, and their efficacy.

**Activity 3: Design and development**

Create the design research artefact. This activity includes determining the artefact's desired functionality and its architecture and then creating the actual artefact. Resources required for moving from objectives to design and development include knowledge of theory that can be brought to bear in a solution.

**Activity 4: Demonstration**

Demonstrate the use of the artefact to solve one or more instances of the problem. Resources required for the demonstration include effective knowledge of how to use the artefact to solve the problem.

**Activity 5: Evaluation**

Observe and measure how well the artefact supports a solution to the problem. This activity involves comparing the objectives of a solution to actual observed results from use of the artefact in the demonstration. It requires knowledge of relevant metrics and analysis techniques. Depending on the nature of the problem venue and the artefact, evaluation could take many forms.

**Activity 6: Communication**

Communicate the problem and its importance, the artefact, its utility and novelty, the rigor of its design, and its effectiveness to researchers and other relevant audiences such as practicing professionals, when appropriate. Communication requires knowledge of the disciplinary culture (Peppers et al., 2008).

These steps of the DSRM should be noted as many of the subsequent maturity model development methodologies in Section 3.7 is derived and based on design-science research principles.

### ***3.6.1.2 INFORMATION SYSTEMS RESEARCH FRAMEWORK***

IS are utilised within an organisation for the primary purpose of advancing the effectiveness and efficiency of the organisation (Hevner et al., 2004). For this reason, a significant amount of research has been performed within the IS discipline. Two paradigms exemplify much of this research in the IS discipline: behavioural-science, and design-science.

The *behavioural-science paradigm* seeks to develop and verify theories that explain or predict human or organisational behaviour (Hevner et al., 2004). Such theories enlighten researchers and practitioners of the relations among people, technology, and organisations that must be managed if an IS is to realise its specified purpose, namely, advancing the effectiveness and efficiency of an organisation (Hevner et al., 2004).

As mentioned before, the *design-science paradigm* seeks to encompass the boundaries of human and organisational capabilities by developing new and innovative artefacts (Hevner et al., 2004). In the design-science paradigm, knowledge and comprehension of a problem domain and its solution are achieved in the conception and application of the designed artefact (Hevner et al., 2004).

Figure 20 depicts a conceptual framework for understanding, executing, and assessing IS research through integrating behavioural-science and design-science paradigms (Hevner et al., 2004). Each of these paradigms are foundational to the IS discipline, as it is situated at the unification of people, organisations, and technology (Hevner et al., 2004).

The IS research framework, with the research cycles of relevance, rigor and design included, can be seen in Figure 20. This framework is discussed by Hevner et al. (2004) as follows:

The framework distinguishes environment, design-science research and knowledge base. The three research cycles connect environment, design-science research and knowledge base, and must be present and visibly identifiable in a design-science research project.

The environment provides relevance to the research, an application domain consists of the people, organisational systems, and technical systems that interact to work toward a goal. Good design-science research often begins by identifying and representing opportunities and problems in an actual application environment. The Relevance Cycle bridges the contextual environment of the research project with the design-science activities.

Design-science draws from a vast knowledge base of scientific theories and engineering methods that provide the foundations for rigorous design-science research. The effective use of the knowledge base provides rigor to the research by appropriately applying existing foundations and methodologies. The rigor cycle connects the existent scientific knowledge with the design-science activities (van Steenbergen, 2011).

The central design cycle supports a tighter loop of research activity for the construction and evaluation of design artefacts and processes. The central design cycle iterates between the core activities of building and evaluating the design artefacts and processes of the research. The requirements are input from the relevance cycle and the design and evaluation theories and methods are drawn from the rigor cycle (Hevner, 2007).

This IS research framework is indicated below in Figure 20.

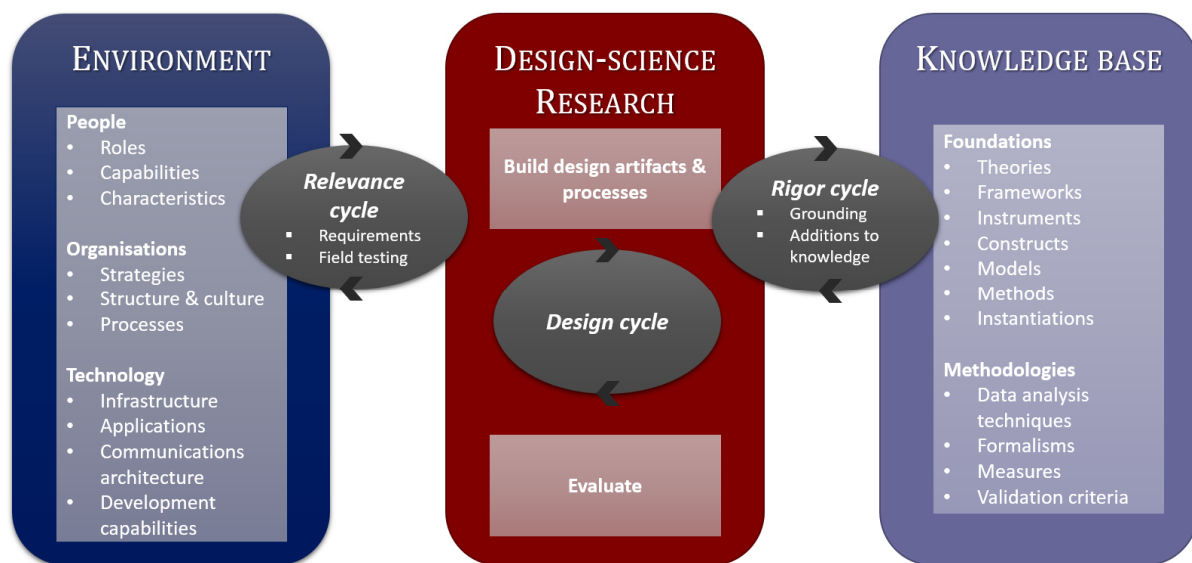


FIGURE 20: INFORMATION SYSTEMS RESEARCH FRAMEWORK WITH DESIGN-SCIENCE RESEARCH CYCLES  
COMPILED FROM (HEVNER, 2007)

### 3.6.2 GENERAL DESIGN PRINCIPLES FRAMEWORK FOR MATURITY MODELS

Despite the major proliferation in the application and development of maturity models, numerous criticisms have been revealed regarding both maturity models as design products and the process of maturity model design. There is no holistic understanding of the design principles (DPs) that maturity models should meet.

Pöppelbuß & Röglinger (2011) address this issue by proposing a framework of general DPs for maturity models, i.e., principles of form and function, which maturity models should comply with in order to be usefully employed according to their application domain and purpose of use (Gregor and Jones, 2007). The purpose of this framework of general DPs is to serve as a logical, yet substantiated checklist for researchers and practitioners involved in the design, enhancement, or application of maturity models (Pöppelbuß & Röglinger, 2011).

As can be seen in Figure 21, the framework of general DPs for maturity models comprises three nested groups of DPs (Röglinger, Pöppelbuß, & Becker, 2012). These are the basic principles, the principles for a descriptive purpose of use, and the principles for a prescriptive purpose of use (Röglinger et al., 2012). The basic DPs should be addressed independently of a specific purpose of use (Pöppelbuß & Röglinger, 2011). Descriptive maturity models should also comply with the basic DPs. Prescriptive maturity models should fulfil the DPs for descriptive maturity models and the basic DPs (Pöppelbuß & Röglinger, 2011).

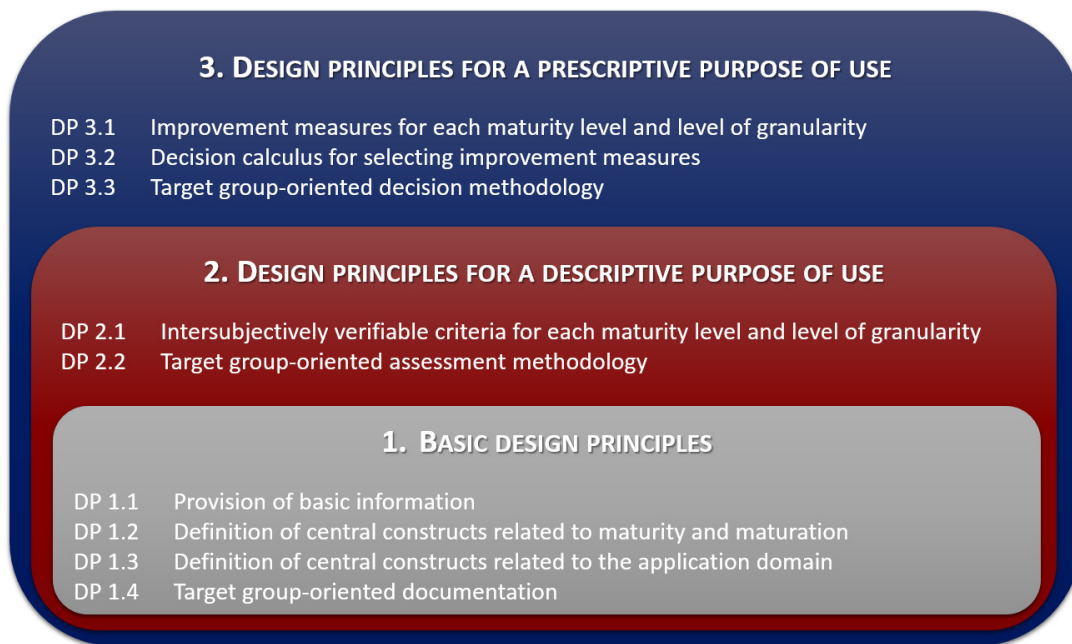


FIGURE 21: FRAMEWORK OF GENERAL DESIGN PRINCIPLES FOR MATURITY MODELS  
 COMPILED FROM (PÖPPELBUß & RÖGLINGER, 2011)

Table 11 includes the sub-aspects that the DPs should address and include when designing new maturity models.

TABLE 11: GENERAL DESIGN PRINCIPLES FOR MATURITY MODELS AS STATED BY (Pöppelbuß &amp; Röglinger, 2011)

GROUP	DESIGN PRINCIPLES	
BASIC DESIGN PRINCIPLES	1.1	<b>Basic information</b> a) Application domain & prerequisites for applicability b) Purpose of use c) Target group d) Class of entities under investigation e) Differentiation from related maturity models f) Design process and extent of empirical validation
	1.2	<b>Definition of central constructs related to maturity and maturation</b> a) Maturity and dimensions of maturity b) Maturity levels and maturation paths c) Available levels of granularity of maturation d) Underpinning theoretical foundations with respect to evolution and change
	1.3	<b>Definition of central constructs related to the application domain</b>
	1.4	<b>Target group-oriented documentation</b>
DESIGN PRINCIPLES FOR A DESCRIPTIVE PURPOSE OF USE	2.1	<b>Intersubjective verifiable criteria for each maturity level and level of granularity</b>
	2.2	<b>Target group-oriented assessment methodology</b> a) Procedure model b) Advice on the assessment of criteria c) Advice on the adaptation and configuration of criteria d) Expert knowledge from previous application
DESIGN PRINCIPLES FOR A PRESCRIPTIVE PURPOSE OF USE	3.1	<b>Improvement measures for each maturity level and level of granularity</b>
	3.2	<b>Decision calculus for selecting improvement measures</b> a) Explication of relevant objectives b) Explication of relevant factors of influence c) Distinction between an external reporting and an internal improvement perspective
	3.3	<b>Target group-oriented decision methodology</b> a) Procedure model b) Advice on the assessment of variables c) Advice on the concretization and adaption of the improvement measures d) Advice on the adaptation and configuration of the decision calculus e) Expert knowledge from previous application

When comparing the fixed-level maturity model and the focus area maturity model with regards to the DPs, the differences between are found in the basic and prescriptive DPs (van Steenberg et al., 2013). These differences are summarised in Table 12.

TABLE 12: COMPARISON OF FIXED-LEVEL AND FOCUS AREA MATURITY MODELS WITH REGARDS TO DESIGN PRINCIPLES (VAN STEENBERGEN ET AL., 2013)

DESIGN PRINCIPLE		FIXED-LEVEL MATURITY MODEL	FOCUS AREA MATURITY MODEL
DP 1.2	Definition of maturity	Maturity is defined in terms of pre-defined stages.	Maturity is defined in terms of the constituent aspects.
	Maturation steps	Global maturation steps.	Specific maturation steps.
	Underlying rationale	Rationale is based on conceptual model of generic dimension.	Rationale is based on conceptual model of specific functional domain.

DESIGN PRINCIPLE		FIXED-LEVEL MATURITY MODEL	FOCUS AREA MATURITY MODEL
DP 3.1	Improvement measures of each maturity level	Improvement measures are grouped at the level of pre-defined maturity levels.	Improvement measures are grouped at the level of focus area capabilities and the dependencies between them.
DP 3.2	Decision calculus for selecting improvement measures	Support for selection of improvement measures is limited to the level of pre- defined maturity levels.	Support for selection of improvement measures can be provided at the level of focus area capabilities and the dependencies between them.
DP 3.3	Target group-oriented decision methodology	Decision methodology is based on selecting focus areas and/or pre-defined maturity levels.	Decision methodology is based on selecting focus areas and/ or dependencies between focus area capabilities.

To ensure that a newly designed maturity model can be usefully employed to its intended application domain and purpose of use, the above-mentioned guidelines should be strictly adhered to. Keeping these guidelines in mind when designing the maturity model for this dissertation will ensure the development of a reliable model.

### 3.7 DEVELOPING MATURITY MODELS

Five development approaches have been proposed regarding the development maturity models. These development methodologies are discussed below and provide insight as to how the development of maturity models can be approached. These development methodologies for maturity models are discussed as stated by the authors, to gain knowledge as to what the appropriate steps would be to develop the maturity model framework for day hospitals.

#### 3.7.1 GENERIC DEVELOPMENT FRAMEWORK FOR MATURITY MODELS

Numerous domain-specific maturity models have been developed in order to measure competency. However, no combined effort has been made to simplify the phases of developing a maturity model in any domain (Tonia de Bruin et al., 2005). This section elaborates on a maturity model development framework that was designed to generalise the key phases of developing a maturity model in any domain. The development framework that describes the generic phases of developing a maturity model is depicted in Figure 22.



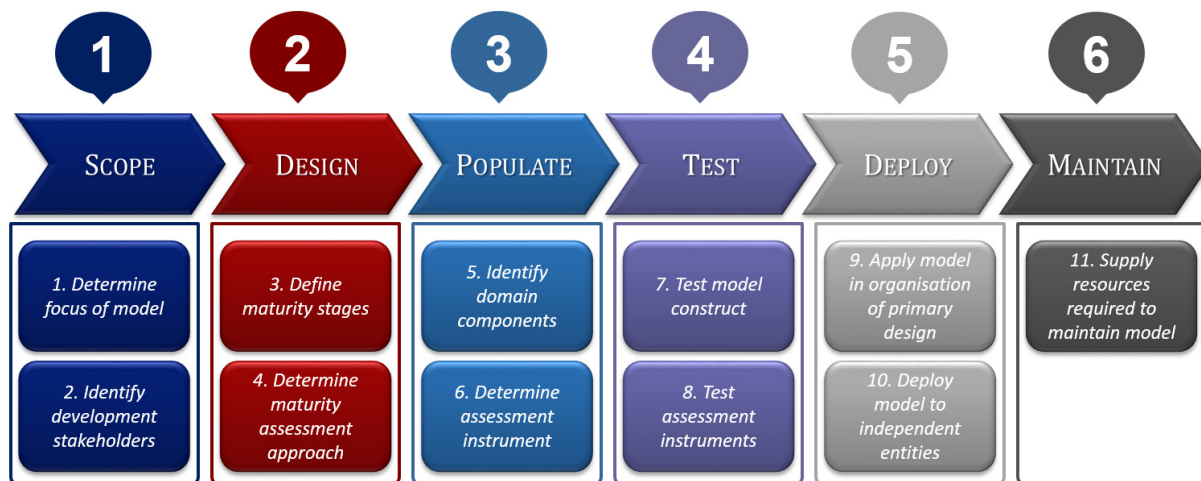


FIGURE 22: GENERIC MATURITY MODEL DEVELOPMENT FRAMEWORK  
 COMPILED FROM (TONIA DE BRUIN ET AL., 2005)

As can be seen from Figure 22, this development method consists out of six main phases. Whilst these phases are generic, their order is important. Each of these phases, along with its relevant steps, are detailed below, as discussed by Tonia de Bruin et al. (2005):

#### PHASE 1: SCOPE

The first phase in developing a maturity model is to determine the scope of the desired model. Determining the scope of the desired model will set the outer boundaries for model application and use.

##### 1. Determine focus of model

The first step is to determine the focus of the model, where focus refers to which domain the maturity model will be targeted and applied. It must be determined whether the maturity model will be developed for general application and use, or whether the model will be developed for application and use within a specific domain. Therefore, it must be established whether the focus of the maturity model to be developed will be domain-specific or general.

If it is supposed to be domain-specific, it is especially important to gather information about the context, the idiosyncrasies and terminology of the specific domain. An extensive review of existing literature in each domain, related domains and maturity models must be conducted to provide a deep understanding of historical and contemporary domain issues. This literature review will also reveal whether there exists a real need for the development of the intended maturity model.

##### 2. Identify development stakeholders

With the primary intent of the model identified, stakeholders can be identified that can contribute to the development of the model. Establishing which stakeholders that can assist in the development process of the model, is influenced and guided by the purpose for which the model is to be designed.

The audience for which the model is model is to be developed must also be identified. The design of the model incorporates the needs of the intended audience and how these needs will be met. Tonia de Bruin et al. (2005) states that the needs of the intended audience are reflected in:

- *Why* they seek to apply the model;
- *how* the model can be applied to varying organisational structures;
- *who* needs to be involved in applying the model; as well as



- *what* can be achieved through application of the model?

To meet the audience's needs, the model design is required to ensure that there exists a balance between an often complex reality and model simplicity.

## PHASE 2: DESIGN

The second phase of the proposed framework is to determine a design or architecture for the model that serves as the basis for further development and implementation.

### 3. Define maturity stages

When defining maturity stages either a top-down or bottom-up approach can be used. The *top-down approach* defines maturity levels by conducting a literature review to identify capabilities and then detailing them into descriptions of how these capabilities present themselves in practice (van Steenberg, 2011). Thus, definitions are written first and then measures are developed to fit the definitions (Mettler & Rohner, 2009). This type of approach works well if the domain is relatively new and there is little evidence of what is thought to represent maturity.

With a *bottom-up approach* maturity levels are established from experimental data (Tonia de Bruin et al., 2005). The requirements and measures are determined first and then definitions are written to reflect these (Mettler & Rohner, 2009).

Design principles to remember when defining maturity stages (Tonia de Bruin et al., 2005):

- A common design principle is to represent maturity as a number of cumulative stages where higher stages build on the requirements of lower stages with level five representing high maturity and level one representing low maturity;
- the number of maturity stages may vary;
- the maturity stages must be distinct and well-defined, indicative of logical progression through stages;
- maturity levels must be termed with concise labels that give a clear indication of the purpose of the level; and
- maturity level definitions should be formulated to expand level names and provide a summary of the main requirements and measures of the stage, particularly those aspects that are new to the stage and not included as elements of lower maturity levels.

### 4. Determine maturity assessment approach

The emphasis now shifts from what maturity represents to how this maturity can be measured and reported to the intended audience. There are two approaches as to how maturity stages can be represented, namely staged or continuous.

A *staged approach* refers to the representation of maturity as a series of one-dimensional linear stages. This approach is widely-accepted and has formed the basis for assessment in many existing tools. This form of assessment results in an average maturity stage being provided for the entity. Whilst this form of assessment provides a simple means of comparing maturity stages, it does not adequately represent maturity within complex domains; providing little guidance to an organisation wishing to improve the 'as-is' position.

A *continuous approach* enables the provision of more differentiated maturity assessments within complex domains. This approach is achieved by providing additional layers of detail that enable separate maturity assessments for a number of discrete areas, in addition to an overall assessment for the entity. These layers can be represented by the domain, domain components and sub-components.

A domain component is a key, independent facet of a particular domain that is important to domain maturity. Domain components are reflected in general stage definitions and enable clustering of results to

model audience. Domain sub-components are specific capability areas within the domain components that provide further detail enabling targeted maturity level improvements.

The results obtained from a layered model enable an organisation to gain a comprehensive understanding of their relative strengths and weaknesses in the domain and to target specific improvement strategies. Thereby enabling more efficient resource allocation. The ability to drill-down through the maturity assessment enables model assessment reports to be tailored to changing needs of multiple audiences.

### **PHASE 3: POPULATE**

After the scope and design of the model are determined, the content of the model must be stipulated. This phase must specify *what* needs to be measured in the maturity assessment, as well as *how* this can be measured. Whilst the methods employed for populating the model may vary from case to case, the use of complementary research methods in the identification of independent and relevant content assists in developing a soundly constructed model that can be further tested.

#### **5. Identify domain components**

Identification of domain components is critical for complex domains as this enables a deeper understanding of maturity, without which the identification of specific improvement strategies is difficult. The goal is to attain domain components and sub-components that are mutually exclusive and collectively exhaustive.

In a mature domain, the identification of domain components can be achieved through an in-depth literature review (Mettler & Rohner, 2009). In particular, critical success factors and barriers to entry provide great insights into domain components (Mettler & Rohner, 2009). The presence of a rich stream of literature and tested models reduces concerns of whether components are mutually exclusive and collectively exhaustive. After identification of domain components, interviews are used to further validate the a priori constructs and increase the already established mutually exclusive and collectively exhaustive list of critical success factors.

In a relatively new domain, it may not be possible to gather sufficient evidence through existing literature in order to derive a comprehensive list of domain components. In this instance, a literature review is considered only sufficient in providing a theoretical starting point and other means of identification is necessary.

For complex domains, it is recommended to identify domain sub-components. This additional layer of detail assists in the development of assessment questions, enables richer analysis of maturity results and improves the ability to present maturity results in a manner that meets the needs of the target audience.

For complex domains, the exploratory research methods such as Delphi technique, Nominal Group technique, case study interviews and focus groups can be considered in addition to a literature review to identify sub-components. Selection of the most appropriate techniques will depend on the stakeholders involved in the model development and the resources available to the development team. The important issue when populating the model is to select the combination of research methods that are most appropriate for model development in the context of earlier scoping decisions and desired model outcomes.

#### **6. Determine assessment instrument**

Next, it is necessary to determine how maturity measurement can occur. This means establishing which instruments will be used in conducting an assessment and the appropriate questions and measures that should be included within this instrument. When selecting an instrument for conducting an assessment consideration needs to be given to the model generalisability together with resources available for conducting assessments.

A quantitative method such as a survey can be made available through electronic means is recommended. Use of a survey that incorporates quantitative measures enables collection of results that enable consistent statistical analysis and improves comparability of results.

With respect to determining the questions, the domain components and sub-components provide good guidance. A review of existing literature can result in a comprehensive list of questions. Another alternative is to use questions that have previously been determined and used in another form.

The use of Likert scales can improve reliability and consistency of response and enables results to be easily mapped to maturity stages. It is important that questions and responses are valid, ensuring they measure what they are intended to measure.

In addition, a balance in the number of questions is important. Sufficient questions are required to ensure complete measurement but too many questions may reduce reliability of data by resulting in a reduction in total survey responses or an increase in incomplete surveys.

Whilst the methods employed for populating the model may vary from case to case, the use of complementary research methods in the identification of independent and relevant content assists in developing a soundly constructed model that can be further tested.

#### **PHASE 4: TEST**

Once a model is populated, it must be tested for relevance and rigor. It is important to test both the construct of the model and the model instruments for validity, reliability and generalisability.

#### **7. Test model construct**

Construct validity is represented by both face and content validity. The initial steps for ensuring construct validity are critical to ensuring that the theoretical basis of the model is sound.

*Face validity* is assessed by whether good translations of the constructs have been achieved. Such validation is assessed during the population of the model using tools such as focus groups and interviews. The maturity model should be considered complete and accurate with respect to the identified scope of the model. Selecting complementary methods for populating the model will assist in achieving face validity.

*Content validity* is assessed as to how completely the domain has been represented. The extent of the literature review and breadth of the domain covered provides a measure of content validity. Once the initial maturity model has been judged complete, an inter-rater reliability pilot test can be initiated in order to improve the convergence of opinions that desired design objectives have been achieved.

#### **8. Test assessment instruments**

In addition to testing the model construct, it is necessary to test any assessment instruments for validity to ensure they measure what they intended to measure, and for reliability to ensure results obtained are accurate and repeatable. A maturity assessment survey is an assessment instrument that is often employed.

#### **PHASE 5: DEPLOY**

Following population and testing, the model must be made available for use to verify the extent of the model's generalisability. To whom it is made available, and in what manner, can be addressed in two steps which will provide wider acceptance and improve the standardisation of the model.

#### **9. Apply model in organisation of primary design**

The first step in promoting model generalisability that can lead to the general acceptance of the model, is through the application of the model in the organisation for which it was designed. In this situation, the design collaborators are considered to be the primary respondents. Where the model has been developed and tested, utilising the resources of an involved stakeholder, it is likely that the initial application of the model will be with this stakeholder.

**10. Deploy model to independent entities**

To further develop the model's generalisability and general acceptance, the second step requires deployment of the model to entities that are independent of the model development and testing activities.

Models that were developed for specific domains where single organisational stakeholders were involved, in those cases the identification of similar firms in different markets may supply the list of potential administrations. For models developed in general domains where multiple organisational stakeholders existed, the use of consortiums for further application may be appropriate.

Depending on the original scope of model application, selection of a range of entities on the basis of industry, region, sector, financial resources and employee numbers will assist in improving the generalisability of the model. The identification of organisations that may benefit from future application of the maturity model and the ability to apply the model to multiple entities, provides the final steps towards standardisation and global acceptance of the developed model.

**PHASE 6: MAINTAIN**

The continued relevance of a model will be ensured only by maintaining the model over time. The goal of the maturity model greatly impacts the resources necessary to maintain the model's growth and use.

**11. Supply resources required to maintain model**

Success in establishing the generalisability of the model requires that provisions be made to handle a high volume of model applications. This will necessitate some form of repository in order to track model evolution and development. Evolution of the model will occur as the domain knowledge and model understanding broadens and deepens.

A model that provides prescriptive actions to improve maturity must have the resources available to track interventions longitudinally. This capability will further support the model's standardisation and global acceptance. The availability of resources to undertake such maintenance will also be determined to some degree by initial scoping (Tonia de Bruin et al., 2005).

These steps should be considered in the development of the maturity model framework for day hospitals as it provides a generic development method for developing a maturity model in any domain.

**3.7.2 DESIGN PROPOSITION FOR SITUATIONAL MATURITY MODELS**

In order to identify and explore the strength and weaknesses of particular organisational designs, a wide range of maturity models have been developed. The developed models often only represent a static view of an organisation, leaving behind situativity in organisational design. The term 'organisational design' often refers to the construction and modification of an organisation's structure in order to be able to operate more effectively (Mettler & Rohner, 2009). The majority of maturity models are restricted to an enumeration of maturity levels without considering the situativity in organisational designs. Situativity, should however, play an important role in the design of a maturity model, given that it is an important influencing factor of maturity (Mettler & Rohner, 2009). From this, the need for situational application of a maturity model arises (Mettler & Rohner, 2009).

To present an approach to designing situational models, a model referred to as Hospital Supplier Relationship Management (HSRM) maturity model was developed and implemented to identify the strength and weaknesses of HSRM activities (Mettler & Rohner, 2009).

This section elaborates further on a design procedure for the development of situational maturity models. This development methodology, as derived from developing the HSRM maturity model, provides an

approach to designing situational maturity models that use process, object and people perspectives as basis for assessing maturity of organisational designs (Mettler & Rohner, 2009). This model was further designed with regards to the first three activity steps of the DSRM developed by Peffers et al. (2008). The steps of the DSRM are detailed in Section 3.6.1.1.

The procedure for developing situational maturity models is depicted in Figure 23. The main phases of this development procedure are discussed below.

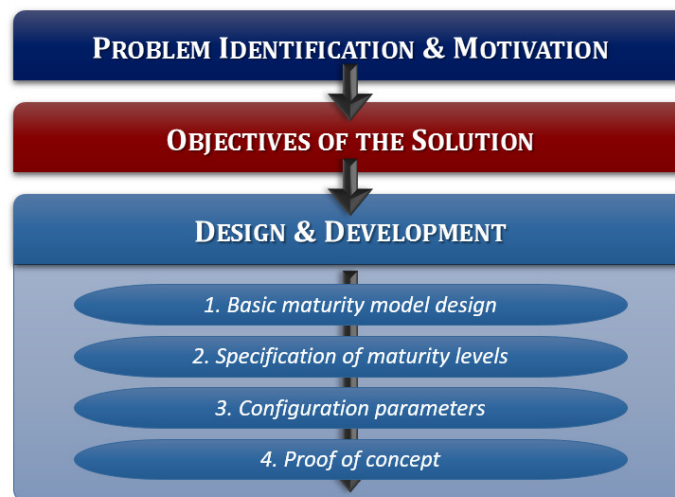


FIGURE 23: DEVELOPMENT PROCEDURE FOR SITUATIONAL MATURITY MODELS

The steps followed to design a maturity model that incorporates situativity is elaborated on below as stated by Mettler & Rohner (2009):

#### PHASE 1: PROBLEM IDENTIFICATION & MOTIVATION

The aim of this phase is to define the specific research problem and justify the value of a solution (Peffers et al., 2008). With regards to the development of the HSRM maturity model, the research problem was initially identified as, the healthcare sector being characterised by monolithic structures with a low division of labour and annually increasing expenditures. Further, this phase involves obtaining knowledge regarding the state of the problem and the importance of its solution (Peffers et al., 2008).

Through gaining knowledge regarding the state of the identified problem, it was established that although labour costs constitute the major share of the total costs of a medical treatment, there is still a major economic potential in improving expenditure on materials and services. The sophisticated management of the relationships with suppliers, commonly referred to as supplier relationship management, was identified as a possible solution through which costs can be reduced while enhancing service delivery. Through further investigation of the state of the identified problem, it was determined that there is, however, a lack of managerial techniques available to effectively change the organisational design in order to implement supplier relationship management.

#### PHASE 2: OBJECTIVES OF THE SOLUTION

This phase involves inferring a solution from the problem definition and gaining knowledge of what is possible and feasible (Peffers et al., 2008).

As hospitals represent a very complex class of organisations; it was required that a maturity model adapted to the unique features of a hospital was to be developed. Consequently, the solution to the research problem

involved the development of an artefact referred to as HSRM maturity model. Designing the situational maturity model enables hospital management to identify the strengths and weaknesses of their HSRM activities.

### PHASE 3: DESIGN & DEVELOPMENT

This phase involves creating the intended design artefact. The desired functionality and architecture of the artefact must first be determined before the actual artefact can be created.

#### 1. Basic maturity model design

The basic design of the HSRM maturity model is based on a grid pattern. This model contrasts domain-specific dimensions, as identified from a literature review, with three maturity dimensions on a grid pattern as depicted in Figure 24.



FIGURE 24: BASIC STRUCTURE OF A SITUATIONAL MATURITY MODEL  
COMPILED FROM (METTLER & ROHNER, 2009)

In this model the three domain-specific dimensions that were identified in the field of Supplier Relationship Management are: strategy; tactics; and operations.

Most well-known maturity models exclusively use a process perspective to assess organisations. This model however, utilises the people, process, and object perspective as basis for assessing maturity. The three maturity dimensions used in this model are (Mettler & Rohner, 2009):

- *Process maturity*, i.e. extent to which a specific business process is explicitly defined, managed, measured, controlled, and effective;
- *object maturity*, i.e. extent to which a particular physical object like a software product, a company report or similar reaches a predefined level of sophistication; and
- *people capability*, i.e. extent to which the workforce is able and willing to enable knowledge creation and enhance proficiency.

The field in the grid pattern must be populated with assessment items. These assessment items can be gained from interviews and a further literature review on existing maturity models.

#### 2. Specification of maturity levels

This model defines three different 5-point Likert scales (with identical number of stages) to account for each of the maturity dimensions. A bottom-up approach was used to define these maturity stages as assessment items had already been investigated.

The idea of having three different scales to rate the maturity of an organisation is based upon contingency considerations and the thought that the mutual influence of process, people and object maturity is not always given. There exists three different ways of progressing the maturity of the organisational design in this model.

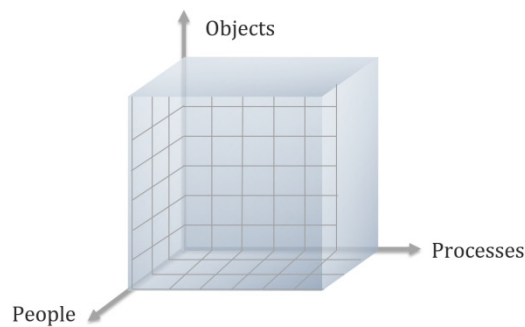


FIGURE 25: MATURITY LEVELS OF SITUATIONAL MATURITY MODEL  
COMPILED FROM (METTLER & ROHNER, 2009)

Considering the possible improvement paths from Figure 25, the three different ways include (Mettler & Rohner, 2009):

- The ideal case in which the level of sophistication is found indicates an improvement of all three maturity factors, namely object, process, and people abilities;
- the cases in which only two factors are enhanced; and
- the cases in which maturity enhanced in one direction only.

### 3. Configuration parameters

The next step is to integrate situativity considerations into the design. For this, several case studies were conducted in order to explore the most relevant contextual factors of the organisational design of a hospital's procurement department, that have a major influence on the complexity of the internal structures and processes.

As a result of their greater flexibility, focus area maturity models are more amenable to situational application than fixed-level maturity models. There exist three basic approaches to integrate situativity considerations into focus area maturity models in order to make the model situation specific. These approaches include (van Steenberg, 2011):

- Configuring the model by making a selection of focus areas and/or capabilities that are relevant to the situation, i.e. disabling some focus areas and/or capabilities that are deemed not applicable in the situation at hand;
- configuring the model by varying the order in which focus areas or capabilities are addressed, i.e. change the relative positioning of the capabilities in the matrix; and/or
- to configure the improvement actions associated with the capabilities to the organisation specifics, rather than configuring the model itself as in the previous two approaches.

Certain focus areas or capabilities were identified as inapplicable to certain types of organisations. Five different scenarios of coordination forms in hospitals were identified. On the basis of the identified scenarios, the configuration of the basic model was performed and consequently five configurations were derived. This was done in focus group discussions in which the applicability of every assessment item was evaluated for each scenario.

### 4. Proof of concept

In order to provide a proof of concept for the practicability of the proposed design of the HSRM maturity model and the applicability to the topic of organisational design, the maturity model was presented by means of a software prototype.



The developed prototype then served as a starting point for an expert evaluation. The experts judged the prototype with regards to its quality of content, quality of instantiation, utility for personal decision-making, and utility for the organisation. The outcome of expert evaluation allows for the identification of model weaknesses and improvement recommendations that aid in refining the model.

The outcome of the expert evaluation of the HSRM maturity model prototype indicated a need for comprehensible reports to be generated from the assessment results, and a need to assess the scenario-specific assessment items for the actual situation, as well as for the target state (Mettler & Rohner, 2009).

The development procedure, as described above by Mettler & Rohner (2009), should be considered if the maturity model framework for day hospitals should include situativity.

### 3.7.3 GENERIC PROCEDURE MODEL FOR THE DESIGN OF MATURITY MODELS

The continuous increasing number of maturity models indicate a level of uncertainty concerning their development processes. This is especially highlighted by incomplete documentation of methodologies applied for maturity model development. To address this issue a generic and consolidated procedure model for the design of maturity models was developed (Becker, Knackstedt, & Pöppelbuß, 2009).

The procedure model for developing maturity models distinguishes eight phases that provide a manual for the theoretically founded development and evaluation of maturity models (Becker et al., 2009). This procedure model is depicted in Figure 26.

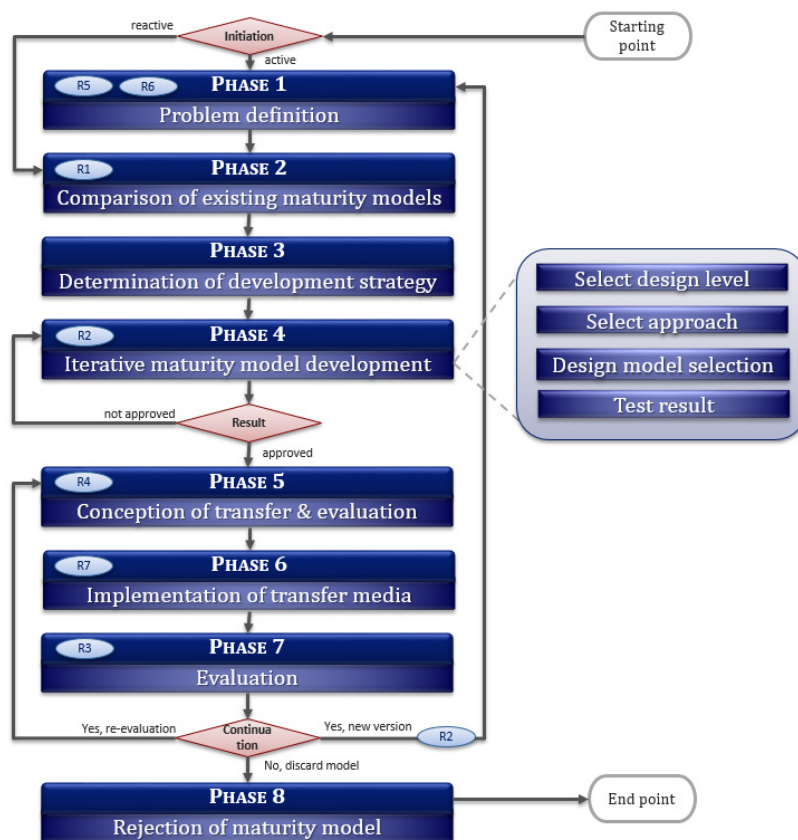


FIGURE 26: PROCEDURE MODEL FOR DEVELOPING MATURITY MODELS  
COMPILED FROM (BECKER ET AL., 2009)



This procedure model and all its elements, feature and development steps as stated by Becker et al., (2009) are discussed below:

The elements of the procedure model depicted in Figure 26 are informed by eight requirements necessary for the development process of maturity models. This procedure model was developed by proposing these eight requirements must be met during the process of developing a maturity model. The requirements for designing maturity models were derived from the seven design-science guidelines as proposed by Hevner et al., (2004). Section 3.6.1.1 details these design-science research guidelines.

The requirements which must be met during the development of a maturity model, as suggested by Becker et al., (2009), are detailed in Table 13.

TABLE 13: REQUIREMENTS OF THE PROCEDURE MODEL NECESSARY FOR DEVELOPING MATURITY MODELS (BECKER ET AL., 2009)

REQUIREMENT	DESCRIPTION OF REQUIREMENT
Requirement 1: Comparison with existing maturity models	The need for the development of a new maturity model must be substantiated by a comparison with existing models.
Requirement 2: Iterative Procedure	Maturity models must be developed iteratively.
Requirement 3: Evaluation	All principles and premises for the development of a maturity model, as well as usefulness, quality and effectiveness of the artefact, must be evaluated iteratively.
Requirement 4: Multi-methodological Procedure	The development of maturity models employs a variety of research methods, the use of which needs to be well-founded and finely attuned.
Requirement 5: Identification of Problem Relevance	The relevance of the problem solution proposed by the projected maturity model for researchers and/or practitioners must be demonstrated.
Requirement 6: Problem Definition	The prospective application domain of the maturity model, as well as the conditions for its application and the intended benefits, must be determined prior to design.
Requirement 7: Targeted Presentation of Results	The presentation of the maturity model must be targeted with regard to the conditions of its application and the needs of its users.
Requirement 8: Scientific Documentation	The design process of the maturity model needs to be documented in detail, considering each step of the process, the parties involved, the applied methods, and the results.

In the graphic representation of the procedure model (Figure 26), which is based on a flow chart, notations for references to requirements have been applied to the individual procedure model elements. The eight phases distinguished by the procedure model for the development of maturity models are detailed below.

#### Phase 1: Problem definition

According to Requirement 6, this procedure model starts by defining the problem. For this purpose, both the targeted domain and the target group of the maturity model must be determined. According to Requirement 5, the problem relevance, i.e. the actual demand for the maturity model, must be clearly demonstrated.

#### Phase 2: Comparison of existing maturity models

Although varying in scope, a comparison of existing maturity models, as stipulated in Requirement 1, is very important. Comparing existing models allows for the identification of shortcomings or lack of transferability that motivate improvements of older models.

**Phase 3: Determination of the design strategy**

A comprehensive comparison is a requisite for a reasoned determination of the design strategy, which, according to Requirement 8, needs to be documented. Basic design strategies can include (Becker et al., 2009):

- A completely new model design;
- an enhancement of an existing model;
- the combination of several models into a new one; as well as
- the transfer of structures or contents from existing models to new application domains.

**Phase 4: Iterative Maturity Model development**

The central phase of the procedure model is the iterative maturity model development, which reflects Requirement 2. The sub-steps of this phase, as can be seen in Figure 26, that must be iterated are (Becker et al., 2009):

- Selecting the design level;
- selecting the approach;
- designing the model section; and
- testing the results for comprehensiveness, consistency, and problem adequacy.

**Phase 5: Conception of transfer & evaluation**

After the maturity model is designed in the previous phase, the different forms of result-transfer for the academic and the user communities need to be determined. The aim of this phase is to plan for the transfer design, which requires developing a transfer concept, as well as an evaluation concept.

Firstly, the different forms of result-transfer for the academic and the user communities need to be determined in this phase. Requirement 4 prescribes a reasoned selection of the different forms that the targeted communication of the maturity model can take. The transfer media can include (Becker et al., 2009):

- Publication of document-based check lists and manuals; and
- software-tool supported accessibility of the maturity model.

Possibilities for the evaluation of the problem solution proposed by the maturity model should be incorporated into the transfer design. This requirement guarantees users the possibility for feedback as early as the design stage of the media.

**Phase 6: Implementation of transfer media**

The purpose of this phase is to make the maturity model accessible in the planned fashion for all previously defined user groups (Becker et al., 2009). At this stage, the most important point is to target the transfer media, as specified in Requirement 7.

**Phase 7: Evaluation**

According to Requirement 3, this phase should establish whether the maturity model provides the projected benefits and an improved solution for the defined problem (Becker et al., 2009). The defined goals are to be compared with real-life observations.

The execution of the evaluation phase can lead to one of three possible outcomes (Becker et al., 2009):

- A reiteration of the design process (Requirement 2);
- the maturity model may be retained unchanged, while the conception of transfer and evaluation may need to be modified; or
- negative results may lead to a rejection of the model.

**Phase 8: Rejection of Maturity Model**

If the outcome of the previous evaluation phase leads to a rejection of the model, the model should be purposefully, explicitly, and if possible, actively taken off the market.

Maturity models inherently become obsolete because of changing conditions, technological progress or new scientific insights. If an unchanged maturity model is supposed to be permanently valid for its problem area, it needs to be validated regularly by appropriate evaluations (Becker et al., 2009).

This procedure model also provides a generic approach for the design of maturity models. This approach and its relevant constituents should also be considered in establishing the steps that should be followed in the development of the maturity model framework for day hospitals.

**3.7.4 DEVELOPMENT ROADMAP FOR MATURITY GRIDS**

One approach to evaluating organisational capabilities is by means of maturity grids. Maturity grid assessments are quick and relatively cheap to perform which makes them particularly attractive to organisations seeking to evaluate their performance levels. Maturity grids can further be utilised as assessment tools, as well as tools for improvement.

Although maturity grids often have a similar structure, their content varies and, as a result, they are repeatedly newly developed, each according to its own development approach (Maier, Moultrie, & Clarkson, 2012). Subsequently, guidance regarding the systematic development of maturity grids is required. To address this issue, a roadmap was developed to offer a mutual reference point and to propose parameters for a more meticulous methodology to the development of maturity grids (Maier et al., 2012). This roadmap provides guidance on how to develop maturity grids which aim to obtain mature business processes in pursuit of increased performance.

So as to develop all-encompassing maturity grids, the maturity grid development roadmap proposes four generic design phases: planning; development; evaluation; and maintenance. This roadmap for developing maturity grids is depicted in Figure 27.

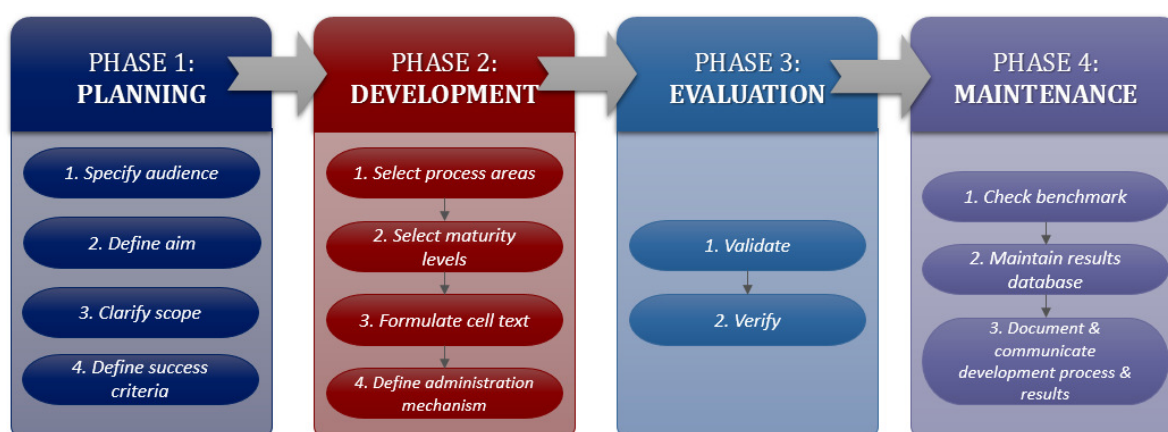


FIGURE 27: MATURITY GRID DEVELOPMENT ROADMAP  
COMPILED FROM (MAIER ET AL., 2012)

All the relevant steps and aspects of the maturity grid development roadmap is detailed below as described by Maier et al. (2012):

This development roadmap is a first attempt at identifying and synthesising phases and decision points that may be useful to both authors of assessment grids and implementers required to handle the multi-model environment. Although courses of action with respect to decision points within the phases of this roadmap may vary, the phases are consistent. Consequently, they lend themselves to being applied across multiple domains.

For each phase of the development roadmap, a number of relevant decision points and options must be considered during the development of a maturity grid. All the phases of the maturity grid development roadmap are detailed below. It must be noted that while these roadmap phases are generic, their order is important.

### PHASE 1: PLANNING

The first phase of the maturity grid development roadmap involves the author of the maturity grid deciding on the intended audience; defining the purpose of the assessment; clarifying the scope; as well as defining the success criteria.

#### 1. Specify audience

The first important decision when developing maturity grids is to identify who all the expected users are. The term audience refers to all stakeholders who will participate in various aspects of the assessment; be it for the data acquisition process, as implementer of results, or as the subject of the assessment, also known as the improvement entity. Multiple audiences may be addressed for varying reasons.

For reasons of clarity and accuracy of interpretation, it is necessary to differentiate between audiences. Decisions will have both logistical and conceptual implications. Logistical implications concern predominantly time and resource constraints relating to the participants and facilitator of the assessment. Conceptual implications relate mainly to validity, reliability, and generalisability of the assessment.

#### 2. Define Aim

There seem to exist two improvement paradigms that drive improvement initiatives. These two are (Maier et al., 2012):

- The *analytic improvement paradigm*, aims for evidence to determine what improvements are needed and whether an improvement initiative has been successful; and
- the *benchmarking improvement paradigm* depends on identifying best practices and/or identifying an excellent organisation in a field to which practices are compared. It specifies best practices that have been demonstrated to add value in a particular context and have been explicitly stated in models and standards.

These two strategies can be complementary, as both may lead to a measurement-based strategy. A measurement-based strategy means that processes are measured and compared to objectives set by management or industry standards in order to identify which processes need to be improved.

#### 3. Clarify Scope

An author needs to determine whether the maturity grid is to be generic or domain-specific (Maier et al., 2012). If it is supposed to be domain-specific, it is especially important to gather information about the context, the idiosyncrasies and terminology of the specific domain in order for it to be understood by and of relevance to the audience.

#### 4. Define Success Criteria

One way of establishing whether the development and application of a maturity grid is successful is through checking whether the success criteria has been fulfilled. Success criteria must therefore be determined early in the development process. Success criteria can manifest in two forms, namely high-level requirements and specific requirements.

*High-level requirements* for an intervention method can be usability and usefulness. Usability mainly addresses the degree to which users understand the language and concepts used. Usefulness could be seen in terms of enterprise's perceptions of whether they found the assessment helpful in stimulating learn effects or in leading to effective plans for improving a certain situation.

*Specific requirements*, in contrast, pertain to the individual context and are also influenced by the underlying theoretical stance used by the author of a maturity grid.

### PHASE 2: DEVELOPMENT

The development phase of the roadmap is intended to define the architecture of the maturity grid. During this phase the author is required to make decisions regarding the process areas to be assessed; the maturity levels to be assigned; the cell descriptions to be formulated; as well as the administration mechanism to be used.

#### 1. Select Process Areas

An effective assessment should be based on an underpinning conceptual framework, generated from principles of good practice. The goal of this step is to establish key process areas that are mutually exclusive and collectively exhaustive. Inevitably, the selection of process areas yields insights into the authors' conceptualisations of the field. The conceptual framework underlying the assessment method determines the scope of the assessment.

Firstly, process areas can be established through experience and knowledge. Thus, the justification of process areas is based on the experience in the field of the originator and by reference to established knowledge in the relevant field.

Secondly, comprehensively reviewing the existing literature within a particular domain can help identify process areas. However, in the absence of significant prior experience, and in a relatively new field, it may not be possible to gather sufficient evidence through existing literature in order to derive a comprehensive list of process areas. In this instance, a literature review is considered to be only sufficient in providing a theoretical starting point.

After identification of process areas through a literature review, process areas can be solicited by interviewing a panel of experts or by synthesising the most critical and most frequently mentioned concepts in literature. Alternatively, organisational goals and the overall objective of the organisation can be used to derive key process areas.

#### 2. Select Maturity Levels

The next step in the development of a maturity grid is to define a set of maturity levels. Levels need to be distinct, well defined, and need to show a logical progression as clear definition eases interpretation of results.

An explicit statement of the underlying rationale and consistent implementation of a maturity grid is required to provide theoretical rigor. Deciding on what rationale informs the rating scale essentially means deciding on a leverage point for organisational change.

### 3. Formulate Cell Text (Intersection of process areas & maturity levels)

Process characteristics need to be described at each level of maturity. The identification and formulation of behavioural characteristics for capabilities or processes is one of the most important steps in developing a maturity grid assessment.

Ensuring that process descriptions at each maturity level are precise, concise and clear requires (Maier et al., 2012):

- A decision on whether the cell text is prescriptive or descriptive;
- a justification of the information source; and
- a decision on the mechanism of formulating the text descriptions.

### 4. Define Administration Mechanism

The administration mechanism of a maturity grid is integral to the success of the assessment. In choosing a mechanism, consideration needs to be given to the aim of the assessment, the resources and support infrastructure available for conducting the assessment.

## PHASE 3: EVALUATION

Evaluation is an important stage in the development of a maturity grid. During the evaluation process tests are used to validate the grid, feedback is obtained on whether the grid fulfilled the requirements when applied in practice and items for refinement are identified.

During this phase, it is important to test input into the grid for validity and the results acquired by applying the grid in practise and for correctness.

### 1. Validation

Once a grid is populated, it must be tested for validity and relevance. This includes checking whether good translations of the constructs have been achieved. The maturity grid also needs to be tested for breadth of the domain covered.

In addition to testing the content of the grid for validity, it is necessary to ensure that the results obtained through applying the grid in the field are correct, accurate, and repeatable. A case study approach to method evaluation may be employed. If benchmarking is desired, results acquired through the assessment need to be tested for generalisability.

### 2. Verification

In terms of verification through application, the developed method needs to be evaluated against the success criteria and requirements defined during Phase I.

## PHASE 4: MAINTENANCE

The maintenance phase is an ongoing phase. Continued accuracy and relevance of a maturity grid will be ensured by maintaining it over time.

### 1. Check benchmark

Maintenance becomes necessary as domain knowledge and understanding broadens and deepens. Current best practice can become outdated as a result of, for example, new technological developments. This requires that the grid must be maintained over time to ensure the grid remains accurate and relevant.

### 2. Maintain results database

If the tool was developed for benchmarking purposes, it is particularly important to ensure accurate data storage and retrieval. In general, while regular maintenance is recommended, updating a tool to reflect

current best practice can compromise validity. Hence, if substantial changes are made after a tool has been formally evaluated, the evaluation phase needs to be repeated.

### **3. Document and communicate development process and results**

Finally, maintenance includes adequate documentation and appropriate communication of the design process and results to the academic community and findings from application cases to practitioners (Maier et al., 2012).

In the development of the maturity model framework for day hospitals, this roadmap approach to designing maturity grids, together with all its steps, should be considered if the framework is to take on the structure of a maturity grid.

## **3.7.5 GENERIC METHOD FOR DEVELOPING FOCUS AREA MATURITY MODELS**

There is a need for developing focus area maturity models; as they provide more guidance to incremental improvement than fixed-level maturity models which are mostly encountered in the existing literature. A method for developing focus area maturity models was, however, only recently formulated.

The steps of the focus area maturity model development method were established by combining existing literature on design-science research with the existing literature available on developing fixed-level maturity models. The design-science research approach utilised the DSRM process model (discussed in 3.6.1.1) and the IS Research Framework (discussed in Section 3.6.1.2).

Focus area maturity models are much less common than fixed-level models. Therefore, existing literature on developing fixed-level maturity models was considered in defining and describing the steps of a development methodology for focus area maturity models. The available literature on fixed-level maturity model development approaches that were considered include (van Steenbergen, 2011):

- The maturity model development framework (Tonia de Bruin et al., 2005);
- the approach to designing situational maturity models (Mettler & Rohner, 2009);
- the procedure model for maturity model design (Becker et al., 2009); and
- the maturity grid development roadmap (Maier et al., 2012).

The framework development methodology for focus area maturity models was further shaped by using a design-science research approach, in particular the IS research framework with the three research cycles by Herver (2007), as elaborated on in Section 3.6.1.2; and the DSRM process model by Peffers (2007), as described in Section 3.6.1.1. The DSRM helped to structure the design cycle while designing the focus area maturity model development method (van Steenbergen, 2011).

The resultant method for developing focus area maturity models can be seen in Figure 28. Additionally, the generic method steps of developing a focus area maturity model for new functional domains is also depicted in Figure 28. The method steps are structured into four main phases namely: scoping; design model; instrument development; and implementation & exploitation (van Steenbergen et al., 2010). The steps are briefly described below.



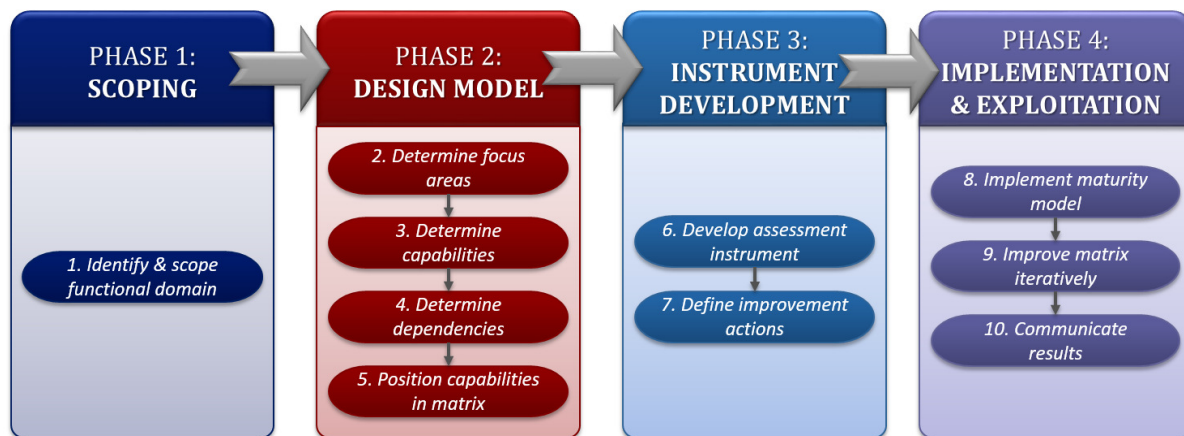


FIGURE 28: DEVELOPMENT METHOD FOR FOCUS AREA MATURITY MODELS  
COMPILED FROM (VAN STEENBERGEN, 2011)

The steps and relevant concepts of the development method for focus area maturity models are elaborated on below as described by van Steenbergen (2011):

#### PHASE 1: SCOPING

##### Step 1: Identify and scope the functional domain

To develop a model that is balanced and well-founded, the domain in which the model is to be developed must be scoped properly. This starts with making explicit the underlying rationale and conceptual framework concerning the functional domain in terms of (van Steenbergen, 2011):

- The relevant dimensions the model must focus on;
- what constitutes progressive maturity for the scoped functional domain as a whole, as well as for each of the distinguished focus areas constituting the functional domain; and
- what to include and what to exclude.

Existing maturity models developed in the same or similar functional domains are identified to be used as a starting point for further development (Becker et al., 2009).

#### PHASE 2: DESIGN MODEL

##### Step 2: Determine focus areas

Within the chosen domain, the focus areas must be identified. A good number of focus areas to identify is around twenty (Maier et al., 2012).

These focus areas can be determined through performing a literature review that can be followed by exploratory research methods like expert groups or case studies (Mettler & Rohner, 2009). Focus areas can also be established by exploring critical success factors in previous research (Tonia de Bruin et al., 2005).

It is important for means of validation to make the underpinning conceptual framework, used in defining the focus areas, very clear. Grouping the focus areas into a small number of categories may add to the accessibility of the model and is also a means of validating completeness.

##### Step 3: Determine capabilities

Each focus area consists of a number of different capabilities representing progressive maturity levels. The evolutionary path of capabilities is specified for each focus area previously defined. This evolutionary path is based on the underlying rationale of how the focus area can be incrementally developed in an evolutionary way.



Approaches to defining maturity levels include a top-down approach and a bottom-up approach. Section 3.7.1 details the difference between these two approaches.

**Step 4: Determine dependencies**

In step 4 dependencies between capabilities are identified. The dependencies that need to be identified refer to the dependencies between capabilities of the same focus area; representing progressive maturity levels, as well as the dependencies that may exist between capabilities of different focus areas.

As the capabilities represent progressive maturity levels, they possess an inherent order of preferred implementation, starting with the first capability. Sometimes this order is inevitable, for instance it is not possible to use measurements for improvement if there is no measurement mechanism in place. In other cases, the order is a preferred one, for instance it is advisable to set clear goals before putting a measurement mechanism in place. It is not impossible, though unwise, to skip the step of goal-setting.

**Step 5: Position capabilities in matrix**

In this step the capabilities are positioned in the matrix. Based partly on the previously determined dependencies, and partly on concerns of practicality, the capabilities are positioned in the maturity matrix.

Capabilities that are dependent on other capabilities are always positioned further to the right. This gives partial ordering. This ordering can be further refined based on experience and practices.

Capabilities that are not dependent on each other may be put at the same level. For reasons of practicality, however, if many capabilities are contained in one level, they may be divided over a number of levels to get a more balanced matrix. By this positioning the number of levels of the matrix is revealed.

**PHASE 3: INSTRUMENT DEVELOPMENT****Step 6: Develop assessment instrument**

To be able to use the focus area maturity model as an instrument to assess the current maturity of a functional domain, measures must be defined for each of the capabilities. This can be done by formulating control questions for each capability and combining them in a questionnaire that can be used in assessments. Formulation of the questions is usually based on the descriptions of the capabilities and on experience and practices.

**Step 7: Define improvement actions**

For each of the capabilities, improvement actions can be defined to support practitioners in moving to that capability. Improvement actions are usually based on experience and practices. The usefulness of specific improvement actions will very much depend on the actual situation of an organisation. Therefore, it is advisable to present them as suggestions, rather than as prescriptions.

**PHASE 4: IMPLEMENTATION & EXPLOITATION****Step 8: Implement maturity model**

Implementation can be done in various ways. A questionnaire can be distributed by electronic means which allows for collecting many assessments in a relatively short timeframe (Tonia de Bruin et al., 2005). The assessment can also be performed by independent assessors, basing their assessment on discussion in workshops or individual interviews.

**Step 9: Improve matrix iteratively**

The initial applications of the model can be used to evaluate the model qualitatively. Once enough assessments have been collected, quantitative evaluation becomes possible. To evaluate how the model assists in incremental improvement interventions should be tracked longitudinally. A repository must be kept to collect assessment results.

**Step 10: Communicate results**

To further the field, the results of the design should be communicated to practitioners as well as to the scientific community (van Steenberg, 2011).

If a focus area maturity model structure is being considered as the appropriate structure for the maturity model framework for day hospitals; these steps and concepts of a generic method for designing focus area maturity models should be noted.

All the above-mentioned approaches and methodologies to developing maturity models should be considered, and if applicable, incorporated into the design of the maturity model framework for day hospitals.

### **3.8 BUSINESS PROCESS MATURITY MODELS**

---

As the growing globalised market is characterised by demanding customers, organisations are striving to excel in order to gain competitive advantage or to outperform competitors in their societal obligations. Business processes describe how organisations operate, and as a result have an impact on how organisations perform (Van Looy et al., 2013). Hence, organisations are increasingly focusing on their business processes to excel in pursuit of the highest level of organisational performance (Van Looy, De Backer, & Poels, 2010, 2014). Business Process Maturity Models (BPMMs) are tools that can be utilised in this pursuit of increased performance. BPMMs provide a framework to improve business processes.

A *Business Process Maturity Model* assesses and improves a business process throughout its lifecycle by focusing on the necessary capabilities to perform. Hence, the model components of a BPMM must affect business process performance (Van Looy et al., 2010). Process assessment is the foundation activity for process improvement. It investigates strong, weak or missing points in definition and enactment of a set of business processes (Tarhan, Turetken, & van den Biggelaar, 2015). Findings from a process assessment are typically transformed into a roadmap for improvement (Tarhan, Turetken, & van den Biggelaar, 2015). The BPMMs present a sequence of maturity levels and a step-by-step roadmap with goals and best practices to reach each consecutive maturity level (Van Looy et al., 2011).

*Business Process Maturity* indicates how well an organisation can perform based on its business processes (Van Looy et al., 2014). Maturity aims at systematically assessing and increasing the capabilities of a business's processes and the organisation to deliver higher performance over time (Rosemann & de Bruin, 2005; Van Looy et al., 2010, 2014).

Business Process maturity can refer to (T. de Bruin & Rosemann, 2007):

- The maturity of specific business processes; and/or
- the maturity of business process management in general, i.e. the maturity of all business processes in the organisation.

#### **3.8.1 BUSINESS PROCESS MATURITY MODEL COMPONENTS**

---

A BPMM assesses the capabilities of a specific business process to establish the maturity of the relevant business process. A BPMM can also be utilised to assess and improve the overall maturity of an entire organisation to deliver higher performance over time (Van Looy et al., 2010). Van Looy et al. (2011) derived

six theoretical components that must all be assessed and improved in order to fully reach business process maturity. These theoretical components specify whether BPMMs deal with BP (Business Process), BPM (Business Process Management) or BPO (Business Process Orientation). In pairs, these BPMM components form a funnel structure, starting from a BP, which is a subset of BPM, and which is part of BPO. The components of a BPMM are illustrated in Figure 29.

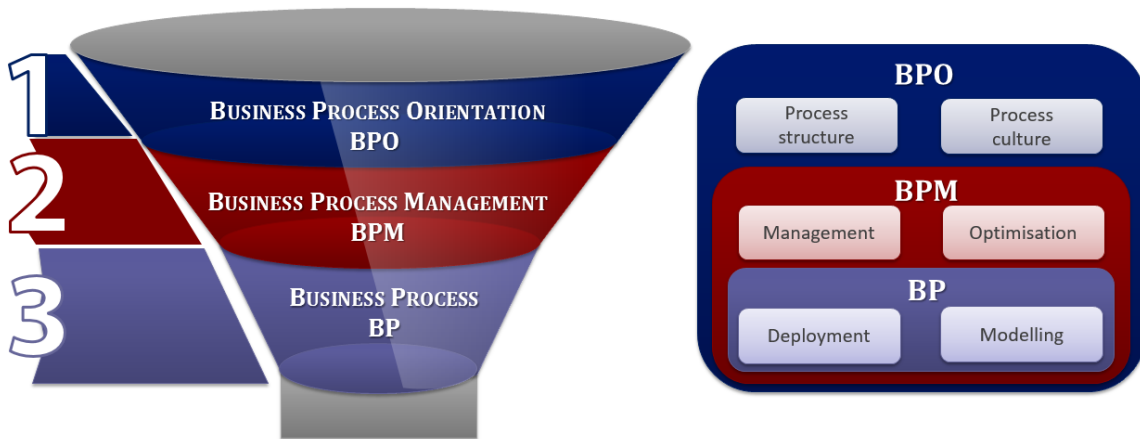


FIGURE 29: THE FUNNEL STRUCTURE OF COMPONENTS IN BUSINESS PROCESS MATURITY MODELS  
COMPILED FROM (Van Looy et al., 2010)

The theoretical model components addressed in a maturity model specify what is being measured by the BPMM (BP maturity, BPM maturity, or BPO maturity). Each of the BPMM components are detailed in Table 14.

TABLE 14: DESCRIPTION OF THEORETICAL COMPONENTS IN BUSINESS PROCESS MATURITY MODELS (Van Looy et al., 2011)

THEORETICAL COMPONENT	DESCRIPTION OF COMPONENT
Modelling	This component comprises methods and IT (Information Technology) for the design and analysis of business processes.
Deployment	This component encompasses methods and IT for the implementation and enactment of business processes, as well as their measurement and control during enactment.
Optimisation	This component includes methods and IT for the evaluation and improvement of business processes after enactment. Improvements vary from incremental (e.g. total quality management) to radical (e.g. reengineering).
Management	This component comprises the daily management of business processes, including the required roles and responsibilities with corresponding skills and training. It also involves linking process goals to the organisational strategy and the relationships with customers, suppliers and other stakeholders.
Culture	This component contains values that favour business processes and their translation in attitudes and behaviours. It requires appraisals and rewards that consider process results and top management commitment.
Structure	This component comprises a shift in the organisation chart to visualise horizontal business processes and specific governance bodies to coordinate the management of all business processes within an organisation.

The components addressed in a BPMM specifies what maturity is being assessed, namely:

- BP maturity;
- BPM maturity; or
- BPO maturity.

These three maturity types are detailed below.

### ***3.8.1.1 BUSINESS PROCESS(BP) MATURITY***

A BP describes how work is accomplished in an organisation (Harmon, 2014). The work performed in a BP transforms physical or informational inputs into outputs. Therefore, a BP refers to a value-adding transformation taking place (Van Looy et al., 2010).

A BP is comprised of a set of activities, each of which may have its own set of activities. The complete set of BPs of an organisation describes all the work undertaken by that organisation (Harmon, 2014).

Processes are generally independent of formal organisational structures, crossing functions or departments and involving people with different expertise and roles (Gemmel, Vandaele, & Tambour, 2007). In a process oriented organisation, processes are mapped so that task responsibilities are described with a focus on processes (Gemmel et al., 2007).

A BP can be characterised by the following features (Van Looy et al., 2010):

- Predictable and definable inputs;
- a linear, logical sequence or flow;
- a set of definable and interrelated activities;

- predictable and desired outputs;
- horizontal or cross-departmental;
- performed by resources;
- repeatable; and
- adding value for customers.

BPs can be categorised according to their functionality and structure. The functional business process types are (Van Looy et al., 2011):

- *Core, operational, primary or value-adding processes*; these are processes concerning the production and delivery of products or services, contributing to value creation and directly related to external customers;
- *Support or value-enabling processes*; they support the core processes and facilitate organisational performance, characterised by internal customers, for instance, processes in information management or human resources;
- *Management processes* are linked to the strategy and policy setting, serving the overall planning, and controlling all activities in the organisation; and
- *Business network processes* extend the core processes to external trading partners.

BPs can further be structurally classified as (Van Looy et al., 2011):

- *Fully structured* BPs where subsequent steps are completely predefined by fixed rules;
- *Semi-structured* BPs; or
- *Fully unstructured* BPs where subsequent steps are ad hoc.

### **3.8.1.2 BUSINESS PROCESS MANAGEMENT (BPM) MATURITY**

BPM is a comprehensive system for managing and transforming organisational operations, based on what is arguably the first set of new ideas about organisational performance since the Industrial Revolution. Through process management, an enterprise can create high-performance processes, which operate with much lower costs, faster speeds, greater accuracy, reduced assets, and enhanced flexibility (Rosemann & Brocke, 2015).

BPM involves continuously managing and improving BPs, guided by process owners (Van Looy et al., 2014). BPM is expected to contribute to both process excellence and business excellence by assuring a uniform way of working and by continuously looking for optimisations (Van Looy et al., 2010). Nonetheless, the journey towards process excellence is challenging. As a result, various authors have proposed step-by-step roadmaps with best practices, from which organisations gradually benefit (Van Looy et al., 2010). These roadmaps are called BPMMs.

BPM involves continuously managing BPs by process owners, while using the benefits of IT. Thus, BPM emphasises the importance of the IT and managerial aspects in advancing maturity (Van Looy et al., 2011).

The difference between BP and BPM, is that BPM also addresses managerial aspects and optimisation efforts with regard to one or more BPs (Van Looy et al., 2010). The four relevant components of assessing BPM maturity can be seen in Figure 29. It can further be seen from Figure 29 that BPM includes BP, but BP does not necessarily include BPM. A BP can run without optimisation or management efforts, albeit not in its most optimal way, but it always require some modelling (Van Looy et al., 2014).

### **3.8.1.3 BUSINESS PROCESS ORIENTATION (BPO) MATURITY**

The BPO concept suggests that organisations can enhance their overall performance by adopting a process-view of the organisation (Lockamy & McCormack, 2004). According to McCormack & Johnson (2001), an organisation focused on BPO is “an organisation that emphasises process; a process oriented way of thinking; customers; and outcomes as opposed to hierarchies”.

The BPO focus is broader than solely implementing BPM as a management principle and modelling the processes. BPO implies developing process awareness or a process-driven mind-set (Van Looy et al., 2011).

The relevant components for assessing BPO maturity can be seen in Figure 29. As can be seen from Figure 29, BPO goes beyond the four BPM components by also referring to organisation management, in particular by adopting a horizontal process-oriented structure and a process-oriented culture with rewards linked to the performance of business processes instead of departments (Van Looy et al., 2010).

## **3.8.2 CAPABILITY AREA FRAMEWORK FOR BPMM**

---

Van Looy et al. (2014) developed a conceptual framework that provides all the capability areas that must be assessed and improved in order to reach business process excellence. In previous research, Van Looy et al. (2011) derived six BPMM components from recognised definitions for BP, BPM and BPO. These components form the main capability areas in the conceptual framework. The main capability areas are detailed in Section 3.8.1.

The six main capability areas are supported by 17 sub capability areas that encompass a comprehensive framework, depicting all the relevant capability areas that must be assessed and improved to fully reach business process maturity (Van Looy et al., 2014). The classification of the main capability areas and sub capability areas is depicted in Figure 30.

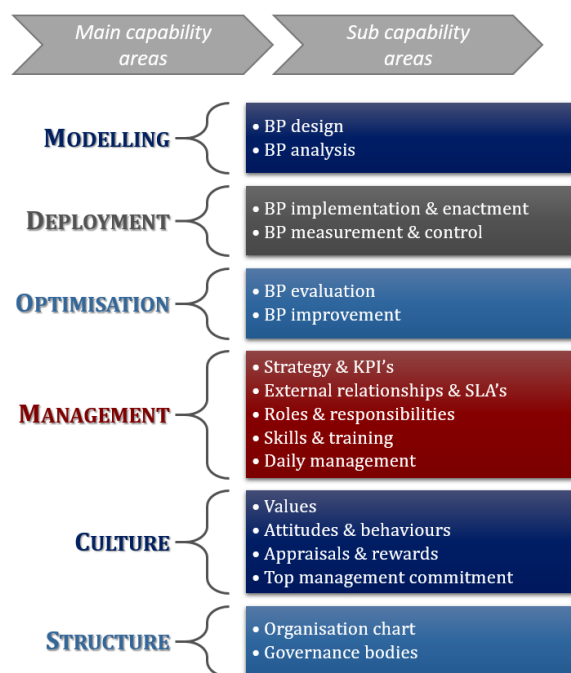


FIGURE 30: CONCEPTUAL FRAMEWORK & CLASSIFICATION OF CAPABILITY AREAS FOR BUSINESS PROCESS MATURITY  
COMPILED FROM (Van Looy et al., 2014)

Each sub capability area of the conceptual framework is detailed in Table 15. These capability areas are stated as defined by Van Looy et al. (2014):

TABLE 15: CONCEPTUAL FRAMEWORK & CLASSIFICATION OF CAPABILITY AREAS FOR BUSINESS PROCESS MATURITY  
(Van Looy et al., 2014)

MAIN CAPABILITY AREA	SUB-CAPABILITY AREA	DESCRIPTION OF CAPABILITY AREA
Modelling	Business Process Design	Refers to the identification and representation of a business process model. Designers start from an initial set of the business process purpose, performance targets, required behaviours and deliverables (Van Looy et al., 2014). Based on this set, business processes are modelled in a textual and/or graphical representation. Business process modelling must specify: <ul style="list-style-type: none"> <li>• The process structure - the relationship between inputs, activities, outputs, business rules and data;</li> <li>• the resource structure - who or what executes the activities;</li> <li>• the allocation logic - how activities are assigned to resources; and</li> <li>• the interfaces between business processes and between business processes and external partners.</li> </ul>
	Business Process Analysis	Refers to the validation, simulation and verification of a (re)designed business process model. Business stakeholders must validate that these models conform the business reality. Simulations must test the models in real-world settings.

MAIN CAPABILITY AREA	SUB-CAPABILITY AREA	DESCRIPTION OF CAPABILITY AREA
Deployment	Business process implementation and enactment	Refers to the preparation and actual running of business processes. During implementation, the high-level business process models are translated into deployable models by adding operational details. The operational systems are selected, configured, tested and released. These systems include human process participants, who follow the defined procedures, and/or process-aware information systems, such as a BPM suite or a workflow system. Business process enactment starts when business processes are actually executed by following the implemented procedures and software systems. Each time the business process runs in real life, a process instance is created.
	Business process measurement and control means	Refers to gathering of log files and real-time monitoring. During business process enactment, the performance of business process instances must be measured by recording activities in log files. This allows for real-time monitoring and process optimisation. The log files of active process instances are used to: <ul style="list-style-type: none"> <li>• Maintain conformance with the business process models by correcting deviations; and</li> <li>• provides information on the current status of active instances.</li> </ul> <p>The use of log files after enactment belongs to the next capability area.</p>
Optimisation	Business process evaluation	Refers to the utilisation of enactment information to quantify the performance of finished business process instances, specified during business process modelling, and the operational environment, specified during business process deployment.
	Business process improvement	Refers to making business processes conform to their models and optimising the models through redesign.
Management	Strategy and KPIs	Since business processes must contribute to customer satisfaction and business performance, they need to serve the organisational mission, vision and strategy. Strategic alignment refers to aligning business processes with strategic objectives and customers' needs or systematically connecting business processes with the business strategy and thinking in terms of customer goals. The organisational strategy must be translated into a business process strategy, and the organisational performance targets must be translated into business process performance targets.
	External relationships and SLAs	For strategy realisation, business processes must take into account their external environment. Moreover, external parties must be actively involved in activities regarding business process modelling, deployment, optimisation or management. Examples are external communication or committing to Service Level Agreements (SLAs) with partnering suppliers and customers.
	Roles and responsibilities	A permanent business process owner must be appointed by top management. This business process owner is responsible and accountable for the performance and continuous improvements of a specific business process, as well as for the budget, resources and the interfaces with other business processes. The process owner can be assisted by a process team to model, deploy and optimise business processes. The process owner also leads a cross-functional team of business process participants.
	Skills and training	In order to fulfil these roles, individuals must be trained to obtain the required skills and knowledge. Besides knowledge on the process models, employees can be trained in problem solving, process improvement and decision making.
	Daily management	The process owner applies project management activities. These project management activities include: decision-making; planning; budgeting; communication; business-IT alignment; change management; risk management; compliance management; quality assurance; and configuration management.
Culture	Values	A process-oriented culture implies that a certain set of values are considered supportive of BPM objectives. An organisation must cherish values that facilitate the realisation of the previous capability areas.



MAIN CAPABILITY AREA	SUB-CAPABILITY AREA	DESCRIPTION OF CAPABILITY AREA
	Attitudes and behaviours	These previously mentioned values must be concretised in attitudes and behaviours that go beyond a specific business process. For instance, employees who are aware of the business processes within their organisation, who are motivated to do their job, who do not resist change, who share technological and organisational facilities, as well as lessons learned among business processes through a repository or social network.
	Appraisals & rewards	Employees must be appraised and rewarded according to the performance of business processes, instead of departments. Hence, process-related skills must be added to the job descriptions and career paths of all employees.
	Top management commitment	Top managers must support or sponsor business processes. It implies: <ul style="list-style-type: none"> <li>• A leadership style - considering business processes as a way of managing the business; and</li> <li>• a leadership role with responsibilities - a top manager who is centrally responsible for and actively engages in all business processes within the organisation.</li> </ul>
Structure	Process-oriented organisation chart	This refers to a shift from a vertical, departmental organisation towards a horizontal organisation. By structurally emphasising end-to-end business processes or value chains, this shift expresses process-oriented values, such as a customer focus, and multidisciplinary collaboration.
	Process-oriented management/governance bodies	Additional bodies must be created, such as: <ul style="list-style-type: none"> <li>• A process management council or office (per business process);</li> <li>• a program management council or office, or a steering committee (among business processes); and</li> <li>• a centre of excellence or support office (i.e. a competence centre to assist these councils).</li> </ul> A program manager must be assigned to coordinate the process owners. He leads a centralised centre of excellence, comprising process experts or internal consultants in methods and IT for process management and project management.

How these capability, and sub-capability areas are defined and categorised should be noted and considered when developing the dimensions of the maturity model framework for day hospitals.

### 3.9 GENERIC BUSINESS PROCESS MATURITY MODELS

Given the importance of mature business processes, a proliferation of maturity models was realised during recent decades. Tarhan, Turetken, & Reijers (2015) investigated generic maturity models that have been proposed for BPM based on the studies reported in the scientific literature. Twenty maturity models were identified, of which nine were considered leading with respect to the attention they acquired in the academic research for BP, BPM and BPO. The nine most prominent BPMs, as identified by Tarhan, Turetken, & Reijers (2016), can be seen in Table 16. All the capability dimensions of each BPM was identified and summarised in Table 16.

TABLE 16: GENERIC BUSINESS PROCESS MATURITY MODELS REFERRED TO IN THE LITERATURE &amp; THEIR CAPABILITY DIMENSIONS (Tarhan et al., 2016)

MATURITY MODEL	ABBREVIATION	DEVELOPER	CAPABILITY DIMENSIONS OF MATURITY MODEL
Business Process Management Capability Framework	BPM-CF	(Rosemann & de Bruin, 2005)	The six factors identified as being critical to BPM are (T. de Bruin & Rosemann, 2007): Strategic Alignment; Governance; Methods; Information Technology; People; and Culture. Each of these critical factors have five capability areas whose measurement is necessary for assessing the maturity of these factors.
Business Process Maturity Model	BPMM-Fisher	(Fisher, 2004)	Fisher defined actions on the grounds that BPMM is represented as five levers of change and five states of process maturity. The key to the Five Levers is the ability to achieve consistent alignment across all five. When that is achieved, then the organisation is operating at a level where it can achieve optimal results. The "Five Levers of Change" that represent the core of most organisations include: Controls; People; Technology; Process; and Strategy.
Business Process Maturity Model	BPMM-Harmon	Harmon 2004	The process maturity model described by Harmon (2004) regards all the core and support processes as a value chain, starting from the resource right up to the final product (Lee, Lee, & Kang, 2007). It also provides a checklist for accessing organisation or process maturity. Although Harmon's approach shows the need for including values in the model, his maturity model does not provide the means to achieve these values (Lee et al., 2007). In addition, it is a heuristic and informal approach that assesses the maturity level based on just a few checklists (Lee, Lee, & Kang, 2007).
Business Process Maturity Model	BPMM-OMG	Object Management Group. (2008)	The nine process areas that create a maturity level two capability of this BPMM include: Organisational Process Leadership; Organisational Business Governance; Work Unit Requirements Management; Work Unit Planning and Commitment; Work Unit Monitoring and Control; Work Unit Performance; Work Unit Change Management; Sourcing Management; and Process and Product Assurance. This model has 21 other process areas that are incorporated as the maturity level of the organisation develops. The nine process areas mentioned above are the only focus areas considered from this model, as they are the most crucial basic areas required to advance in before any further maturity development of an organisation takes place.
Business Process Orientation Maturity Model	BPO-MM	McCormack & Johnson's (2001)	The BPO Maturity Model is based on the notion that strong measures of BPO within an organisation improves business performance (McCormack et al., 2009). Improving the BPO maturity within organisations leads to a positive corporate climate that is characterised by a high degree of organisational connectedness and low levels of internal conflict. According to this maturity model, there are several components of maturity (McCormack et al., 2009). The basic components of the model are: Process View; Process Jobs; and Process Management & Measurement. In addition to the basic components there are two supporting components; these provide the structure and culture that enable the basic components to operate, interactively. These components are: Process Structure; and Customer-focused Process Values & Beliefs.
Business Process Orientation Maturity Framework	BPO-MF	(Willaert, Van den Bergh, Willems, & Deschoolmeester, 2007)	This maturity model provides a framework for identifying characteristics of BPO and provides a tool for measuring the degree of BPO of an organisation. The degree to which an organisation is process-oriented is influenced by the following dimensions: Customer Orientation; Process View; Organisational Structure; Process Performance; Culture, Values & Beliefs; People Management; Information Technology; and Supplier Perspective.
Process and Enterprise Maturity Model	PEMM	(Hammer, 2007)	This model requires organisations to develop two characteristics to ensure business processes become more mature. The first characteristic is Process Enablers, that pertains to individual processes; and the second is Enterprise Capabilities which apply to entire organisations. The Process Enablers include: Design; Performers; Owner; Infrastructure; and Metrics. The Enterprise Capabilities include: Leadership; Culture; Expertise; and Governance.
Process Management Maturity Assessment	PMMA	(Rohloff, 2009)	The Process Management Maturity Assessment (PMMA) was developed to assess the implementation of BPM. The maturity model is based on the assessment of nine categories which comprehensively cover all aspects that impact the success of BPM. The nine categories are: Process Management Organisation; Process Portfolio; Process Documentation & Standardisation; Process Performance Controlling; Process Management Maturity Assessment; Methods & Tools; Communication; Qualification & Training; and Target Setting & Incentives.

MATURITY MODEL	ABBREVIATION	DEVELOPER	CAPABILITY DIMENSIONS OF MATURITY MODEL
Value-based Process Maturity Model	vPMM	(Lee, Lee, & Kang, 2009)	The vPMM is a model that can be used to determine the maturity of an organisation's current business process practices by considering an organisation's business value creation capability. The vPMM categorises process areas into four categories: organisational management; Product or Service work management; process management; and organisational support. There are 23 key process areas within this model including: Casual Analysis & Resolution; Organisational Process Innovation & Deployment; Environmental Change Improvement; Integrated Process Performance Management; Quantitative Product & Service Management; Business Value Management; Organisational Process Definition; Organisational Process Improvement Management; Product & Service Management; Product & Service Provision; Organisational Common Asset Management; Organisational Collaboration Management; Configuration Management; Organisational Process Improvement Leadership; Planning; Monitoring & Control; Measurement & Analysis; Quality Assurance; Product & Service Development; Supplier Management; Organisational Resource Management; Investment Management; and Organisational Customer Relationship Management.

Among the leading maturity models in the BPM field, the BPO-MM by McCormack & Johnson (2001); the BPM-CF by Rosemann & De Bruin (2005); and the BPMM-OMG by the Object Management Group (2008) are the models that stand out the most in terms of being referred to in the academic literature (Tarhan et al., 2016). The OMG's BPMM is considered to possess strong descriptive and prescriptive properties that bring it to the fore as a unique maturity model for systematic and detailed business process assessment and improvement (Tarhan, Turetken, & van den Biggelaar, 2015).

These BPMM were considered and investigated regarding their dimensions as established, due to their popularity in the BPM literature.

### **3.10 BUSINESS PROCESS MATURITY MODELS IN HEALTHCARE**

Managers in the healthcare industry are re-focusing their attention on processes so as to achieve better health system performance, as a reaction to the financial crisis (Buttigieg, Gauci, & Dey, 2016). Healthcare management is increasingly applying systems thinking and BPM as philosophies, which have proved to make a difference in organisational performance and competitiveness to the industry at large (Buttigieg et al., 2016). BPM has developed into a possible driver and tool for the seamless integration of healthcare services (Buttigieg et al., 2016).

The quality of healthcare services is influenced by the maturity of healthcare processes used to develop it. In the last decade, a number of maturity models have been proposed with varied focus and depth for business processes. However, the number of studies that adapt these models to healthcare domain or propose healthcare-specific maturity models is very scarce (Tarhan, Turetken, & van den Biggelaar, 2015). In this section, a few healthcare-specific maturity models were considered relevant to the purpose of this dissertation, and are discussed below.

#### **3.10.1 HOSPITAL PROCESS ORIENTATION (HPO) MEASUREMENT TOOL**

The Hospital Process Orientation (HPO) tool was developed to measure the process orientation maturity of employees within a large hospital facility (Gemmel et al., 2007). The HPO measurement tool provides hospitals with a means to evaluate their evolvment towards process orientation maturity.

The HPO tool was derived from the BPO Maturity Model as developed by McCormack & Johnson (2001). As organisations increasingly started to focus on restructuring their operational thinking towards a more process-oriented horizontal organisation, McCormack and Johnson (2001) developed this measurement tool which allows for the measurement and quantification of an organisation's BPO. This maturity model that assesses BPO maturity, was adopted and adapted to the specific context of healthcare in the development of the HPO tool (Gemmel et al., 2007). This study proved that the three basic components of BPO maturity, as defined by McCormack and Johnson (2001), are valid within healthcare settings. The basic BPO components are (McCormack & Johnson, 2001):

- Process view;
- process jobs; and
- process management & measurement.

The aggregation of these three components of BPO maturity indicates an organisation's BPO score. In other words, these basic components measure the BPO of an organisation (Gemmel et al., 2007).

The details and development method of the HPO tool, as described by Gemmel et al. (2007), is detailed below:

Process orientation in hospitals start with the awareness that the flow of the patient determines the sequence of activities to be performed. Clinical pathways can be seen as schedules of medical and nursing procedures, including diagnostic tests, medications, and consultations designed to perform an efficient, co-ordinated program of treatment.

To adapt McCormack & Johnson's (2001) BPO measurement tool to a healthcare context, and to get more insight into the specific consequences related to the implementation of care programs and clinical pathways, additions were made to each of the three BPO components. A brief description of the purpose of including additional dimensions to each of the BPO components is given below (Gemmel et al., 2007):

- **Process View:** This component must include dimensions that measure the knowledge about the care processes to which a respondent contributes, and that assess whether patients with similar needs and process characteristics are perceived as one homogenous group.
- **Process Jobs:** This component must include additional dimensions that allows for better insight regarding the respondent's opinion about organisational aspects related to empowerment, job enrichment, decentralisation of decision making and the alignment of supporting process jobs.
- **Process Management and Measurement:** This component must include additional dimensions that can assess whether the respondents are aware of the objectives of the care processes to which they contribute, and whether the outcome of performance indicators is used to improve these care processes.

The resultant HPO measurement tool and its components are detailed in Table 17.

TABLE 17: COMPONENTS OF THE HPO MEASUREMENT TOOL (Gemmel et al., 2007)

HPO COMPONENT	DIMENSIONS OF HPO COMPONENT
Process view	The care processes in the hospital are defined, documented with the input of the patient and in terms of benefits for the patient.
	The care processes are sufficiently defined so that each employee knows how he/she must work.
	Employees are able to name and describe the different care processes of patients on the particular unit to which they belong to.
Process Job	The employee's job is multidimensional and not simple tasks.
	The employee's job includes frequent problem solving.
	The employee constantly learns new things on the job.
Process Management & Measurement	The performance (efficiency and effectiveness) of the care processes is measured.
	Performance indicators are defined for the care processes.
	Specific performance goals are in place for the care processes.
	The outcomes of the care processes are measured.
	The results of the performance measurement are used to change the care processes.

The HPO measurement tool has proven to be a useful instrument with which to measure the process orientation of employees within a hospital setting. BPO and hospital process orientation, designates that processes are clearly documented and understood from start to end. Moreover, that jobs and responsibilities in the organisation are process oriented; encouraging people from different departments to collaborate in order to achieve common goals, and that the performance of organisational processes is measured and analysed (Gemmel et al., 2007).

This HPO tool should be considered if the process orientation of employees within a day hospital is to be included in the maturity model framework for day hospitals.

### 3.10.2 CMM FOR HOSPITAL PROCESS MANAGEMENT

Process management has repeatedly been named as an effectual approach for improving quality while reducing costs and resources. For this reason, hospitals have recently been investing considerably in process orientation and management.

Adopting an existing BPMM Maturity Model for the hospital sector is not always a valid option as existing BPM maturity models stem primarily from manufacturing and service industries (Cleven, Winter, Wortmann, & Mettler, 2014). Hospitals are significantly different from manufacturing and service organisations; thus, existing, generic capability maturity models for process management are not applicable within the hospital context.

Successful process management within hospital settings require a much stronger focus on both cultural and structural capability areas than it does in other organisations, where the focus is rather on IT-support and process automation (Cleven et al., 2014). A lack of consensus regarding the capabilities and development stages of hospitals required to become process-oriented, was identified by Cleven et al. (2014). For this reason, a theoretically grounded staged CMM for process management was specifically developed for the hospital environment (Cleven et al., 2014).

The relevant elements of the CMM for process management is elaborated on as described by Cleven et al. (2014):

#### CAPABILITY DIMENSIONS OF MATURITY MODEL

The capability dimensions of the maturity model must aim to address the whole spectrum of process management development. For this reason, Cleven et al. (2014) drew upon the constructs proposed in the socio-technical theory and organisational culture theory to derive the capability dimensions for hospital process management. These socio-technical and organisational culture concepts have been integrated and translated into process management capability areas to advance the process management maturity of hospitals. The conceptual basis, from which the capability dimensions of this maturity model for hospital process management has been derived, can be seen in Figure 31.

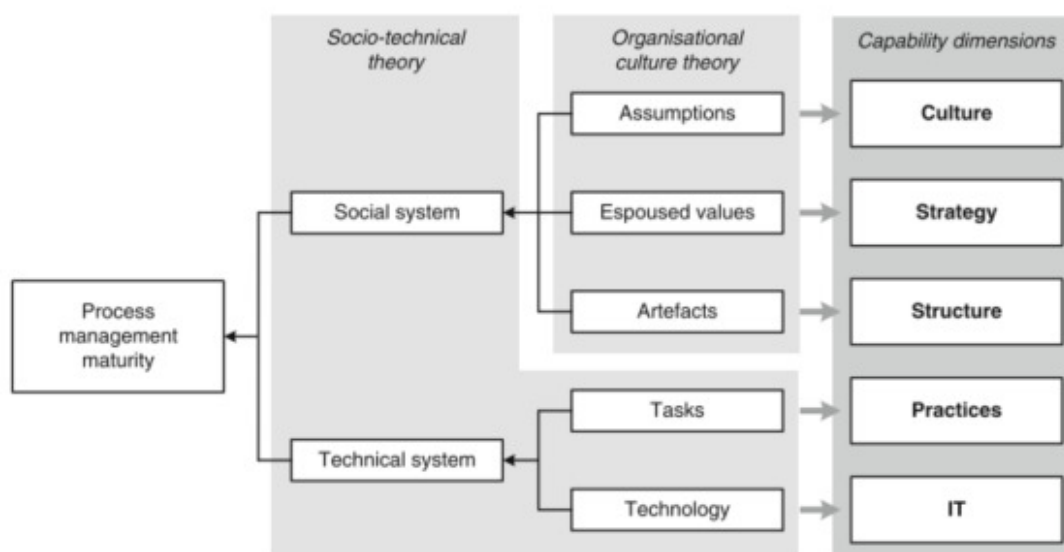


FIGURE 31: CONCEPTUAL BASIS FROM WHICH CAPABILITY AREAS FOR HOSPITAL PROCESS MANAGEMENT MODEL COMPILED FROM (Cleven et al., 2014)

The conceptual basis for the CMM for hospital process management consists of five capability dimensions, including (Cleven et al., 2014):

- Culture;
- strategy;
- structure;
- practices; and
- IT.

A more in-depth description of each of the capability dimensions can be seen in Table 18.

TABLE 18: CAPABILITY DIMENSIONS OF HOSPITAL PROCESS MANAGEMENT MATURITY MODEL (Cleven et al., 2014)

CAPABILITY DIMENSION	DESCRIPTION OF DIMENSION
Culture	This capability area covers communication and leadership-related practices that are essential for a hospital to establish effectual process management. These practices include, for instance, an open communication across functional borders and hierarchical levels as well as the empowerment of clinical and administrative staff.
Strategy	In defining strategic objectives, this capability area covers principles that are prerequisite for a full development of process management. These include, among others, cross-departmental and cross-clinic cooperation and information exchange.
Structure	This capability area comprises organisational dimensions that are essential for process management like for instance little barriers between clinics and other departments and the regular deployment of cross-professional teams.
Practises	This capability area summarises work practices that are crucial for process management in hospitals like regular care process performance reviewing, care process documentation and patient flow orientation.
IT	This capability area contains items that capture in how far the employed hospital IT systems are able to support a smooth flow of complete patient care, are easy to use and facilitate an adequate availability of patient data.

**MATURITY STAGES OF MATURITY MODEL**

The five stages of the CMM for hospital process management are cumulative, which means they are subsequently traversed, while additively increasing the level of maturity of each capability dimension. The full maturation path of the hospital process management maturity model is detailed in Table 19.

TABLE 19: DESCRIPTION OF MATURITY STAGES OF THE CMM FOR HOSPITAL PROCESS MANAGEMENT (Cleven et al., 2014)

MATURITY STAGE	DESCRIPTION OF MATURITY STAGE
Stage 1: Encouragement of process orientation	The first stage is characterised by an initial strategic commitment to process management, which is reflected in the fact that cross-clinic cooperation and information exchange represent fundamental elements of the strategy and are thus actively promoted by hospital management. While staff are encouraged to contribute ideas for improving work practices, it is not yet clear whether these ideas are actually put into practice. A regular employment of cross-professional teams also points to the appreciation of a process-oriented mode of operations.
Stage 2: Case-by-case handling	Stage two features a further movement towards process management. Open communication is actively practiced, not only between regular doctors and chief physicians of the same clinic, but also between different clinics. However, with respect to process management this stage still has an ad hoc character: while adherence to the strategic goal of implementing process, management is continuously reviewed, cross-departmental issues are in this stage only addressed in a case-by-case manner.



MATURITY STAGE	DESCRIPTION OF MATURITY STAGE
Stage 3: Defined processes	On stage three, process orientation spreads throughout the hospital: procedures are now modelled and documented, work steps are adjusted to follow the patient flow, and doctors and other employees are aware of the processes of up- and downstream departments and clinics. Visible and invisible barriers between departments diminish noticeably and senior management as well as chief physicians abandon their authoritarian leadership style. Clinical and administrative processes are on this stage supported by IT systems that facilitate a timely and high-quality provision of required patient data.
Stage 4: Occasional corrective action	Stage four represents a further manifestation of process management. Hospital IS are in place that are well integrated and facilitate a smooth flow of complete patient care. The performance of processes is measured on an occasional basis. If necessary, procedures are subsequently adapted or changed. Decisions on alterations, both regarding patient care or hospital organisation, are made collectively.
Stage 5: Closed loop improvement	Stage five of process orientation in hospitals is characterised by IS that are easy to use for all staff and enable a clear and highly understandable interaction. Staff on all hierarchical levels is actively supporting the strategic decision to transform the hospital into a process-oriented organisation. At this stage, process ownership is not just a role but an established organisational entity with significant authority and process reviews are conducted on a regular basis in order to realise continuous improvement.

Figure 54, in Appendix A, illustrates the complete graphical representation of the staged CMM that describes the evolution of process management within hospital settings. These capability dimensions and maturity stages must be considered when categorising the dimensions of the maturity model framework for day hospitals. These maturity stages also provide a deeper understanding as to how progressive maturity levels are described and detailed.

### 3.11 LEAN PRINCIPLES

With reduced revenue and increased costs, there is an increased emphasis on improving the efficiency and productivity of day hospitals (Joshi, 2008). Improving efficiency of a day hospital is critical to its economic viability (Joshi, 2008). Improving efficiency should, however, simultaneously focus on delivering safe, high-quality day surgery services that are patient-centred, timely and equitable.

Several different approaches exist that share the goal of increasing productivity and improving quality, while reducing costs. One of these process improvement approaches is known as lean management. Although there exists many of these process improvement philosophies and techniques, lean management distinguishes itself with its systematic value stream approach to driving change and eliminating waste within processes to ultimately create added value for the customer (Kim et al., 2006). Lean management involves principles, methods, and tools to understand and improve the performance of a system (Rutman, Stone, Reid, Woodward, & Migita, 2015).



In this section, various lean principles, concepts and tools that are applicable to the healthcare industry are elaborated on. Possessing adequate knowledge with regards to lean thinking will enable the identification and improvement of inefficiencies within a day hospital context.

The principle of lean management can be simply thought of as an approach which aims to do more with less (McAuliffe, 2007). On an operational level, the focus of lean thinking is on reducing variation within processes (Joosten J., Bongers I., & Janssen R., 2009), where variation is defined as ‘the degree of difference in the same process when repeated’. Lean thinking provides five principles that are designed to guide the task of reducing this variation within processes (Doğan & Unutulmaz, 2014). These five key principles of lean thinking can be seen below in Figure 32.

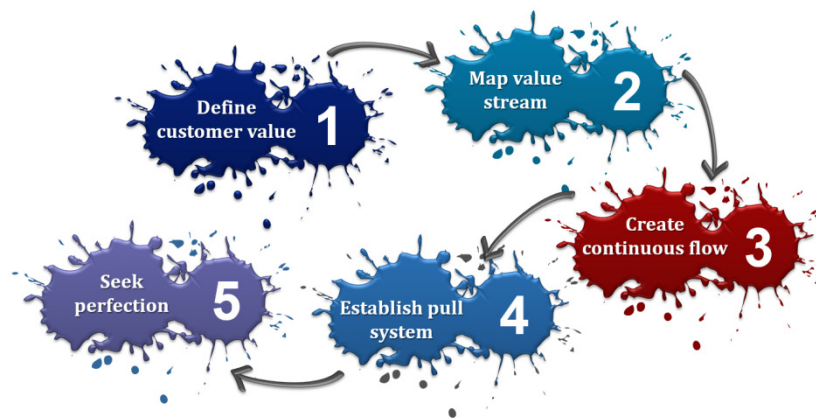


FIGURE 32: LEAN PRINCIPLES

Lean manufacturing, initially known as the Toyota production system, was first introduced by the Toyota Motor Company, which today is widely recognised as one of the most successful companies in the world (Kim et al., 2006). The focus of this approach was to eliminate waste and represented an alternative to the traditional mass production system within the manufacturing industry (Kollberg, Dahlgard, & Brehmer, 2007).

Lean thinking has become an umbrella term which comprises lean production applications both in manufacturing and in the service industries (Doğan & Unutulmaz, 2014). In the minds of many, the healthcare industry widely differs from other industries. Although this is true to some extent, the managerial processes of all industries are alike (Manos, Sattler, & Alukal, 2006). Lean thinking has been proven to be just as applicable in the healthcare industry as in the manufacturing industry where the lean principle was conceived (Kim et al., 2006; Kollberg et al., 2007; Manos et al., 2006).

The lean thinking concept can also be applied in the management of day hospitals (Joshi, 2008). The implementation of lean principles within the day hospital setting is predicated on the continuous identification and elimination of waste within system processes (Casey, Brinton, & Gonzalez, 2009).

A survey conducted in 2009 by the American Society for Quality aimed to determine the reasons as to why 53% of participating hospitals implemented lean principles to varying degrees (Godinho Filho, Boschi, Rentes, Thurer, & Bertani, 2015). The survey revealed that 73% of the hospitals indicated the need to improve the hospital throughput, 68% indicated the need to reduce costs, and 62% indicated the need to improve the quality of the service provided (Godinho Filho et al., 2015).

The increasing number reports in the literature focused on the implementation of lean healthcare indicates that this approach is an effective way of improving healthcare organisations (Souza, 2009). Furthermore, the concepts of staff empowerment and gradual continuous improvement, which are the fundamentals on which lean thinking is built, results in lean being very relevant to the healthcare industry as indicated by the sustainable results reported in the literature (Souza, 2009).

### **3.11.1 CUSTOMER VALUE**

---

The first step is to fully understand what customers define as value (Kim et al., 2006). Value is defined as the ability to provide the customer with the exact product or service it desires, within the shortest time-frame between the customer requesting the product or service and receiving it, at the most appropriate price (Womack & Jones, 2003).

According to (Womack & Jones, 2003), this value can only be defined exclusively by the customer, and therefore it is of utter importance to correctly identify who the customer is and what the customer needs (Kollberg et al., 2007).

The complexity of a healthcare system is perhaps best understood from the point of view of the patient (Rutman et al., 2015). The aim of lean within a day hospital setting can be recognised as improving value as perceived by the patient (Toussaint & Berry, 2013). From the patients' perspective value is defined based on factors such as healthcare quality, comfort, patient-centeredness, accessibility, effectiveness and efficiency (Kim et al., 2006; Kollberg et al., 2007).

### **3.11.2 VALUE STREAM MAPPING**

---

Lean methodology dictates that an important first step in process improvement is to document the current state of a system. This allows for the identification of areas of delay, inefficiencies and wastes that may exist. The lean method utilises a value stream map of patient flow that details event location, personnel, information technology requirements, and alternative pathways that can indicate variability within the system (Duska, Mueller, Lothamer, Pelkofski, & Novicoff, 2015). Value stream mapping looks at the totality of the patient's interaction with the health care system (Rutman et al., 2015). This map is created to analyse the process flow and highlight opportunities for improvement (Kollberg et al., 2007).

Pathways of patients in day-surgery care can be divided into sequential steps where the concepts of flow time and throughput should be applied to identify steps that could slow down the pathway from arrival to departure (Beaussier et al., 2015). For each of these steps, wasted times must be detected and eliminated for physicians and staff to have more time to perform more valuable tasks (Beaussier et al., 2015).

Having an awareness of exactly what the customer defines as value, process steps can be categorised as value adding activities or non-value adding activities (Joosten J. et al., 2009). Value adding activities are those activities that directly contribute to producing the product or service that the customer desires (Joosten J. et al., 2009). While non-value adding activities are those activities not focused on directly producing that which the customer desires, and is essentially waste which needs to be eliminated (Joosten J. et al., 2009).

With regards to a healthcare setting, value adding activities include any activity that directly contributes to improvement of the patient's medical condition or experience; another way of defining a value adding activity is one that the patient would be willing to pay for on an itemized bill (Rutman et al., 2015).

In a recent study, a new Value Stream Mapping (VSM) model was formulated specifically for the hospital environment (Henrique, Rentes, Godinho Filho, & Esposto, 2015). The need for a healthcare industry specific VSM model emerged as previous VSM models used in implementations of lean healthcare were only simple adaptations of VSM models developed for the manufacturing industry (Henrique et al., 2015). The primary difference is that within a manufacturing context, VSM comprises the material and information flows that transforms raw materials into a finished product, whereas VSM within a hospital setting refers to the transformation of sick patients into healthy patients (Henrique et al., 2015).

This new VSM considers, on a single map, all of the flows that directly affect the duration of patient treatment and serves as a standard model for lean applications in hospitals (Henrique et al., 2015). The results of the study by Henrique et al. (2015) indicated that the proposed VSM model was able to identify some operational bottlenecks and wastes that interfere in the patient's treatment that could not be identified by other mapping models studied (Henrique et al., 2015). The new VSM model proposed for hospital environments was developed by unifying the positive points of each studied model and is able to portray the vision of the whole, reuniting the patient, information and material flows that occur during the transformation of the patient from sick to healthy (Henrique et al., 2015).

There exist seven primary flows in healthcare (Pelly, Zeallear, Reed, & Martin, 2013):

- Patient flow;
- patient family flow;
- providers flow;
- medications flow;
- supplies flow;
- equipment flow; and
- information flow.

The development of the value stream map is performed in two phases, *Pre-mapping* and *Mapping*, each with its individual steps, as indicated in Figure 33. The primary purpose of this model is to represent the information, material, and patient flow involved in the transformation of a sick patient into a healthy patient on a single map (Henrique et al., 2015).

According to Hall, Belson, Murali, & Dessouky (2006), the largest delays are often related to flows that are invisible to the patient. Therefore, the patient lead time will depend, in part, on how they physically move through the hospital and, in part, the manner in which the information, equipment and other materials flow and meet their needs.

The principal focus of the improvement process is the patient value stream, considering groups of patients with similar needs for the delivery of services (Henrique et al., 2015). The patient families are delineated by the similarity of processes performed to transform a sick patient into a healthy patient (Henrique et al., 2015). The patient families are created by grouping patients with similar value streams together (Henrique et al., 2015).

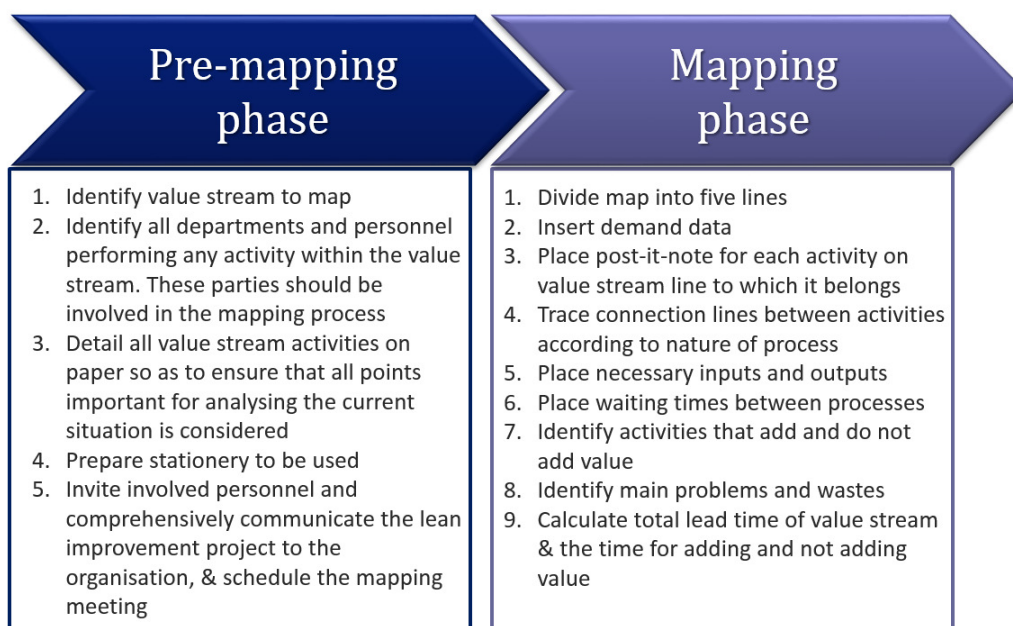


FIGURE 33: VALUE STREAM MAPPING PROCESS AS PROPOSED BY (HENRIQUE ET AL., 2015)

The first step of the mapping phase involves dividing the map into five lines. These five lines include (Henrique et al., 2015):

- Material flow;
- information flow;
- patient flow;
- time line; and
- problems identified.

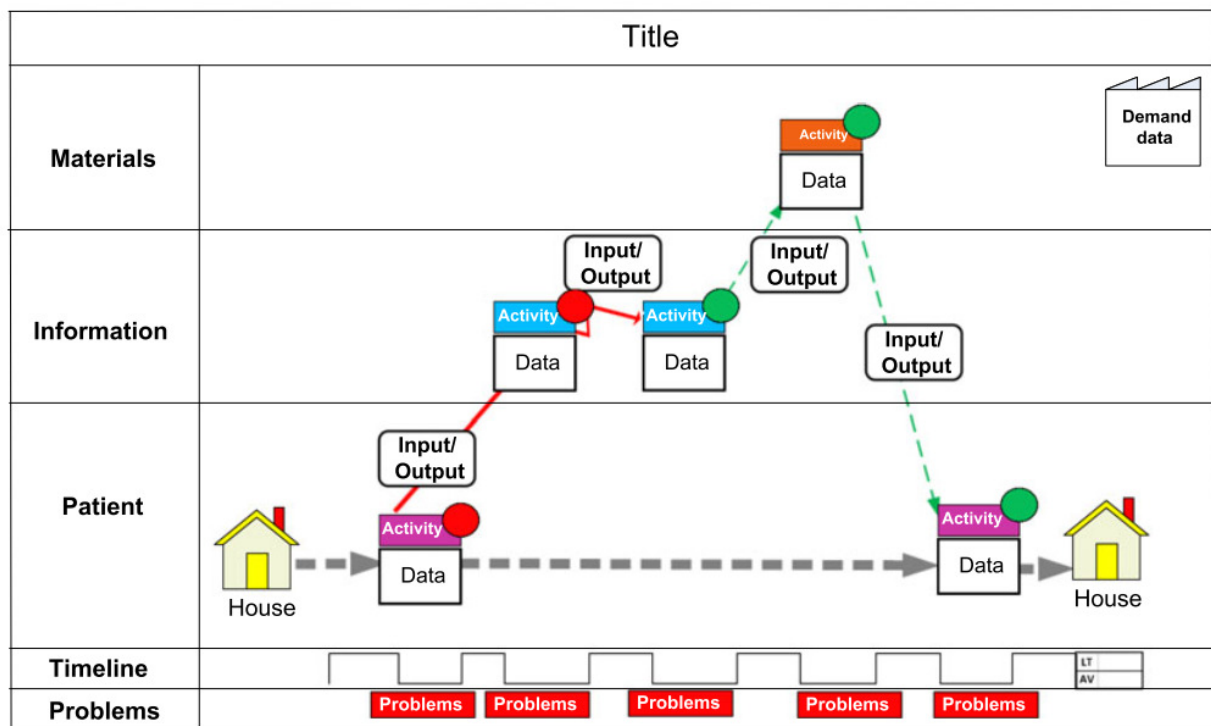


FIGURE 34: FORMAT OF THE VALUE STREAM MAP  
COMPILED FROM (HENRIQUE ET AL., 2015)

After analysis of the current state VSM the desired future state VSM is proposed. The proposed future state can be attempted by executing the following suggested actions (Henrique et al., 2015):

- Eliminate non-value adding activities that are not required;
- propose improvements for required non-value adding activities;
- where possible, eliminate the movement of the patient between hospital and patient-home;
- where possible, eliminate transitions between departments; and
- where possible, propose continuous flow.

### 3.11.3 CONCEPT OF WASTE

At its core, lean strives to remove waste from a process. Waste is defined as any step which does not provide value to the patient and family (Rutman et al., 2015). The following wastes can exist in a system:

1. Over-production. This refers to creating an excess of something earlier than the next process requires it (Manos et al., 2006).
2. Inventory. The cost of carrying inventory and supplies, especially in the healthcare industry, is very expensive. Therefore, it is essential to ensure that no excess inventory is held, as inventory that is held for long periods of time frequently become obsolete or defective, which is a major waste of money (Manos et al., 2006). An important lesson to be learned from the manufacturing industry that can be of major value in the healthcare industry is that smaller, more frequent shipments are more desirable than a volume discount (Manos et al., 2006). Another way to reduce inventory and to make it more visible is by having inventory located at the point of use (Manos et al., 2006). Differing supply needs for the same procedure based on provider preference is also a source of

- inventory waste, as excess supply can lead to expired items and increase search time (Rutman et al., 2015).
3. Unnecessary motion. Motion waste mainly results from a poor designed space that requires employees to move multiple times to perform tasks (Manos et al., 2006).
  4. Unnecessary transportation. This type of waste appears when moving goods or parts. In the healthcare industry, this may refer to any unnecessary movement of patients, staff, tests or supplies (Manos et al., 2006).
  5. Over-processing. This waste results from doing more than is required for a specific task, without the additional effort adding value to the task being performed (Manos et al., 2006). In a healthcare setting this can include asking patients the same questions multiple times (Rutman et al., 2015).
  6. Defects. This type of waste refers to any defect that must be corrected, adjusted or discarded (Manos et al., 2006).
  7. Waiting. Waiting is a major waste that frequently occurs within the healthcare industry when patients have to wait for theatres to open up, doctors to see them, drugs to be administered (Manos et al., 2006). Thus, the type of waste is typically a symptom of all other types of waste in the healthcare industry (Rutman et al., 2015).
  8. Under-utilising staff. This waste refers to failing to utilise employees to their fullest regarding their knowledge, skills, education and creativity (Manos et al., 2006). Under-utilisation of staff typically appear within hierarchical structures and the absence of team work (Manos et al., 2006). This leads to some staff being overburdened, while others are underused (Rutman et al., 2015).

### **3.11.4 EMPLOYEE INVOLVEMENT**

A fundamental lean principle is respect for the people who do the work. Therefore, in any lean improvement project, it is essential to include front line staff from multiple disciplines and for leadership to go to the actual site of the work.

In the transformation of an organisation's culture to one of continuous quality improvement, a substantial shift of mind is required by management (Joosten J. et al., 2009). It is essential for management to retire as the master problem-solver, and give the problem-solving over to those close to the problem (Toussaint & Berry, 2013). Successful sociotechnical improvements require managers within the healthcare industry to realise that it is not their responsibility to improve care processes, but the responsibility of the professionals actually interacting with the care processes (Joosten J. et al., 2009).

Transferring problem-solving responsibilities will allow management to draw on the knowledge of its employees that know the relevant process best. It will also create an opportunity for employees to gain experience in lean methods and experience its benefits of improved performance and teamwork first-hand, promote the notion that what exists can likely be improved (Toussaint & Berry, 2013).

The focus of management should be on improving and developing its workforce by creating an environment where interaction between team members leads to a high level of performance; that is not achievable by an individual working on their own (Joosten J. et al., 2009).

Staff members who are encouraged to provide solutions, allowed to implement it and witness the improved performance of processes are likely to be feel highly motivated and driven to keep on continuously improving processes (Toussaint & Berry, 2013). As motivated employees constantly strive to improve processes, the organisation as a whole becomes more innovative which leads to more employees requesting to be directly involved with successful improvements. Ultimately resulting in an organisational foundation based on continuous improvement (Toussaint & Berry, 2013).



### 3.11.5 STANDARDISED WORK

The ultimate goal for improvement of a process is to achieve flow. In the ideal state, the patient's experience moves seamlessly from one step to the next with minimal waste and no barriers. In this state, everyone knows what to expect next and the amount of time spent by the patient in the health care setting is reduced to the time necessary to safely and effectively treat their medical condition.

One prerequisite for flow is to standardise processes wherever possible. The primary aim of standardising processes, is reducing variation and ultimately produce a controlled process. This concept requires every step in every task to be defined on the basis of best practice and must be performed according to a rigid script (D. O. Weber, 2006). Variability in processes is however always present to some extent. Healthcare professionals often resist against the idea of the standardisation of operations due to their belief that each patient is different and therefore requires specialised treatment (Manos et al., 2006; McAuliffe, 2007).

This is where the notion of natural variability and artificial variability comes into play (Joosten J. et al., 2009). Artificial variability is related to controllable factors in the design and management of health care systems, whereas natural variability is needed to effectively deal with individual differences between patients and their needs and deliver patient centred care (Joosten J. et al., 2009).

McAuliffe (2006) indicates that if processes are controlled and standardised and artificial variability minimised, then the only variation that the healthcare professional will have to deal with is the patient. Therefore, the healthcare professional can solely focus on providing quality professional judgement and discretion to the patient, rather than continuously performing time-consuming activities on a daily basis (McAuliffe, 2007).

### 3.11.6 PLAN-DO-CHECK-ACT CYCLE

For continuous improvement, the Plan-Do-Check-Act (PDCA) cycle must be promoted (Furukubo, Ohuchi, & Morimoto, 2004). Thus, the PDCA cycle is a tool for continual improvement. The PDCA cycle has been embraced as an excellent foundation for, and foray into, quality improvement for health departments, as it is both simple and powerful (Gorenflo & Moran, 2009). This cycle is visually depicted in Figure 35.

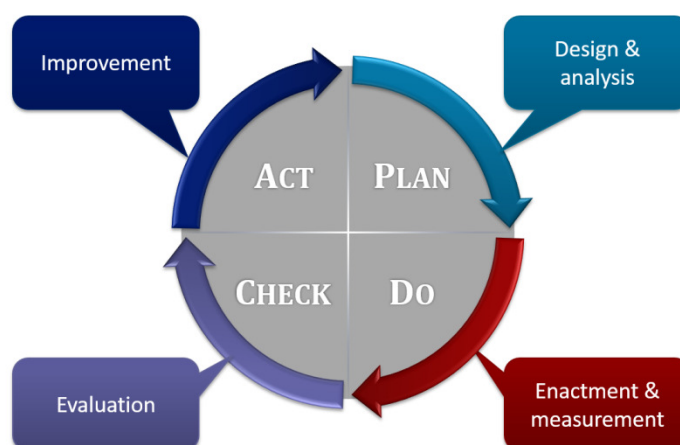


FIGURE 35: PDCA CYCLE

The PDCA cycle provides a strategy for improvement (*Plan*), carries it out (*Do*), checks its achievement (*Check*), and copes with it (*Action*), then steps up to the next subject (Furukubo et al., 2004). The process steps of the PDCA cycle, as described by Furukubo et al. (2004) are detailed below:

#### **PLAN**

The purpose of this phase is to investigate the current situation, fully understand the nature of any problem to be solved, and to develop potential solutions to the problem that will be tested.

- Identify and prioritise quality improvement opportunities.
- Develop an AIM statement.
- Describe the current process surrounding the problem in order to understand the process and identify areas for improvements.
- Collect data on the current process.
- Identify all possible causes of the problem and determine the root cause.
- Identify potential improvements to address the root cause, and agree on which one to test.
- Develop an improvement theory.
- Develop an action plan indicating what needs to be done, who is responsible, and when it should be completed.

#### **DO**

The purpose of this phase is to implement the action plan.

- Implement the improvement.
- Collect and document the data.
- Document problems, unexpected observations, lessons learned and knowledge gained.

#### **CHECK**

This phase involves analysing the effect of the intervention.

- Reflect on the analysis, and consider any additional information that emerged as well. Compare the results of your test against the measurable objective.
- Document lessons learned, knowledge gained, and any surprising results that emerged.

#### **ACT**

This phase marks the culmination of the planning, testing, and analysis regarding whether the desired improvement was achieved as articulated in the aim statement, and the purpose is to act upon what has been learned.

- Adopt: Standardise the improvement if the measurable objective in the aim statement has been met.
- Adapt: The team may decide to repeat the test, gather different data, revise the intervention, or otherwise adjust the test methodology.
- Abandon: If the changes made to the process did not result in an improvement, consider lessons learned from the initial test, and return to the “Plan” phase.

These four process steps of the PDCA cycle should be repeated over and over to continuously improve a process (Simon & Canacari, 2012).

### **3.11.7 DEFINE–MEASURE–ANALYSE–IMPROVE–CONTROL**

The main objective of healthcare organisations must be to identify and reduce the root causes of variation in its processes and systems, in an attempt to enhance the quality of healthcare delivery, improve the timeliness thereof, as well as reducing the cost of providing these healthcare services. Business organisations have previously utilised Six Sigma methodologies and tools to achieve this objective.



The primary methodology of Six Sigma is the Define, Measure, Analyse, Improve, and Control (DMAIC) cycle, developed by General Electric. The DMAIC methodology evolved from W. Edwards Deming's version of the PDCA cycle, as discussed in Section 3.11.6.

The DMAIC can be seen in Figure 36. The phases of the DMAIC cycle is detailed in Table 20.

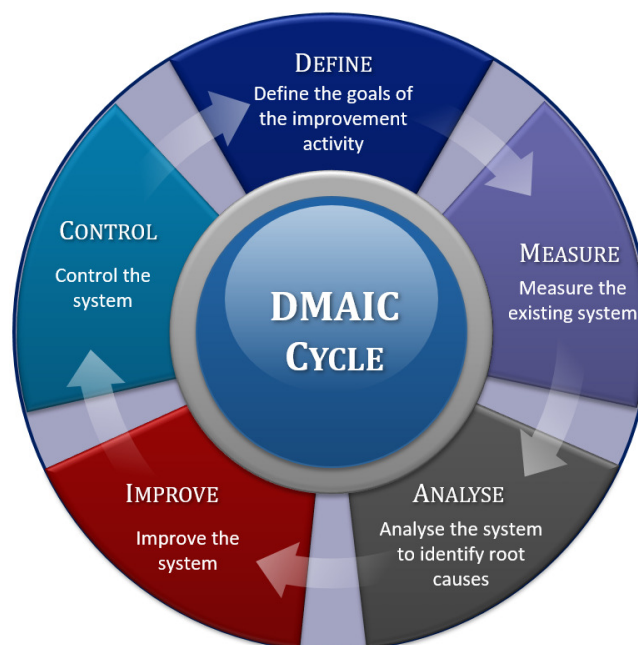


FIGURE 36: DMAIC CYCLE

TABLE 20: PHASES OF DMAIC CYCLE

PHASE	DESCRIPTION
Define	Define the problem or opportunity, goals and benefits of the project.
Measure	Map the current process, measure current state, gain the voice of the patient/client, and establish baseline performance. This phase is about understanding the process and creating a baseline to measure future changes in the systems or processes.
Analyse	Complete an analysis of your baseline measure(s) which should "tell a story". What is the root cause?
Improve	Brainstorm solutions and improvements that best address the root cause(s) and then test and implement them.
Control	Embed the new process so that things do not slip back to the old way of doing things. This is completed by verifying the controls that have been put in place and implementing any other controls that are necessary to sustain change. This is the most important part of the cycle.

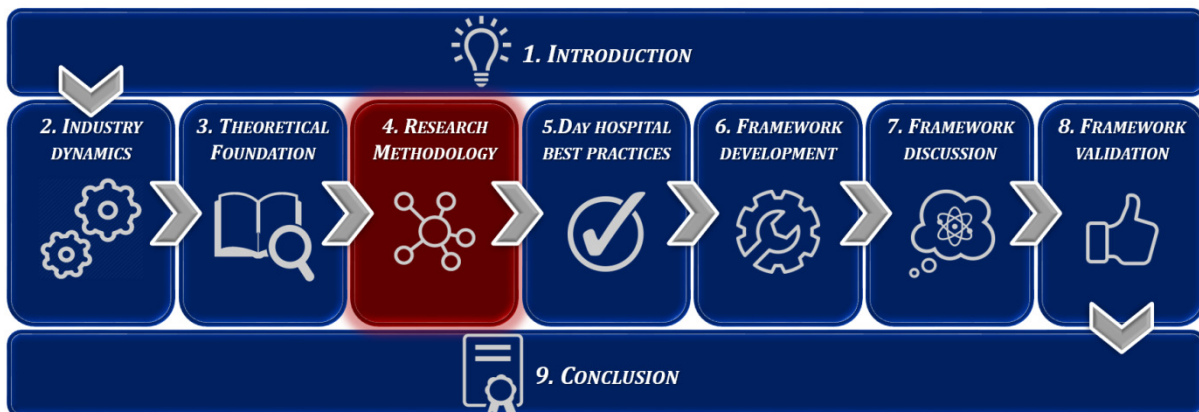
### 3.12 CHAPTER CONCLUSION

This chapter presented the second part of the literature study. This chapter initially explored the Enterprise Engineering field along with its key concepts, tools and methodologies. It then shifted its focus to

investigating the fundamentals of maturity model development. Various types of maturity models were investigated, as well as their development methods. Further, the chapter investigated the concept of Business Process maturity models, along with some existing maturity model. The chapter concluded with a review of lean principles, as well as the fundamentals of continuous improvement relevant within the healthcare industry.

# Chapter 4 RESEARCH METHODOLOGY

This chapter details the approach that will be followed in the development of the maturity model framework for day hospitals. Chapter 4, therefore, covers the research methodology of the dissertation. The main purpose of this chapter is to present the research methodology and methods used in this study to address the identified research problem. The discussion on this chapter is initiated by re-iterating the research aim and objectives of this study. The reasons for the choice of methodology used in this research study will also be clarified in this chapter. The discussion on this chapter further outlines the research design and approach, the research strategy, as well as the methods of data collection that were employed.



---

## 4.1 RESEARCH AIM AND OBJECTIVES OVERVIEW

---

### 4.1.1 RESEARCH AIM

---

The research proposed in this document aims to develop a framework that will enable day hospitals within the private healthcare industry of South Africa to assess and potentially advance their capability maturity in pursuit of increased performance, efficiency and profitability.

### 4.1.2 RESEARCH OBJECTIVES

---

A number of objectives can be identified to support the research aim including:

- Establishing the fundamentals of maturity model framework development;
- investigating the features and dimensions that affect the efficiency, performance, and profitability of a day hospital;
- identifying the relevant capability dimensions that should be included in a framework that assesses the maturity of a day hospital;
- establishing how the maturity levels for a model assessing the maturity of a day hospital should be determined;
- consolidating all the acquired knowledge into a maturity model framework that assesses the maturity of a day hospital; and finally
- validating and improving the framework through interviews with SME's.

## 4.2 RESEARCH DESIGN

---

The purpose of a research design is to ensure that the evidence obtained allows for the initial research question to be answered as unambiguously as possible (de Vaus, 1993). Burns & Grove (2001) defines research design as, "the clearly defined structures within which the study is implemented".

### 4.2.1 APPLIED VERSUS FUNDAMENTAL RESEARCH

---

Research can be categorised as applied (action) research or fundamental (basic) research. The aim of applied research is to find a solution for an immediate problem facing a society or a business organisation, and attempts to deliver useful information that can be applied to the problem being studied. This is in contrast with fundamental research that is primarily concerned with generalisations and with the formulation of new knowledge required to understand a phenomenon (Kothari, 2004).

Thus, the primary purpose of applied research is to discover a solution for a relevant practical problem. While basic research is directed towards finding information that has a broad base of applications and, as a result, adds to the already existing organised body of scientific knowledge (Kothari, 2004).

The research conducted in this document can be classified as applied research as this study aims to find a solution for day hospitals to be able to advance their capability maturity in pursuit of increased efficiency, performance and profitability.

### 4.2.2 PURPOSE OF INQUIRY

---

Research can be classified in terms of its purpose. Accordingly, research is typically classified as exploratory, descriptive, or explanatory (Saunders, Lewis, & Thornbill, 2007). Each of these are detailed below.

#### Exploratory research

Exploratory research can be defined as research conducted to gain new insights, discover new ideas, and for increasing knowledge of the phenomenon (N. Burns & Grove, 2001). According to Collins Cobuild English Dictionary for Advanced Learners (2001), “exploratory actions are done in order to discover something or to learn the truth about something.”

Exploratory research is useful when the research questions are vague, or when there is little theory available to guide predictions (Singh, 2013). Exploratory studies are a valuable means of finding out what is happening, to seek new insight, to ask questions, and to assess phenomena in a new light (Singh, 2013). It is particularly useful if a researcher wishes to clarify the understanding of a problem (Singh, 2013). There are three principle ways of conducting exploratory research (Saunders et al., 2007):

- A review of the literature;
- approaching experts in the subject; and
- conducting interviews.

Although this research study has strong elements of exploratory research, it is considered that there is adequate literature available on day hospitals.

#### Descriptive research

Descriptive research describes some situation (Singh, 2013). Descriptive research designs are typically structures that are specifically designed to measure the features described in research questions (Singh, 2013). Hypothesis, derived from the relevant theory, usually serve to guide the process, and establishes what needs to be measured (Singh, 2013).

Descriptive research involves direct exploration, analysis and description of the particular phenomena, as free as possible from unexplained presuppositions, aiming at maximum intuitive presentation (Streubert & Carpenter 1999). The objective of descriptive research is typically to portray an accurate profile of persons, events, or situations (Singh, 2013).

#### Explanatory research

Explanatory research is conducted to identify cause and effect relationships. The aim of this type of research is thus to establish causal relationships between variables (Singh, 2013). The emphasis of this type of research is studying a situation or problems in order to explain the relationship between variables (Saunders et al., 2007).

This research project does not aim to investigate cause and effect relationships, eliminating this type of research as relevant to this thesis. As the objective of descriptive research is typically to portray or describe an accurate profile of situations, this research study can be categorised as being descriptive in nature due to this study capturing best practises of day hospitals.

### 4.2.3 RESEARCH REASONING

---

The two reasoning approaches to conducting research that can be followed are either inductive or deductive. Inductive and deductive reasoning are two methods of logic used to arrive at a conclusion based on information assumed to be true. Inductive reasoning takes events and makes generalisations. Deductive reasoning arrives at a specific conclusion based on generalisations.

#### *Inductive reasoning*

Thomas (2006) states the purposes for using an inductive approach are to:

- Condense raw textual data into a brief, summary format;
- to establish clear links between the evaluation or research objectives and the summary findings derived from the raw data; and to
- to develop a framework of the underlying structure of experiences or processes that are evident in the raw data.

The general inductive approach provides an easily used and systematic set of procedures for analysing qualitative data that can produce reliable and valid findings (Thomas, 2006).

#### *Deductive reasoning*

Deductive analysis refers to data analyses that set out to test whether data are consistent with prior assumptions, theories, or hypotheses identified or constructed by an investigator (Thomas, 2006). In deductive analyses, such as those used in experimental and hypothesis testing research, key themes are often obscured, reframed, or left invisible because of the preconceptions in the data collection and data analysis procedures imposed by investigators (Thomas, 2006).

The research approach that was followed for the purposes of this research was inductive due to day hospital best practises being condensed into a framework. This research study does however also include deductive elements as the initial framework that was developed was validated through interviewing SME's to test whether the framework is consistent with the best practises obtained from a comprehensive literature study.

### 4.2.4 RESEARCH APPROACH

---

There are two general approaches to conducting a research study, namely a qualitative research approach, or a quantitative research approach. Kloss (2010) defines qualitative research as, "any kind of research that produces findings not arrived by means of statistical procedures or other means of quantification". Qualitative research can be described as (Burns & Grove 2003:356; Kloss, 2010; Morse & Field 1996:1999; Woodbridge, 2014):

- a systematic, subjective approach used to describe life experiences and give them meaning;
- mostly associated with words, language and experiences rather than measurements, statistics and numerical figures;
- flexible and unstructured;
- capturing verbatim reports or observable characteristics;
- yielding data that usually do not take numerical form; and finally

- employing data sources that include observation and participant observation, interviews and questionnaires, documents and texts, and the researcher's impressions and reactions.

An obvious basic distinction between qualitative and quantitative research is the form of data collection, analysis and presentation. While quantitative research presents statistical results represented by numerical or statistical data, qualitative research presents data as descriptive narration with words and attempts to understand phenomena in their “natural settings” (Woodbridge, 2014).

Qualitative research is mostly inductive (Kloss, 2010). In contrast to quantitative research, where hypotheses are formed and are then applied to various specific cases (deduction), qualitative research uses inductive reasoning, proceeding from particular to more general statement (Marketing, 2006). The criticism towards qualitative methods is largely based on validity and reliability (Kloss, 2010). This is discussed in Section 8.1.

The research approach of this study is of a qualitative nature as the findings of this research was not obtained from statistical procedures or quantitative methods. This research study further presents data as a descriptive narration to understand the phenomena of day hospital best practises, resulting in this study being qualitative in nature.

## **4.3 RESEARCH METHODOLOGY**

---

---

Burns & Grove (2001) defines research methodology as, “the total strategy, from the identification of the problem, to the final plans for data gathering and analysis”. Research methodology can also be viewed as a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically (Kothari, 2004).

The research methodology focuses on the research process and the kind of tools and procedures to be used. Subsequently, the tools and procedures used for this research are outlined below.

### **4.3.1 RESEARCH STRATEGY**

---

---

In this study, research strategy refers to how the research was done and its logical sequence. The conceptual framework of the research methodology and strategy of this study can be seen in Figure 37.

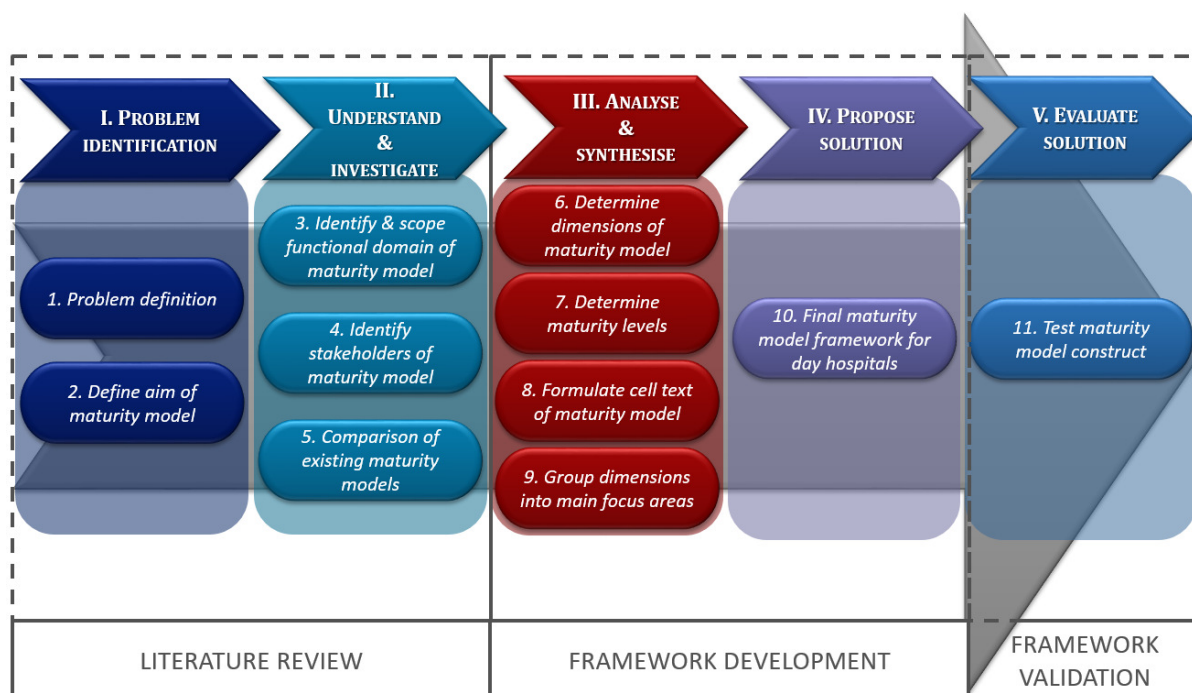


FIGURE 37: THE CONCEPTUAL FRAMEWORK FOR THE RESEARCH METHODOLOGY AND STRATEGY OF THE STUDY

This conceptual methodology framework was adapted from the research approach proposed by Srari et al. (2013) and the eight-phase qualitative process of analysis by Jabareen (2011). Both of these are discussed in Appendix B. In addition, various development methods of maturity models were considered when refining the final strategy for developing the maturity model. These maturity model development methodologies and approaches are presented in Section 3.6 and Section 3.7. Table 38 in Appendix B outlines the phases and steps of these development methodologies that were considered to establish the final phases and steps of the research strategy followed for this study.

#### 4.3.2 DATA COLLECTION & ANALYSIS PROCEDURES

The main data collection techniques utilised in this research study were the literature reviews, observation, semi-structured interviews with SME's, and research-evaluation questionnaires. Each of these methods are discussed in according to the phases in Figure 37 that they were applied in.

##### 4.3.2.1 PHASE I & PHASE II

The two stages of Phase I, *Problem Definition* and *Define aim of Maturity Model* were already comprehensively discussed in Chapter 1.

The data required for the stages of Phase I and Phase II was primarily acquired through observational analysis and informal interviews with various role players within the day hospital industry. Six day-hospital facilities within the private healthcare sector were visited and observed. The day hospital facilities are detailed in Table 21.



TABLE 21: DAY HOSPITAL FACILITIES OBSERVED

HOSPITAL GROUP	FACILITY LOCATION	TYPE OF FACILITY
Mediclinic	Strand	Day ward within general hospital
Mediclinic	Somerset West	Day ward within general hospital
Mediclinic	Durbanville	Day hospital co-located to general hospital
Cure Day Clinics	Paarl	Free-standing day hospital
Cure Day Clinics	Bellville	Free-standing day hospital
Advanced Health	Durbanville	Free-standing day hospital

With experience gained through observation, further literature was studied. The literature review included investigating the dynamics of the day hospital industry in Chapter 2, and investigating the fundamentals and various types of maturity models in Sections 3.2, 3.3, 3.4 and 3.5.

The stages of Phase I and Phase II will be revisited in Chapter 6 for the sake of comprehensiveness.

#### **4.3.2.2 PHASE III**

Phase III is the first phase that initiates the development of the maturity model framework.

##### **DETERMINE DIMENSIONS OF MATURITY MODEL**

The various dimensions that affect the efficiency, performance and /or profitability of a day hospital was identified through taking a patient-flow approach. The entire perioperative patient flow pathway should be considered when analysing the factors affecting the efficiency of patient throughput in a day hospital.

The generic patient flow activities were identified by studying and combining various patient flows in day hospitals and outpatient units (Almeida, Paterson, Craig, & Hookey, 2016; Day, Belson, Dessouky, Hawkins, & Hogan, 2014; Day & Belson, 2015; Quemby & Stocker, 2013; Ramis, Palma, & Baesler, 2001; Rohleder, Lewkonja, Bischak, Duffy, & Hendijani, 2011). The sources and patient flow diagrams considered to construct the phases and relevant activities of a patient undergoing day surgery can be seen in Appendix C.

This conceptual patient flow pathway, along with each of the broken-down patient flow steps, was then validated and confirmed as being a reflection of an actual patient flow within a day hospital setting by Pieter Lotz, Operational Manager of Mediclinic's Day Hospital division. A summarised version of the general comments made can be seen in Appendix D. All the proposed improvements were integrated throughout this dissertation.

The conceptual patient flow pathway of patients undergoing day procedures within a day hospital context can be divided into five main phases. These five main phases are depicted in Figure 39.

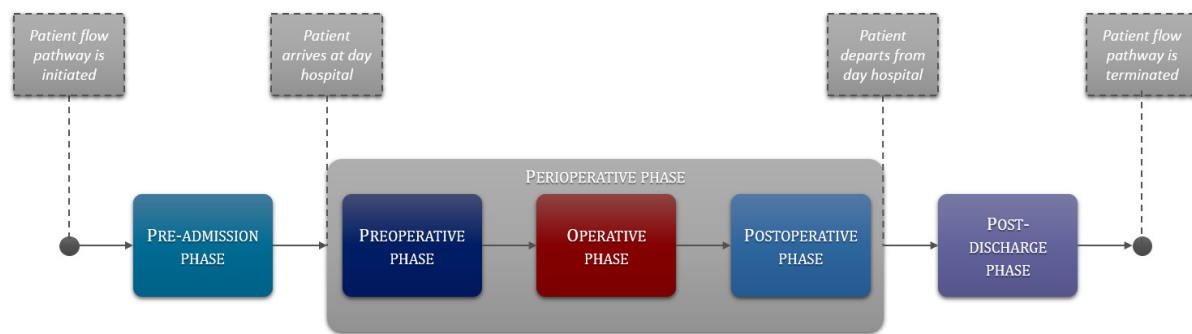


FIGURE 38: MAIN PATIENT FLOW PATHWAY PHASES OF PATIENT UNDERGOING SURGICAL DAY PROCEDURE

Each of the main patient flow pathway phases were then further broken down into stages. These stages are detailed and elaborated on in Section 5.2.

With the patient-flow approach in mind, various dimensions affecting the efficiency, performance, and profitability were identified and investigated. These dimensions are comprehensively discussed in Chapter 5.

### **DETERMINE MATURITY LEVELS**

When defining maturity stages either a top-down or bottom-up approach can be used. The *top-down approach* defines maturity levels from conducting a literature review to identify capabilities and then detailing them into descriptions of how these capabilities present themselves in practice (van Steenberg, 2011). Definitions, are thus written first, and then measures are developed to fit the definitions (Mettler & Rohner, 2009). This type of approach works well if the domain is relatively new and there is little evidence of what is thought to represent maturity. For this reason, the top-down approach was employed to determine the maturity stages of the maturity model framework for day hospitals developed in the research study.

Tonia de Bruin et al. (2005) emphasises the following design principles to remember when defining maturity stages:

- A common design principle is to represent maturity as a number of cumulative stages; where higher stages build on the requirements of lower stages with level five representing high maturity and level one representing low maturity;
- the number of maturity stages may vary;
- the maturity stages must be distinct and well-defined, indicative of logical progression through stages;
- stages should also be named with short labels that give a clear indication of the intent of the stage; and
- stage definitions should be developed to expand stage names and provide a summary of the major requirements and measures of the stage, especially those aspects that are new to the stage and not included as elements of lower stages.

From further studying maturity models in the literature, it was established that the number of maturity stages typically range between four and six. However, as stated before the number of stages may vary. For the purpose of the maturity model framework for day hospitals developed in this study, the appropriate

number of maturity stages was between three and four. These maturity stages are visually depicted in Section 7.2.2.

### **FORMULATE CELL TEXT**

To establish the various criteria of each identified dimension, an in-depth literature review on each of the dimensions was performed. The formulated cell text of the maturity model framework for day hospitals was formulated in Section 6.4.3 from best practises of each dimension investigated in Section 5.3.

### **GROUP DIMENSIONS INTO MAIN FOCUS AREAS**

The main focus areas of the maturity model framework for day hospitals were established through investigating nine leading generic Business Process maturity models as identified by Tarhan, Turetken, & Reijers (2015). These Business Process maturity models are detailed and elaborated on in Section 0.

The various categories into which the dimensions of each of the maturity models were divided into were studied to determine the main focus areas of the maturity model framework for day hospitals. Subsequently, the dimensions that are identified in Chapter 5 for the maturity model framework for day hospitals were divided into the identified categories. The final main focus areas are detailed and defined in Section 7.2.1.

#### **4.3.2.3 PHASE IV**

---

The final maturity model framework for day hospitals is formulated into a structure through consolidating the identified dimensions, the main focus areas, the defined maturity levels and the formulated cell text.

#### **4.3.2.4 PHASE V**

---

The final maturity model framework for day hospitals was validated through interviewing four subject matter experts within the day hospital field. This validation process is comprehensively elaborated on in Chapter 8.

### **4.4 CHAPTER CONCLUSION**

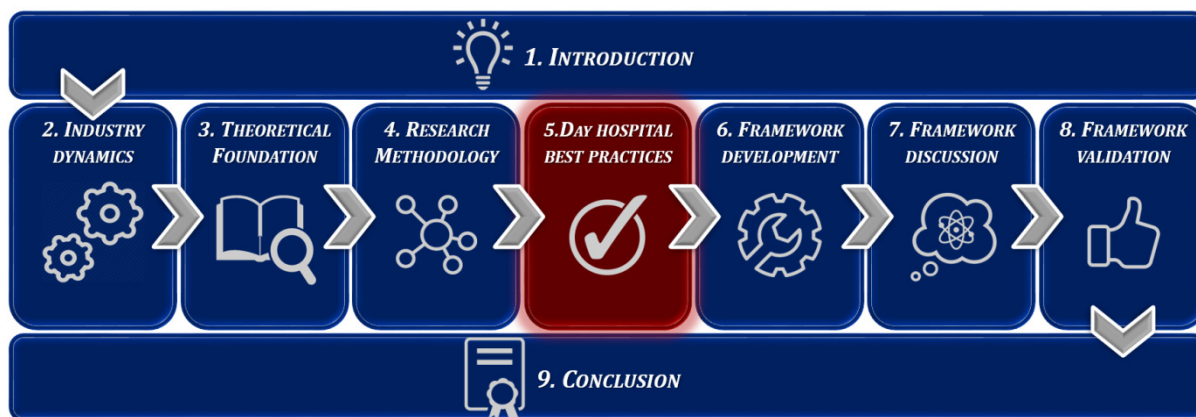
---

---

This chapter provided the research methodology of this thesis. The main purpose of this chapter was to present the research methodology and methods to be used in this study. The reasons for the choice of methodology used in this research study was also clarified in this chapter. This chapter elaborated on the research aim and objectives of this study. Finally, the chapter outlined the research design and approach, the research strategy, as well as the methods of data collection that were employed.

# Chapter 5 DAY HOSPITAL BEST PRACTISES

The purpose of this chapter is to investigate and identify all the various dimensions that should be included in the maturity model framework for day hospitals. Initially, Chapter 5 investigates all the elements involved in day hospital operation; with significant impact on day hospital efficiency, performance and profitability. These dimensions were identified through formulating a conceptual patient flow pathway, and subsequently investigating all the relevant best practises associated with each of the patient flow phases. This conceptual patient flow strategy followed to identify the dimensions of the maturity model framework for day hospitals was validated as being representative of day hospital practises within the industry by a subject matter expert.



---

## 5.1 DETERMINE FOCUS AREAS

---

Increased day hospital efficiency can be obtained by increasing productivity (i.e. increasing the number of surgical procedures performed in a given time period) (Joshi, 2008). Thus, increased efficiency suggests that more surgical procedures are performed utilising the same resources, or that less resources are required to perform the same number of surgical procedures (Joshi, 2008). Streamlining patient throughput in a day hospital can contribute to improving overall productivity (Joshi, 2008).

Patient throughput, and thus productivity within a day hospital, is influenced by some elements including preoperative, operating room, and postoperative factors, all of which are interconnected. This section will aim to investigate all factors that affect the turnaround time of a patient within a day hospital or day ward undergoing a surgical day procedure.

The major objective is to ensure that the patient turnaround time is reduced as far as possible, whilst minimising the cost involved in achieving such a reduced turnaround time. The turnaround time is defined as the total time the patient spends in the day hospital from the arrival of a patient, until the departure of a patient from the day hospital. Thus, the focus is to build an efficient patient flow pathway that ensures that a patient only spends useful and necessary time within the day hospital (Beaussier et al., 2015).

The efficient management of patient flow within a day hospital will enable an increase in patient throughput, and should simultaneously increase patient satisfaction. The efficient management of patient flow will further ensure that after the patient has exited the system, the patient will not return with problems that can clog the system. Consequently, the focus is also on continually ensuring a high quality of healthcare services are provided.

Increasing patient throughput within a day hospital requires the detection and elimination of waste as far as possible. In the outpatient clinic setting, waste primarily occurs while the patient is waiting for care (Duska et al., 2015). Proactive management of waiting times is considered to be among the most important factors contributing to patient satisfaction (Beaussier et al., 2015; Duska et al., 2015). It is worth noting that apart from improvement in efficiency, decreasing wasted times may directly benefit the quality of care by reducing preoperative anxiety, deviations to preoperative recommendations (eating before surgery, smoking before surgery, etc.), and other discomforts such as the occurrence of hypothermia (Beaussier et al., 2015).

Effective management of a day hospital facility also requires that leadership emphasise constant improvement in the processes of care to achieve maximum patient safety and satisfaction, delivered with highest efficiency (Merrill & Laur, 2010).

---

## 5.2 PATIENT FLOW PATHWAY

---

Patient flow represents the ability of the healthcare system to serve patients quickly and efficiently as they move through the various stages of care. During the hospitalisation process, optimising patient flow should be a strategic aim for the healthcare enterprise (Ortiga et al., 2012). Healthcare facilities can combine process management with information technology to redesign patient flow for maximum efficiency and clinical outcomes (Ortiga et al., 2012). However, this requires in-depth knowledge of current patient flow pathways in a healthcare facility.

Findings from previous studies indicated that the duration of a surgical procedure is rarely rate-limiting and that non-procedural operational flow processes, that occur prior to and subsequently after the procedure, are more critical determinants of time consumption (Almeida et al., 2016; Day et al., 2014). Furthermore, several studies have demonstrated that shortening surgical procedure time has little impact on improving efficiency. Whilst other factors such as scheduling and operational improvements are likely to have more substantial impacts on overall efficiency (Day & Belson, 2015). Therefore, the entire perioperative patient flow pathway should be considered when analysing the factors affecting the efficiency of patient throughput in a day hospital.

The patient flow pathway of patients undergoing day procedures within a day hospital context can be divided into five main phases. These five main phases are depicted in Figure 39.

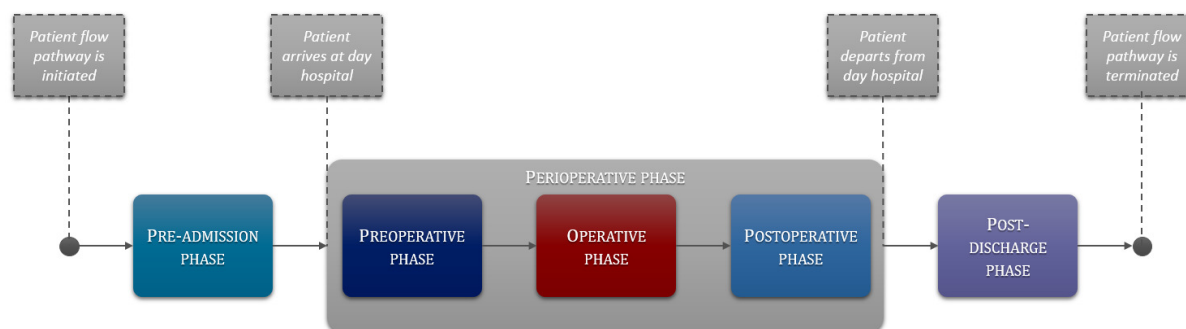


FIGURE 39: MAIN PATIENT FLOW PATHWAY PHASES OF PATIENT UNDERGOING SURGICAL DAY PROCEDURE

How this conceptual patient flow pathway (Figure 39) was developed is comprehensively discussed in 4.3.2.2. The following sections will also further describe the origins and content of each stage of this patient flow pathway.

The patient flow pathway in Figure 39 considers all the activities from the time the patient enters the system and the patient flow pathway is initiated, to the time the patient exits the system when the patient flow pathway is terminated.

The preoperative phase, operative phase and postoperative phase are collectively referred to as the perioperative phase in this thesis. The perioperative phase refers to all the phases and activities that take place from the moment the patient enters the day hospital facility to the instance when the patient exits the day hospital facility after undergoing a surgical day procedure.

Each of the main phases depicted in Figure 39 are described in Table 22. The descriptions of each phase were established through investigating the various literature, as can be seen in Appendix C, and through employing an expert within the industry to validate these descriptions. This expert within the industry was Pieter Lotz, the Operational Manager of Mediclinic's Day Hospital division (2016).

TABLE 22: DESCRIPTION OF PATIENT PATHWAY PHASES OF PATIENT UNDERGOING SURGICAL DAY PROCEDURE

PHASE		PHASE DESCRIPTION
Pre-admission phase		This phase refers to all the activities that take place prior to the patient arriving at the day hospital on the day of surgery. This phase is, thus, typically initiated when a patient experiences pain and/or discomfort and visits his/her primary physician for a consultation, and completed when the patient enters the day hospital facility.
Perioperative phase	Preoperative phase	The preoperative phase refers to all activities that take place from the moment the patient enters the day hospital facility to the moment the patient enters the OR (operating room) to undergo a surgical day procedure.
	Operative phase	This phase refers to all activities that take place from the moment the patient enters the OR to the moment the patient exists the recovery area after the surgical day procedure has been performed by the surgeon (Lotz, 2016).
	Postoperative phase	The postoperative phase refers to all the activities that take place from the moment the patient exits the recovery area after day surgery to the moment the patient is discharged and exits the day facility to return home (Lotz, 2016).
Post-discharge phase		This phase refers to all activities that take place after the patient has departed from the day hospital facility after being discharged.

It is important to realise that the patient flow pathway depicted in Figure 39, only considers the activities that the patient experiences and is directly involved in when undergoing a day surgery procedure. Other background activities, such as information flow, that can have an impact on the efficiency of a patient moving through the process, will only be investigated and incorporated later in this study.

The typical location in which each of the main phases takes place is depicted in Figure 40. These locations were also established through investigating the various literature, as can be seen in Appendix C, and through also employing an expert (Pieter Lotz) within the industry to validate these locations.

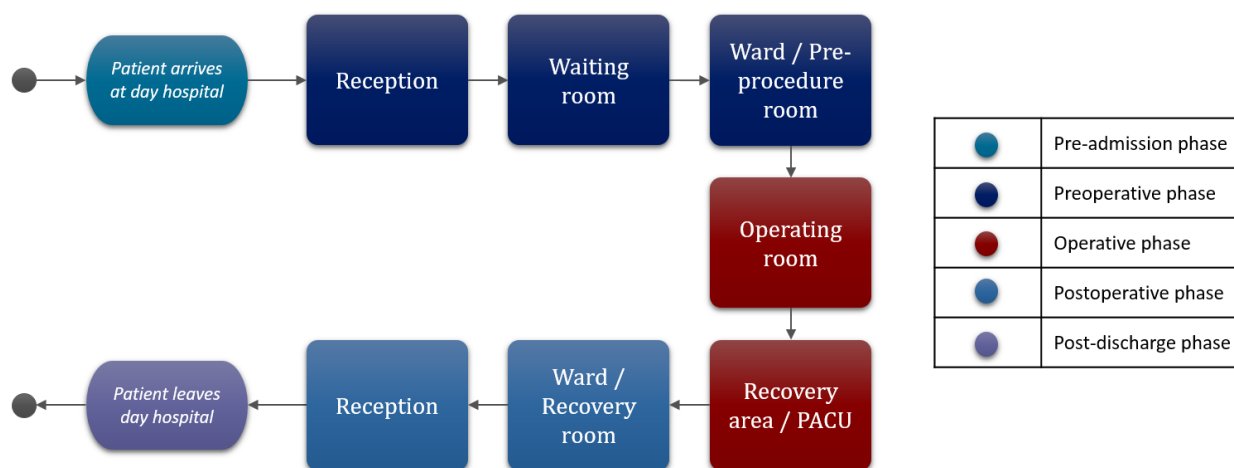


FIGURE 40: LOCATION OF PATIENT FLOW PATHWAY PHASES

At this point, it is important to distinguish between two different approaches regarding terminology used when referring to pre-procedure room, the PACU (Post Anaesthesia Care Unit) and the recovery room. The patient flow is discussed below to depict the differences between South African context and that referred to in the majority of the literature.



Within South African context the patient is assigned to a ward during admission (Lotz, 2016). This is the first step in this patient flow as depicted by the blue arrows in Figure 41. After the patient is assigned to ward, the patient undergoes surgery in the OR (also referred to as the theatre), typically recovers from anaesthesia in the *recovery area*, and is subsequently returned to the same ward the patient was assigned to preoperatively to fully recover (Lotz, 2016).

The majority of sources within the literature however takes an alternative approach to the terminology. This approach is depicted with the red arrows in Figure 41. In this approach the patient is assigned to a pre-procedure room (ward within South African context) during admission, undergoes surgery within the OR, and subsequently recovers from anaesthesia in the PACU. Within South Africa context, the recovery area thus refers to the PACU (Lotz, 2016). After the patient has recovered from anaesthesia in the PACU, the patient is returned to a *recovery room*. This recovery room is however a different ward than the ward the patient was preoperatively assigned to during admission. The recovery ward is thus exclusively dedicated to monitor patients postoperatively; after which patients are discharged when fully recovered.

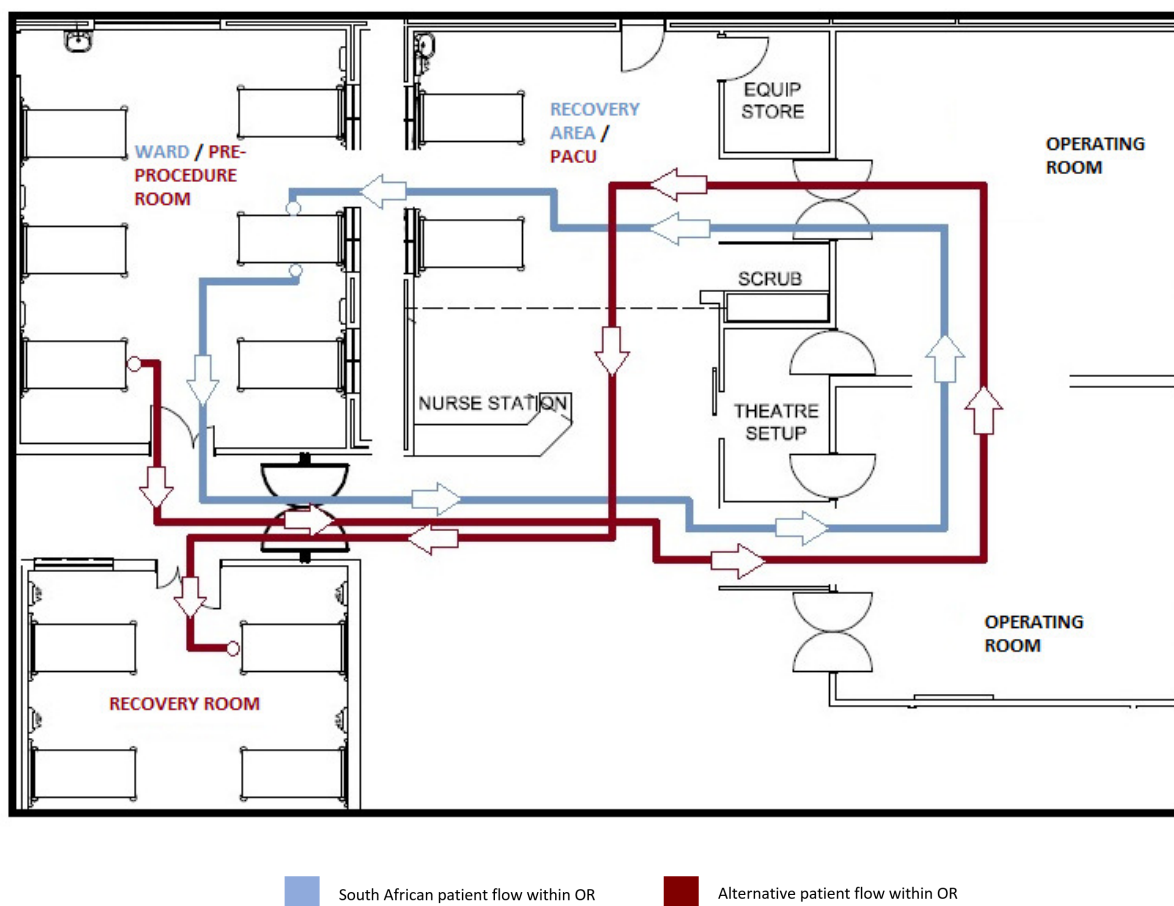


FIGURE 41: LAYOUT INDICATING PATIENT FLOW WITHIN SOUTH AFRICAN CONTEXT

In this thesis the terminology as used within the South African context will be used, as the maturity model framework for day hospitals developed for this research study is formulated for the South African private healthcare sector. With this distinction made, the typical activities performed during each of the five identified phases, as depicted in Figure 39, can be discussed below.



The generic patient flow activities were identified by studying and combining various patient flows in day hospitals and outpatient units (Almeida et al., 2016; Day et al., 2014; Day & Belson, 2015; Quemby & Stocker, 2013; Ramis et al., 2001; Rohleder et al., 2011). Pieter Lotz (2016) was also approached for his input on each of the activities. Lotz (2016) further validated these typical activities performed during each of the five identified patient pathway phases. All the inputs and recommendations made by Pieter regarding this patient flow approach is summarised in Appendix D. All these proposed improvements have been integrated throughout this chapter.

The sources and patient flow diagrams considered to construct the phases and relevant activities of a patient undergoing day surgery can be seen in Appendix C. It should be mentioned that the patient flow pathways constructed below represent the patient flow that will occur in the majority of the cases when a patient moves through a day hospital. Minor deviations may occur from these patient flow pathways; however, it would not deviate to such an extent that it has an influence on the outcome of this thesis.

### 5.2.1 PRE-ADMISSION PHASE

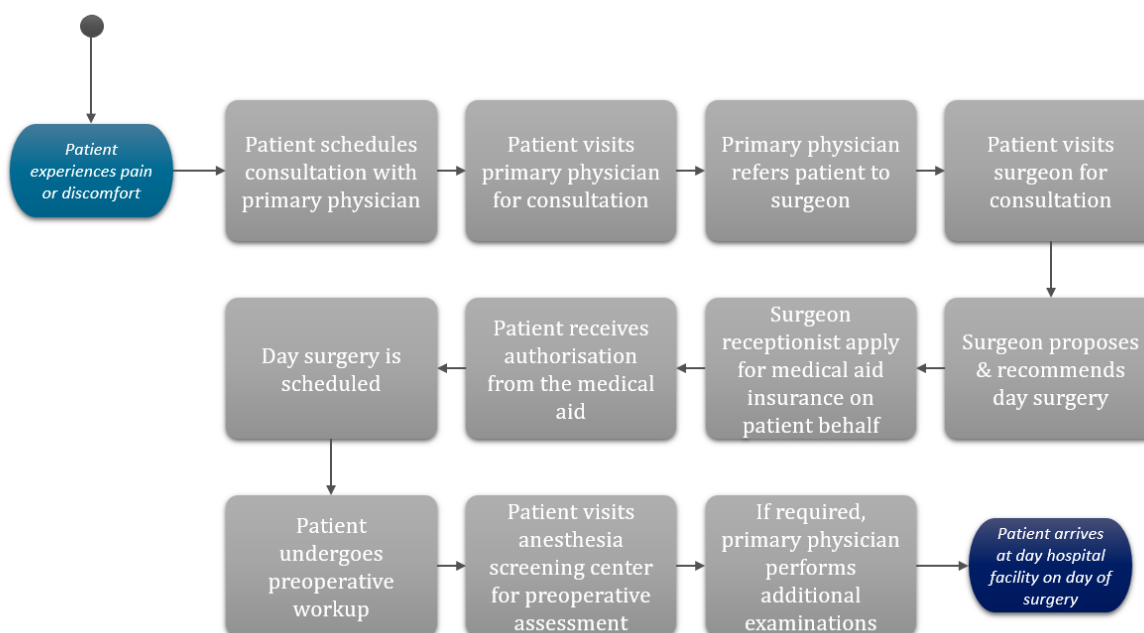


FIGURE 42: ACTIVITIES OF PRE-ADMISSION PHASE

As can be seen in Figure 42, the initiating trigger of a patient undergoing a surgical day procedure within a day hospital is the patient experiencing a medical condition or discomfort. This prompts the patient to typically visit his/her primary physician for a consultation performed at the physician's offices. Based on the physician's recommendation, the patient is referred to a surgeon for further consultation (Schultz, Carayon, Hundt, & Springman, 2007). In some cases, the patient bypasses the primary physician's office and makes an appointment directly with the surgeon (Lotz, 2016; Schultz et al., 2007).

If day surgery is recommended by the surgeon, the receptionist applies for medical aid insurance on behalf of the patient. If the application has been successful, the surgical day procedure is scheduled to be performed within a day hospital facility (Schultz et al., 2007). Within the South African context, it is the

responsibility of the patient to obtain authorisation from the medical aid to pay for the recommended procedure (Lotz, 2016).

The patient will subsequently undergo a preoperative workup, typically performed anywhere from 1 to 30 days prior to the patient's scheduled surgery (Schultz et al., 2007). This workup typically includes a historical and physical examination by a physician or midlevel clinician, as well as additional evaluations that may be needed to ensure the patient is healthy enough for surgery (e.g., laboratory tests, electrocardiogram, cardiac stress test, chest X-ray, cardiology consultation, pulmonary consultation) (Schultz et al., 2007). Midlevel clinicians, such as nurse practitioners or physician's assistants, are medical providers who are not physicians but are licensed to diagnose and treat patients under the supervision of a physician (Schultz et al., 2007). If the workup reveals that the patient is eligible for day surgery the patient is instructed to go for the subsequent preoperative assessment. Nursing within South African context does however not extend to midlevel clinicians (Lotz, 2016). For this reason, it is required that a physician performs the preoperative workup to ensure that the patient is eligible for day surgery.

The patient then typically visits the anaesthesiology clinic for preoperative assessment performed by an anaesthesiologist (Beaussier et al., 2015). This preoperative assessment once again confirms the patient's eligibility to undergo day surgery, and aims to answer any questions the patient may have regarding anaesthesia care (Beaussier et al., 2015; Schultz et al., 2007). Further, anaesthesia-related recommendations and instructions are also given to patients during this assessment (Beaussier et al., 2015; Schultz et al., 2007).

Within South African context the preoperative workup, as well as the preoperative anaesthesia assessment, typically occurs within the day hospital on the day that the patient is admitted (Lotz, 2016). Anaesthesia screening centres have not been developed to such an extent in South Africa that all patient have access to these centres (Lotz, 2016).

Following the preoperative assessment, if any further information is needed prior to surgery, patients frequently have the additional testing and consultations performed at their primary physician's office (Schultz et al., 2007). This marks the final activity of this phase.

## 5.2.2 PREOPERATIVE PHASE

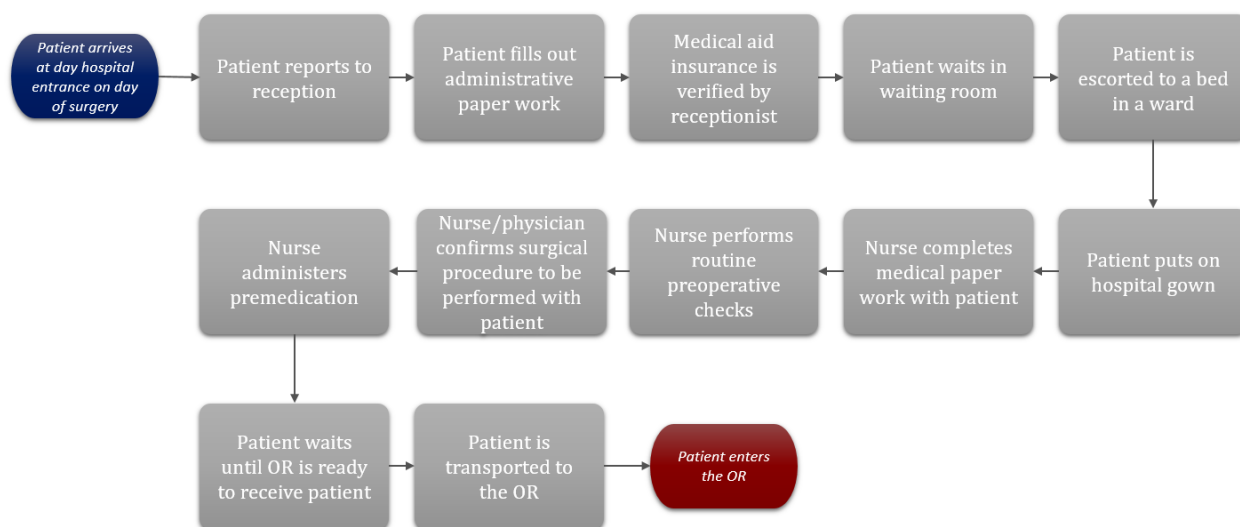


FIGURE 43: ACTIVITIES OF PREOPERATIVE PHASE

As depicted in Figure 43, patients are registered by a receptionist when they arrive at the reception desk of the day hospital facility. During this time, all administrative paper work is completed. Nurses then either admit the patients to a bed within a specific ward, or if a bed is not available, assign them to the waiting room where they remain until called to the assigned ward.

It is important to emphasise the importance of ensuring that the time the patient waits in the waiting is minimised as far as possible. Extended waiting times throughout the entire stay of the patient in the day hospital has a negative effect on patient satisfaction (Lotz, 2016).

When the patient is assigned to a bed within the ward, the patient is required to remove personal clothing and change into a hospital gown that is required. It is preferred that scheduled patients have their assessments completed during a previous clinic appointment, at which time the procedure is explained and written consent is obtained. Patients who have not been seen previously undergo a clinical assessment and provide informed consent in the OR (Operating Room).

Although, nurses still perform routine preoperative checks, provide surgical information, as well as obtain required information from the patient. The nurse then administers premedication at the appropriate time before the surgery starts. When the OR is prepared, the patient is transported to the OR to undergo the surgical day procedure. Lotz (2016) indicated that ideally, if the patient is able to walk from the ward to the OR it could save time, minimise the total amount of hospital beds required, as well as save nursing personnel the effort to physically push the patient in the hospital bed to the OR.

It is important to note that within South African context, the ward the patient is assigned to for patient preparation before the procedure, is typically the same room to which a patient is returned to after surgery to fully recover before discharge (Lotz, 2016).

### 5.2.3 OPERATIVE PHASE

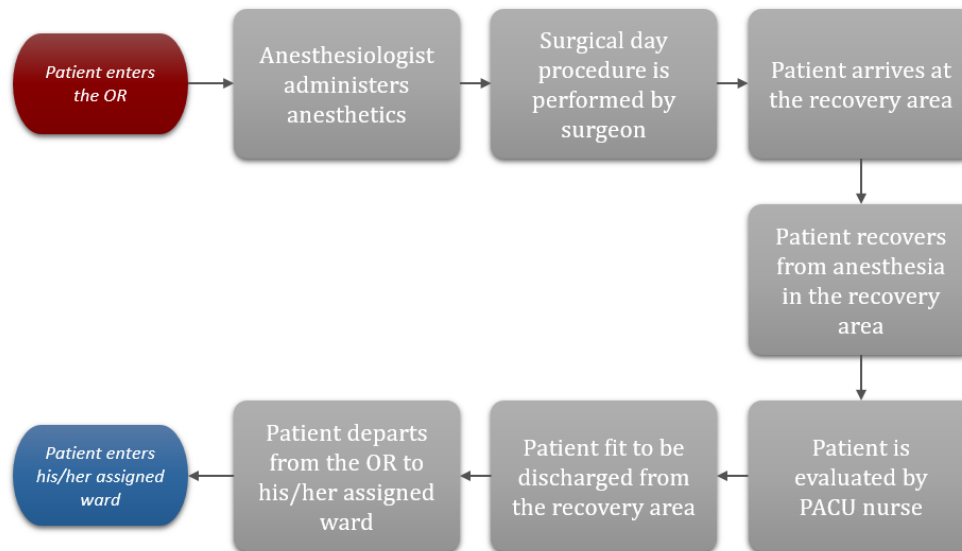


FIGURE 44: ACTIVITIES OF THE OPERATIVE PHASE

As can be seen in Figure 44, when the OR is available, a nurse transports the patient from the assigned ward to the OR. The required sedation is administered in the OR, after which the surgical day procedure is performed by the surgeon.

At the conclusion of the procedure, the patient either recovers in the recovery area, or if a bed is unavailable, then the patient is kept in the OR. This stage of the patient recovering from anaesthesia lasts until the patient is awake, protective reflexes have returned and pain is controlled (Barnett, 2016).

After an evaluation by a theatre nurse to establish whether the patient is fit to be discharged from the recovery area, the nurse completes the required paperwork, transports the patient back to his/her assigned ward, and hands the patient over to the appropriate nursing staff in the ward. It should be noted that within South African context, a theatre nurse is required to evaluate and observe the patient after surgery within the recovery area (Lotz, 2016). This type of nurse is a registered nurse with additional training in anaesthesia care.

In the OR, the surgeon proceeds with post-procedure paperwork including the procedure report and dictation, while the nursing staff prepare the room for the subsequent procedure and reprocess the relevant equipment in a designated room.

The operative phase thus refers to all activities that take place from the moment the patient enters the OR to the moment the patient exists the recovery area after the surgical day procedure has been performed by the surgeon (Lotz, 2016).

## 5.2.4 POSTOPERATIVE PHASE

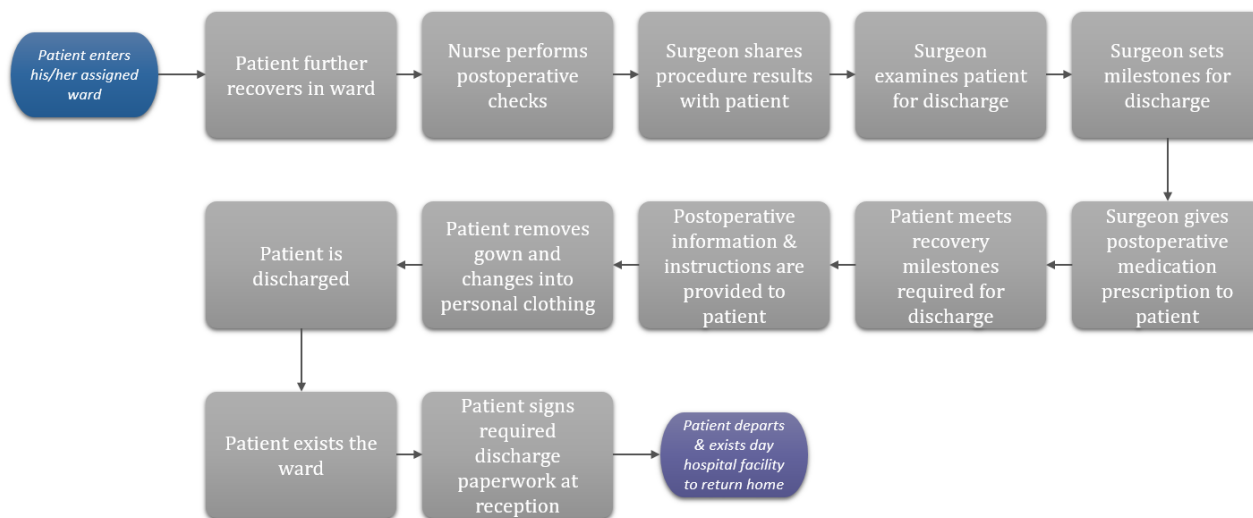


FIGURE 45: ACTIVITIES OF THE POSTOPERATIVE PHASE

The activities that typically takes place during the postoperative phase are depicted in Figure 45. In the ward the nurse typically performs routine postoperative checks to ensure the patient is stable. Procedure results are then communicated to the patient in writing and orally in the ward. During these visits the surgeon determines what milestones the patient must achieve before the nurse can discharge the patient. The surgeon also provides the patient with a prescription for the required postoperative medicine to be collected at a pharmacy.

When the patient meets all the milestones required for discharge, the nurse provides the patient with postoperative instructions and recommendations before allowing the patient to remove his/her hospital gown. On discharge the patient exits the ward and signs off the required paperwork before exiting the day hospital facility to return home.

### 5.2.5 POST-DISCHARGE PHASE

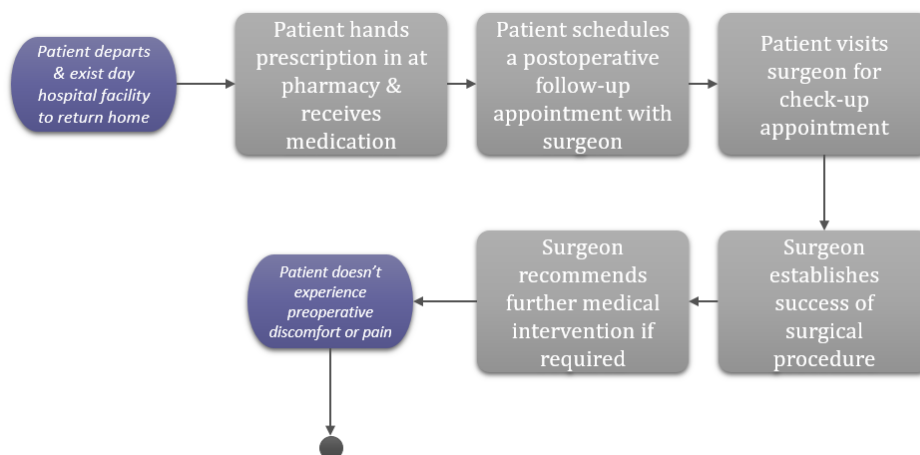


FIGURE 46: ACTIVITIES OF POST-DISCHARGE PHASE

The typical activities of the post-discharge phase are depicted in Figure 46. After the patient has left the day hospital facility, the patient visits a pharmacy to hand in the prescription provided by the surgeon. After obtaining the required medication from the pharmacy a patient typically returns home to rest.

On instruction from the surgeon and nurse the patient then schedules a postoperative follow-up appointment with the surgeon. During this appointment, the surgeon typically performs a physical examination and establishes the success of the procedure performed. The surgeon then recommends further medical intervention, if it is required.

The ideal outcome of this entire process is for the patient to return to health and not experience the pain or discomfort suffered from before the surgical day procedure was performed.

### 5.3 PATIENT FLOW BEST PRACTISES

Inefficiencies, strategies on improving efficiencies and other factors influencing efficiency in day hospitals, as gathered from the literature, are discussed below according to the main phases of a patient flow pathway.

The principle of 'forward pathway' should be adopted throughout the entire patient flow pathway, meaning that a patient should never go back to a previous step in his/her pathway, thereby blocking the system (Beaussier et al., 2015). The patient should only spend useful and necessary time at each patient pathway step (Beaussier et al., 2015).

The availability for a new patient to enter the process and to be ready for surgery should not be dependent on the previous patient (Beaussier et al., 2015). This ensures a continuous patient flow and may result in a better occupancy and efficiency of the ambulatory beds.

### 5.3.1 PRE-ADMISSION PHASE

---

The focus areas relevant to the pre-admission phase have been primarily identified through a literature review. The key concepts, practises, and sources relevant to the pre-admission phase can be seen in Table 25. Each of the focus areas identified are detailed in this section.

#### 5.3.1.1 APPROPRIATE PATIENT SELECTION

Surgery performed within a day hospital setting requires careful organisation to function effectively and efficiently. The success is largely dependent on the appropriate selection and education of patients (Basu, Babajee, Selvachandran, & Cade, 2001). Thus, it is vital to establish that patients are fit for day surgery to ensure successful day surgery outcomes, as well as to ensure no deviations occur in the patient flow process that could cause inefficiencies.

When selecting appropriate patients there are three main areas to consider: social, surgical; and medical factors (Barnett, 2016; Quemby & Stocker, 2013).

#### Social factors

The following social factors should be considered (Quemby & Stocker, 2013; Verma, Alladi, Jackson, & Al, 2011):

- The patient must understand the procedure and consent to have it performed as day surgery.
- Patients who undergo general anaesthesia should have a responsible adult to accompany them home and remain with them for 24 hours after surgery. Additionally, the patient should not be expected to look after dependants during this period.
- After undergoing day surgery, the patient must be able to refrain from driving, operating heavy machinery, and decision-making during the recovery period.
- The home circumstances of patients who undergo day surgery should be appropriate for postoperative care.
- The patient must be able to follow postoperative instructions,
- should have access to a telephone, and
- the geographical proximity of a day surgery patient to medical facilities should not exceed a travelling time of one hour; in case of postoperative complications occurring.

#### Surgical factors

The following are surgical factors that should be considered before clearing a patient for day surgery (Barnett, 2016; Quemby & Stocker, 2013; Verma et al., 2011):

- The procedure should not have significant risk of major post-operative complications necessitating immediate medical intervention.
- The procedure should not require specialist postoperative care or observation;
- only minimally invasive surgical techniques should be utilised to open thoracic and abdominal cavities.
- Post-operative pain should be controlled with oral analgesia and regional anaesthesia; and
- patient should be able to rapidly regain normal functions after the day procedure.

### **Medical factors**

The status of the patient's physical health should determine the patient's fitness for day surgery. As a result, patients are required to undergo a preoperative assessment to determine their physical health prior to day surgery. Preoperative assessments are carried out to ensure that only suitable patients are offered day surgery (I Smith, Cooke, Jackson, & Fitzpatrick, 2006; Verma et al., 2011).

The preoperative assessment and what it entails is comprehensively discussed in Section 5.3.1.2. There are few medical conditions, once fully optimised, which would exclude a patient from day surgery (Quemby & Stocker, 2013).

#### **5.3.1.2 PREOPERATIVE PATIENT ASSESSMENT**

Prior to undergoing surgical procedures, patients undergo preoperative assessments to identify and address issues which may affect the perioperative phase (Poonja, 2013). During a preoperative assessment, a pre-anaesthesia evaluation is performed to gather information regarding the patient's health status and to determine whether any or additional testing, and/or subsequent medical optimisation is necessary prior to surgery (Hofer, Chung, & Sweitzer, 2013)

The central idea of performing preoperative assessments is to ensure that medical issues are identified, addressed and that all essential patient information is obtained, so that knowledge of the patient's status is complete before the day of surgery (Correll et al., 2006).

Preoperative assessment of the patient status by an anaesthesiologist is useful for evaluation, collection of information, synthesis of information, assessment of risk, medical optimisation, and planning of perioperative management (Beaussier et al., 2015; Hofer et al., 2013). It is not sufficient to depend on the surgeon alone to evaluate and prepare the patient for anaesthesia, especially when a large number of surgeons perform surgical procedures at the same day hospital facility (Patel & Hannallah, 1992). To ensure some degree of uniformity, the anaesthesiologist must participate in the preoperative assessment or evaluation (Patel & Hannallah, 1992).

Having a mechanism for timely preoperative assessment should dramatically minimise cancellations and delays, as well as streamline patient throughput (Correll et al., 2006; Gaucher et al., 2016; Joshi, 2008; Xue, Yan, Barnett, Fleisher, & Liu, 2013). Preoperative assessment of the patient before the surgical procedure, has been shown to significantly reduce day-of-surgery cancellations (Dimitriadis, Iyer, & Evgeniou, 2013; Edwards & Slawski, 2016; Rai & Pandit, 2003). A study performed in a paediatric ambulatory surgery centre emphasised the importance of a formal preoperative screening process (Patel & Hannallah, 1992). This study concluded that surgery was postponed or cancelled more frequently in patients who were not evaluated compared to those who were evaluated (Patel & Hannallah, 1992).

### **Pre-anaesthesia evaluation**

A pre-anaesthesia evaluation typically includes a consultation to obtain patient's complete medical history, a detailed head-to-toe physical examination with current vital signs, a listing of surgical-related factors, as well as baseline investigations to obtain applicable diagnostic test results if required (Poonja, 2013; Tinkham, 2012). Table 23 details what the pre-anaesthesia evaluation entails.



TABLE 23: COMPONENTS OF PRE-ANAESTHESIA EVALUATION AS STATED BY (TINKHAM, 2012)

EVALUATION COMPONENT	ELEMENTS	DESCRIPTION
Medical history	Review of main body systems	Body systems to review: Skin, head, eyes, ears, nose & throat system; Pulmonary system; Cardiovascular system; Gastrointestinal system; Urinary system; Musculoskeletal system; and Neurologic system.
	Past medical history	Document previous surgical and anaesthetic treatments & complications, as well as any history of additional risk factors.
	Medication reconciliation	Document a complete list of prescription and over-the-counter medications the patient takes, including the dosages.
	Allergies	Document all known allergies.
	Functional status	The patient's functional status and activity level must be assessed and documented. Potential risk factors, such as tobacco use should also be documented.
Physical exam	Current vital signs	Document the patient's current vital signs including temperature, pulse, respirations, BP and oxygen saturation to provide a baseline of the patient's condition.
	Current height and weight	Document the patient's height and weight.
	Additional evaluation	Some medical conditions noted during the medical history review may warrant additional evaluation during the physical exam.
Surgical-related factors	Patient's chief complaint	The primary illness that the surgery is to rectify.
	History of the present illness	Previous surgeries or procedures undergone to address to illness.
	Surgical plan	The surgical plan documents the surgery to be performed, and includes surgeon's orders, patient consent and the surgery schedule.
	Risks, benefits, and alternatives statement	Along with the surgical plan, a statement of informed consent (usually known as a risks, benefits, and alternatives statement) should be listed.

### **Preoperative testing**

It must be emphasised that a preoperative assessment must be focused on patient-directed, targeted interventions that consider the patients' individual co-morbidities and functional state, rather than on solely performing routine protocol preoperative preparations (Hofer et al., 2013). A healthy patient having an elective procedure may not need any routine testing (Tinkham, 2012).

Preoperative tests must only be selectively ordered if abnormal results will have significant clinical importance, rather than ordering unnecessary routine tests (Hofer et al., 2013). Typical routine tests and examinations performed preoperatively include blood tests, electrocardiogram, echocardiogram, chest radiograph, exercise tolerant test, as well as pulmonary function tests (Poonja, 2013).

Although routine preoperative testing should be avoided at all costs, patient-centred, targeted testing is essential for the prevention of adverse events (Hofer et al., 2013). Requests for selective tests should be based on the collective consideration of surgical-related and patient-related factors that when integrated, increase the overall risk of surgical complications (Hofer et al., 2013).

Routine preoperative testing has proven to increase costs without improving clinical outcomes (Hofer et al., 2013). A pilot study investigating the elimination of preoperative testing in day surgery concluded that there was no increase in the perioperative adverse events as a result of no preoperative testing (Chung, Yuan, Yin, Vairavanathan, & Wong, 2009). This study further indicated that the elimination of selective or targeted testing performed preoperatively, also did not increase perioperative complications. However, the exclusion criteria excluded a large range of patients based on an existing medical condition, and the type of surgical day procedure planned (Chung et al., 2009). For this reason, it is still recommended that selective testing must be considered based on the risk stratification evaluation that considers both patient-related and surgical-related factors.

An effective preoperative assessment procedure leads to a reduction and elimination of excessive and unnecessary preoperative testing (Edwards & Slawski, 2016). The elimination of routine preoperative testing within a day hospital setting allows for substantial savings due to the significant cost of testing, which in turn improves efficiency (Joshi, 2008).

### **Medical optimisation**

Identification of medical risk factors and optimising medical conditions before surgery is also an essential component of preoperative preparation (Quemby & Stocker, 2013). Although day surgery is considered low risk, identification of appropriate day surgery candidates require the assessment of comorbidities and evaluation of patients' physical status (Hofer et al., 2013). Preoperative identification of high-risk patients with complex medical and social issues before hospital admission, has been shown to increase patient safety and satisfaction, as well as improve the efficient use of operating room resources (Edwards & Slawski, 2016; Hofer et al., 2013; Joshi, 2008).

Not only does preoperative intervention and optimisation reduce the risk of perioperative complications, but has also led to significant cost savings (Edwards & Slawski, 2016). Preoperative risk factors are effective predictors of hospital costs. Therefore, timely preoperative intervention to reduce risk can lead to significant cost savings (Correll et al., 2006).

Optimising a patient's medical conditions before surgery decreases operating room delays and cancellations, which have significant negative financial implications for the operating suite (Edwards & Slawski, 2016; Ferschl, Tung, Sweitzer, Huo, & Glick, 2005).

It has been well documented that centralising and standardising even part of the preoperative assessment process through obtaining outside records, completing history and physical examinations, and finalising surgical, anaesthesia, and nursing assessments increases operating room efficiency and decreases costs (Edwards & Slawski, 2016).

There are few medical conditions once fully optimised which would make a patient unfit for day surgery (Quemby & Stocker, 2013). The following medical conditions and situations should be considered for preoperative medical optimisation (Joshi, 2008; Poonja, 2013; Quemby & Stocker, 2013):

- Obese patients;
- elderly or paediatric patients;
- patients with cardiovascular diseases such as hypertension and Ischaemic heart disease;
- patients with respiratory diseases such as asthma, chronic obstructive pulmonary disease, acute upper respiratory tract infections, obstructive sleep apnea;
- diabetes mellitus;

- epilepsy; as well as
- patients on anti-platelets or anti-coagulants.

The preoperative clinical assessment can include a cardiovascular risk assessment, Postoperative Nausea and vomiting (PONV) risk stratification, as well as Obstructive Sleep Apnea (OSA) risk stratification (Hofer et al., 2013).

If possible, the preoperative assessment should take place within the facility where the surgical procedure is to be performed (Quemby & Stocker, 2013; I Smith et al., 2006). This allow patients and their relatives to become accustomed to this environment and staff before the day of surgery (Quemby & Stocker, 2013).

Preoperative assessments should, ideally, occur as close to the decision to treat as possible to give maximum time for optimisation of medical conditions, hence further reducing the risk of cancellation (Quemby & Stocker, 2013). A balance should, however, be maintained with regards to when the preoperative assessment should take place. If the assessment takes place too early before the surgery, the health status of the patient can change in the time period until surgery is performed. However, if patients are assessed too late, the time available for any interventions implemented in order to optimise the patient preoperatively is limited (Dimitriadis et al., 2013).

### **5.3.1.3 PROVIDE PATIENT PATHWAY INFORMATION**

A well-informed patient is essential for achieving successful day surgery outcomes (Quemby & Stocker, 2013). Inadequate preoperative information is listed among the factors of patient dissatisfaction during day surgery (Beaussier et al., 2015). Providing patients with accurate information during the preoperative assessment is therefore essential in reducing patient anxiety, and subsequently increasing their satisfaction with the entire day surgery process (Quemby & Stocker, 2013).

The patient must understand the organisation of care well and be compliant to it (Beaussier et al., 2015). Education of patients and carers about day surgery pathways through verbal communication and extensive written information is an essential component of preoperative preparation (Beaussier et al., 2015; Quemby & Stocker, 2013). Beaussier et al. (2015) suggests that it may be of high value to have specific nurses involved in communicating this information with patients.

The information delivered during surgical consultations and preoperative assessments is crucial for the patient to understand its proper pathway and to become the actor of his/her own management (Beaussier et al., 2015). Detailed written documentations should be provided to the patient through a 'passport,' intended to explain the surgical pathway, to deliver preoperative instructions and recommendations, to provide information regarding post-operative recovery, to provide emergency telephone number, and to familiarise the patient with the environment (Beaussier et al., 2015; Quemby & Stocker, 2013; I Smith et al., 2006). Non-compliance to preoperative recommendations, including arrival time, but also fasting rules and hygienic preparation leads to last minute cancellations (Beaussier et al., 2015).

This patient pathway information can be communicated to the patient via different channels. As mentioned before, the information is typically conveyed to the patient through written and verbal communication. Additional support channels can be incorporated to share the information. These additional channels can include posting the information on the website of the day hospital facility, as well as developing a video conveying this information that can be shared on a public platform, such as you-tube (Lotz, 2016).

All administrative admission documents must be completed and checked before the day of the surgery (Beaussier et al., 2015). The patient pathway information should further also include information on appropriate parking (Lin, Gavney, Ishman, & Cady-Reh, 2013); optimal arrival time (Lin et al., 2013); and, if relevant, current construction projects that require increase in travel time (Lin et al., 2013).

After a detailed review of patient medications during the preoperative assessment, patient-friendly preoperative medication information must be provided (Edwards & Slawski, 2016). This information must address any new preoperative medications, as well as instructions regarding the maintenance of the patient's chronic medications, including analgesics (Edwards & Slawski, 2016).

#### **5.3.1.4 PREOPERATIVE TELEPHONIC PATIENT SCREENING**

Day-of-surgery cancellations are expensive and disconcerting for both the patient and the healthcare team. Late cancellations are particularly problematic in day hospital settings where it can be difficult to schedule a replacement procedure on short notice (Gaucher et al., 2016; Haufler & Harrington, 2011). The cancellation of surgical procedures on or shortly before the scheduled date of surgery results in wasted resources, reduced operating room efficiency and delayed patient care. Cancellations can also have a negative impact on staff motivation, patient satisfaction and hospital profitability (Gaucher et al., 2016; Xue et al., 2013).

Day-of-surgery cancellations are often made after the patient arrives at the day hospital facility, thereby incurring costs to the patients and family members, including a day's lost wages, costs of transportation, and lost productive time (Haufler & Harrington, 2011).

Late cancellations of surgical procedure may be due to patient-related factors or facility-related factors. These factors are mentioned in Table 24.

TABLE 24: LEADING CAUSES OF LATE CANCELLATIONS WITHIN DAY HOSPITAL SETTING

REASON FOR CANCELLATION	REFERENCE
<b>NONMEDICAL PATIENT-RELATED FACTORS</b>	
No-show, meaning the patient did not show up for surgery without known reason or explanation (reasons could include patient is fearful and decides not to undergo surgery anymore, patient can't make it to the hospital due to traffic or inclement weather).	(Gaucher et al., 2016; Haufler & Harrington, 2011; Xue et al., 2013)
Non-compliance to preoperative medical instructions, specifically with regards to fasting (solid food and liquids) restrictions.	(Dimitriadis et al., 2013; Gaucher et al., 2016; Haufler & Harrington, 2011; Xue et al., 2013)
Absence of responsible adult with patient to receive discharge information and drive patient home.	(Haufler & Harrington, 2011)
Unavailability of preoperative test results as requested by the surgeon or anaesthesiologist.	(Gaucher et al., 2016; Haufler & Harrington, 2011)
Unable to provide the correct completed administrative documents required before admission.	(Gaucher et al., 2016)
Unilateral decisions to postpone or suspend surgery.	(Gaucher et al., 2016)
Patient forgetfulness.	(Gaucher et al., 2016)
Arrival on day of surgery without medical insurance being approved.	(Haufler & Harrington, 2011; Lin et al., 2013)
<b>OTHER MISCELLANEOUS FACTORS</b>	

REASON FOR CANCELLATION	REFERENCE
Intercurrent illness of patient.	(Gaucher et al., 2016)
Scheduling errors.	(Gaucher et al., 2016; Haufler & Harrington, 2011)
Lack of specific equipment (the required equipment is not available, or there are problems with the necessary equipment).	(Dimitriadis et al., 2013; Gaucher et al., 2016; Haufler & Harrington, 2011)
Information breakdown.	(Gaucher et al., 2016)

Nonmedical patient-related factors are reported to be the most common causes for late and day-of-surgery cancellations that result in major delays and inefficiencies in the patient flow (Gaucher et al., 2016; Haufler & Harrington, 2011; Macario, 2006).

The evidence indicates that the low-cost intervention of increased communication between healthcare staff members and patients before surgery can eliminate some of the causes of late cancellations (Haufler & Harrington, 2011).

After the pre-admission assessment and provision of important patient pathway information, contact must once again be made with the patient. This contact with the patient can be made through SMS text messaging (Downer, Meara, & Da Costa, 2005), personalised telephone calls and automated phone calls (Gaucher et al., 2016).

To prevent these situations from occurring and causing major delays and/or causing late or day-of-surgery cancellations the following solution has been implemented and proven successful in a day hospital setting:

The appropriate procedure to be followed starts with a registered nurse calling the patient three business days before the scheduled surgery in order to educate the patient, by using a script, regarding preoperative policies and preparedness (Haufler & Harrington, 2011). The nurse should be well-oriented with the book of scripts in order to obtain and provide all the relevant information, while entering all of this information in an electronic spreadsheet, where all numbers and notes are recorded (Haufler & Harrington, 2011). All scripts must be kept in a logbook with patients' telephone numbers and operating room schedule where the responsible staff member can access it.

This first call by the nurse should address the following (Gaucher et al., 2016; Haufler & Harrington, 2011; Lin et al., 2013):

- Confirm the patient's knowledge of the date, time and location of the surgery.
- Inform the patient that the secretary would be in contact once again on the day before surgery to verify the exact time for his/her arrival.
- Obtain all patient contact numbers, including cell phone numbers, that will be with the patient when travelling to the day hospital on the day of surgery;
- inquire whether there has been a change in the patient's health status since the pre-admission assessment.
- The nurse must follow the provided script to explain in detail what food and drink is allowed by mouth and when. It must be emphasised to the patient that it is not safe to have anaesthesia with food or other liquids in the stomach. It must also be stressed that not following the restriction will result in the delay or cancellation of the surgery.

- Inform the patient that a responsible adult, a person who is over 18 years old, must be present with the patient at the day hospital. This person must be able to stay at the facility the entire time, as well as be able to drive the patient home. It must be stressed that without the responsible adult present, the surgery cannot commence.
- Inform the patient of all administrative documentation that must be completed and supplied before the patient can be admitted;
- remind the patient that all test results as requested by the surgeon and/or anaesthesiologist must be present on the day of surgery. If the required tests have not been performed, the patient must immediately aim to get it done. Emphasise that the presentation of these test results is mandatory, as without it the surgery cannot commence and may be cancelled.
- Inform the patient of the medical insurance verification process. Ensure that the patient is aware that he/she cannot be admitted for the procedure if the insurance has not been approved.

After telephonically contacting the patient, the nurse is further responsible for following up with the day hospital personnel, anaesthesiologist, and/or surgeon about any particular patient needs raised during the call (Haufler & Harrington, 2011). It must however be stressed that within South African context, the nurse do not have consent to answer any clinical related questions that the patient might have regarding the procedure. Such questions must be relayed to the surgeon, which must contact the patient in this regard (Lotz, 2016).

The day hospital secretary should contact the patient telephonically again on the day before surgery to reiterate much of the same information a second time by using a script (Haufler & Harrington, 2011).

Individual staff members must initial next to the patient's name in the logbook after each contact is made with a patient, or a patient's family member. This ensures that follow-up can be done if a patient claims that he/she had not been given the appropriate information required (Haufler & Harrington, 2011).

Telephone contact with patients should ideally be made beyond business hours (Basu et al., 2001; Patel & Hannallah, 1992). This could be achieved with an answering machine fixed in the day hospital facility for 24-hour service without employing someone to work after hours (Basu et al., 2001).

### 5.3.1.5 PREADMISSION PHASE TABLE

TABLE 25: BEST PRACTICES OF PRE-ADMISSION PHASE

LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Appropriate patient selection	Section 5.3.1.1	The success of a day hospital to function efficiently is largely dependent on the appropriate selection of patients.	(Barnett, 2016; Basu et al., 2001; Quemby & Stocker, 2013)
		The adequate selection criteria for day surgery is crucial to maximise efficiency in day surgery.	(I Smith et al., 2006; Verma et al., 2011)
		The three main areas to consider when establishing whether a patient is fit for day surgery include: <ul style="list-style-type: none"> <li>• social factors;</li> <li>• surgical factors; and</li> <li>• medical factors.</li> </ul>	(Barnett, 2016; Gandhimani & Jackson, 2006; Quemby & Stocker, 2013; Ian Smith, 2007)
Preoperative patient assessment	Section 5.3.1.2	Effective preoperative preparation is essential for day surgery success.	(Beaussier et al., 2015; Joshi, 2008; Quemby & Stocker, 2013)
		Timely preoperative assessments reduce surgical delays & late cancellations.	(Barnett, 2016; Correll et al., 2006; Dimitriadis et al., 2013; Edwards & Slawski, 2016; Gaucher et al., 2016; Rai & Pandit, 2003; I Smith et al., 2006; Xue et al., 2013)
		Preoperative assessments improve patient satisfaction.	(Correll et al., 2006; Edwards & Slawski, 2016)
		Preoperative assessment reduces unnecessary & excessive testing.	(Correll et al., 2006; Edwards & Slawski, 2016; Joshi, 2008)
		Preoperative assessments improve efficient bed usage.	(I Smith et al., 2006)
Provide patient pathway information	Section 5.3.1.3	A well-informed patient is essential for achieving successful day surgery outcomes.	(Beaussier et al., 2015; Quemby & Stocker, 2013).
		Improved compliance with preoperative instructions.	(Edwards & Slawski, 2016)
		Reduces patient anxiety as it provides them with an opportunity get their questions answered.	(Barnett, 2016; I Smith et al., 2006)
		Improves overall patient experience.	(Beaussier et al., 2015; I Smith et al., 2006)
		Reduces repeat visits.	(I Smith et al., 2006)

LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Preoperative telephonic patient screening	Section 5.3.1.4	Increased communication between healthcare staff members and patients before surgery through telephonic screening can eliminate some of the causes of late cancellations.	(Basu et al., 2001; Gupta, 2009; Haufler & Harrington, 2011; Lin et al., 2013; Patel & Hannallah, 1992)
		Increases patient satisfaction.	(Haufler & Harrington, 2011)



## **5.3.2 PREOPERATIVE PHASE**

---

The focus areas relevant to the preoperative phase have been primarily identified through a literature review. The key concepts, practises, and sources relevant to the preoperative phase can be seen in Table 26. Each of the focus areas identified are detailed in this section.

### **5.3.2.1 DEDICATED FACILITY DESIGN**

Day surgery should ideally occur in a self-contained unit, separate from in-patient facilities and with a good transport system nearby (Barnett, 2016). To maximise efficiency, it is recognised that, whilst this is not always possible, day surgery should ideally be carried out in a separate and dedicated unit. The dedicated day surgery facility is considered the 'gold standard' model that should include its own (Gandhimani & Jackson, 2006; I Smith et al., 2006; Verma et al., 2011):

- Admission & reception area;
- waiting rooms;
- wards;
- theatres;
- operating lists;
- recovery rooms;
- dedicated staff; together with
- administrative facilities.

If day surgery cannot be performed within a dedicated unit, the day ward within a general hospital must be located as close as possible to the operating room. Thereby avoiding unnecessary transfers (Beaussier et al., 2015). Patients are usually able to ambulate from the unit to the operating room following instructions from an accompanying staff member, which implies that patients are dressed properly and do not receive any hypnotic premedication. Walking to the operating room reduces preoperative anxiety and contributes to the concepts of autonomy and self-care investment (Beaussier et al., 2015).

Accessibility to the facility should be easy to avoid any delay in arrival time (Beaussier et al., 2015). Dedicated parking places must be available and identification of the unit location inside the facility should be easy (Beaussier et al., 2015). Car parking or short stay drop-off and pick-up areas should be provided adjacent to the unit (Verma et al., 2011).

### **5.3.2.2 STAGGER ADMISSION TIMES**

Surgical planning is a cornerstone of the patient flow and should be built according to a stepped call principle (Beaussier et al., 2015; I Smith et al., 2006). The number of first-called patients should be in accordance with the number of operating rooms available (Beaussier et al., 2015). Calling for more patients than necessary may overcrowd the reception desk and induce a lot of wasted time for the patients waiting for the surgery. Building a stagger admission time reduces unduly long preoperative waiting time (Beaussier et al., 2015).

### **5.3.2.3 MINIMUM PATIENT BEDS**

Evolution of surgical techniques and anaesthesia allows most patients to leave the operating room without a need to be bedridden. In these cases, to be bedridden can lead to a significant delay in discharge because of the doctor's unavailability to sign the authorisation to leave (Beaussier et al., 2015). Keeping a bed for a patient during the surgical procedure may prevent the admission of a new patient, occupy unnecessary resources, and is in opposition with the forward pathway.

Ambulatory beds, sometimes far away from the surgical theatre, are often inappropriately used as a waiting room when the surgical activity is not properly scheduled (Beaussier et al., 2015). Furthermore, beds are not mandatory after minor procedures (Beaussier et al., 2015). Trolleys can be used instead of traditional beds for day surgery, with one trolley being used for two or more patients per day (Barnett, 2016).

More complex surgical procedures are, however, progressively performed as day surgery. For this reason a limited quota of medically justified beds are necessary for these more complex cases that require an extended recovery (Beaussier et al., 2015).

### **5.3.2.4 CONTINUOUS QUALITY IMPROVEMENT & PROCESS IMPROVEMENT**

#### **FOCUS**

Providing cost effective, high-quality healthcare is the most important objective of any healthcare provider, because high-quality healthcare is cost-effective care (Frezza, Girnys, Silich, & Coppa, 2000). It is therefore necessary for a day hospital to have a continuous quality improvement (CQI) programme, to monitor and modify the performance as well as resources (Joshi, 2008). Quality improvement initiatives and quality of care indicators need to be developed to address various problems in the day hospital setting, such as unnecessary admissions, inadequate staffing, efficient operating room utilisation, quality of care, and assessment outcomes (Frezza et al., 2000).

Audits should be seen as an essential tool to assess, monitor and maintain efficiency and quality of patient care (Barnett, 2016; Joshi, 2008; I Smith et al., 2006; Verma et al., 2011). Regular audits managed by the medical director will facilitate quality assurance within the day hospital facility (Collins, Padda, & Vaghadia, 2001). Assessment of quality indicators, such as unplanned admissions, readmission, and occurrence of postoperative complications, are of major importance in a quality insurance basic plan (Frezza et al., 2000; Quemby & Stocker, 2013). The information gathered from the audit process can be used to streamline the productive steps and eliminate the ineffective steps and, thus, improve the clinical pathways (Joshi, 2008).

As in any successful business, staff members should be encouraged to present ideas in regularly scheduled meetings (Frezza et al., 2000). They should be involved in quality improvement initiatives on a daily basis (Frezza et al., 2000).

Day & Belson (2015) propose three steps for improving efficiency within a healthcare setting. These three consistent steps have proven to be instrumental in improving efficiency in the operating room and have allowed for the enhancement of quality and patient care for surgical patients (Day & Belson, 2015).

The first key step in improving efficiency within a healthcare setting is the establishment and use of metrics; so that improvement work can be measured and monitored. The second step is to better understand areas where performance improvement work is needed (Day & Belson, 2015). Pivotal to this success is the employment of time and motion studies in conjunction with discrete event simulation modelling (Day & Belson, 2015). The third and final step is the implementation of performance improvement projects using a systematic and consistent process, in most cases modelled after the PDSA (plan-do-study-act) process (Day & Belson, 2015). Section 3.11.6 details the PDSA cycle.

### **5.3.2.5 DEVELOPMENT OF PERFORMANCE METRICS**

The measurement and distribution of outcomes of operational workflow are of value in directing process improvement efforts in a variety of industries, including the healthcare industry. The use of process and outcome metrics in day hospital settings, to support ongoing quality improvement and to improve safety by decreasing variability in practise, has been proven to be effective (Merrill & Laur, 2010).

Effective management of a day hospital facility requires that leadership emphasises constant improvement in the processes of care to achieve maximum patient safety and satisfaction, delivered with the highest efficiency. Such work is only effective if staff and physicians understand the value of such improvements to patient and family experiences, and if there is a belief that a gap exists between current operations and the ideal. Therefore, leadership needs a method to obtain, evaluate, and share process and outcome measurements in an open, objective, and clear manner (Merrill & Laur, 2010). This requires the establishment of performance metrics relevant to a particular day hospital.

Clinical, operational, and financial metrics are all critical to the success of a day hospital facility, and therefore management should measure all three domains and share the results with staff and surgeons. Merrill & Laur (2010) identified metrics that they deem to be most valuable in monitoring quality improvement. It should be noted that these metrics are not all encompassing, and should be adapted to fit the day hospital under study. These metrics are elaborated on below.

#### **Financial metrics**

Financial measures useful to monitor for quality improvement can include (Merrill & Laur, 2010):

- Days in accounts receivable
- Net profit (gross income less expenditure) by week, by month, by quarter
- Cost (total operating expense) per case
- Full-time equivalent (FTE) per case
- Cost per FTE (total operating expense per month/total no. of FTEs per month)
- Cases per month (actual vs budgeted)
- Gross charges (day, week, month, quarter, year to date)
- Collection rate (budgeted vs actual)
- Total operating expenses
  - Personnel expenses by department
  - Non-personnel expenses.

### Operational metrics

Operational measures useful to monitor for quality improvement can include (Merrill & Laur, 2010):

- Cases per OR
- Cases per day (average)
- Turnover time, average, same surgeon following self
- Turnover time, average, all cases
- Minutes patient in room per room per day
- Minutes of operation per room per day;
- Minutes from skin closure to OR exit
- Minutes from OR entry to skin incision
- Case time estimation accuracy
- Delay rate: entry into the OR
- Delay rate: OR entry to incision;
- Delay rate: after incision, before closure
- Delay rate: after closure to OR exit
- Delay rate: after ready for discharge
- Percentage of patients who would recommend the facility to a friend or family member who needs the same procedure
- Percentage of patients who would return to this facility if the surgeon suggested it
- Percentage of patients who assessed their care and experience as “excellent”.

### Clinical metrics

Clinical measures useful to monitor for quality improvement can include the number of cases (Merrill & Laur, 2010):

- PONV: in PACU and at call back (PDNV)
- Pain: first rating in PACU and highest after discharge, rated at call back
- Visit to emergency department or physician in first 24 hours
- Visit to emergency department or physician, unscheduled, in first 30 days
- Infection at surgical site within 30 days
- Intraoperative medical event
- Intraoperative anaesthesia induction failure requiring rescue
- Anaesthesia plan alteration
- Failed intubation
- Reintubation in operating room or PACU
- Conversion of laparoscopic procedure to open procedure
- Perforated viscous
- Cardiac arrest
- Respiratory arrest
- unplanned use of nebulizer treatment in PACU
- Admission/transfer to hospital or emergency department postoperatively
- Hypoxemia in PACU
- Use of ventilator in PACU
- Transfusion.

It is highly recommended that the choice of metrics be a function of a facility's committee of staff, anaesthesia providers, surgeons, and management. This use of a group of stakeholders is an important way to involve staff and surgeons in the process improvement program. A committee charged to manage the data process not only ensures that the program is measuring the processes and outcomes that are important to a particular facility, but also provides leadership for the rest of the staff and surgeons to advance change initiatives that arise from these measurements (Merrill & Laur, 2010).

To garner the commitment to continuing improvement that is required to achieve the highest quality, management must actively integrate all staff and surgeons into creating and maintaining the means of collecting accurate data. Ideally, all data would be obtained via electronic records, through an automated download of individual data points, thereby distancing practitioners from the measurement and providing objectivity (Merrill & Laur, 2010). Any data that is actively keyed in by personnel is inherently subject to bias and error. Utilising a radiofrequency identification (RFID) system, which automatically logs a patient into a room by reading a chip embedded in the wristband, will generate more objective turnover data. Section 5.3.6.2 details the various technologies available for tracking assets and obtaining data.

To maintain the credibility of the data and management's assignment of importance to it, the assessment and presentation of that data should be routine and repetitive, objectively spotlighting quality gaps and recognising improvement (Merrill & Laur, 2010). Once collected, data on the processes and outcomes of care are only useful when synthesised into clear reports and shared with all staff and practitioners. Section 5.3.6.1 details some useful reports that can be generated within a day hospital setting. A direct link between the present data and the focus of future improvement efforts is necessary to engage the staff in operational improvements. If staff are accustomed to viewing all the data on a regular basis, they become crucial role players in aiding the redesign of systems, as well as in convincing internal and external managers of improvement suggestions (Merrill & Laur, 2010).

Specific attention should be given to ensure that all data and reports are shared with all the staff involved. This can be done through posting monthly and cumulative data in an area where staff regularly visit. The chosen areas should be secure from the public, but open to all employees. In addition, each employee and practitioner must receive his or her own data via personal e-mail, and comparisons with the averages for his or her risk group on a monthly or quarterly basis (Merrill & Laur, 2010).

### ***5.3.2.6 MULTI-DISCIPLINARY STAFF***

Effective day surgery requires a strong multi-disciplinary team (Barnett, 2016). Using a multi-skilled workforce within a day hospital facility provides significant benefits as it saves money, enabling the facility to offer more cost effective healthcare services (Frezza et al., 2000). Furthermore, encouraging multi-disciplinary team work is crucial for maximising the efficiency of a day hospital facility (I Smith et al., 2006).

It is not unusual to have a worker be responsible for room turnover, instrument processing, and supply inventory (Frezza et al., 2000). Staff may be responsible for cleaning the operating room between cases and for storage (Frezza et al., 2000).

Staff nurses, operating department practitioners, physicians' assistants and other staff are also key to the success of any day surgery enterprise. The staff should ideally be multi-skilled and have the skills and knowledge to be able to work in different areas within the day surgery unit (Barnett, 2016). Efficient use of resources is best achieved by a well-trained, flexible and multi-skilled workforce (Verma et al., 2011).

Experienced nursing staff trained in the practice of day surgery are essential to ensure smooth progression of patients along the day surgery pathway and the rapid turnover which is required to run an efficient unit (Quemby & Stocker, 2013). Delivering high-quality efficient anaesthetic services is a skill requiring experienced clinicians (Quemby & Stocker, 2013).

An effective approach to reduce post-anaesthesia care unit (PACU) costs is to utilise multi-skilled workers through adjusting PACU staffing. This is achieved by cross-training nurses to work in the preoperative area early in the day when patient load in this area is high, followed by working in the PACU when necessary (Joshi, 2008).

### **5.3.2.7 APPOINTED MEDICAL DIRECTOR**

Day surgery units should have a medical director with a specific interest in day surgery who is responsible for the development of local policies, guidelines and clinical governance including Operational Policy, Audit, Research and Development, Clinical Governance and Performance Management (Barnett, 2016; Verma et al., 2011). The responsibilities of the medical director further include developing a strategic clinical vision for the day hospital.

A consultant anaesthesiologist with management experience is ideally suited to such a role and job plans must reflect this responsibility (Verma et al., 2011). Anaesthesiologists are well-suited for the role of medical director due to their participation in all perioperative periods, which provides them the opportunity to develop a strong understanding of OR workflow (Pash, Kadry, Bugarra, & Macario, 2014). In addition, anaesthesiologists are well placed to build relationships with nursing and other staff at all points of care (Pash et al., 2014). Furthermore, there are clinical, operational, and economic alignments between day hospital management and anaesthesiologists, and anaesthesiologists. Anaesthesiologists eventually work with all of the day hospital's surgeons (Pash et al., 2014).

It is recommended that surgeons and anaesthetists are senior clinicians, to promote forward flow and minimise re-admission rates and complications (Barnett, 2016). Appointing a medical director in charge of day surgery has been shown to encourage more efficient use of resources (I Smith et al., 2006). The medical director should also facilitate the continued development of a multi-disciplinary team approach.

Medical directors should be supported by a day surgery manager, who is in charge of the day-to-day running of the unit and who will often come from a nursing background (Barnett, 2016). Day hospitals should also have a multidisciplinary operational committee; who oversees the day-to-day running of the hospital, agrees policies and timetables, reviews operational problems and organises audit strategies (Verma et al., 2011).

The primary focus of a day hospital's medical director should be on the strategies as indicated in Figure 47 to maintain a well-functioning day hospital (Pash et al., 2014).

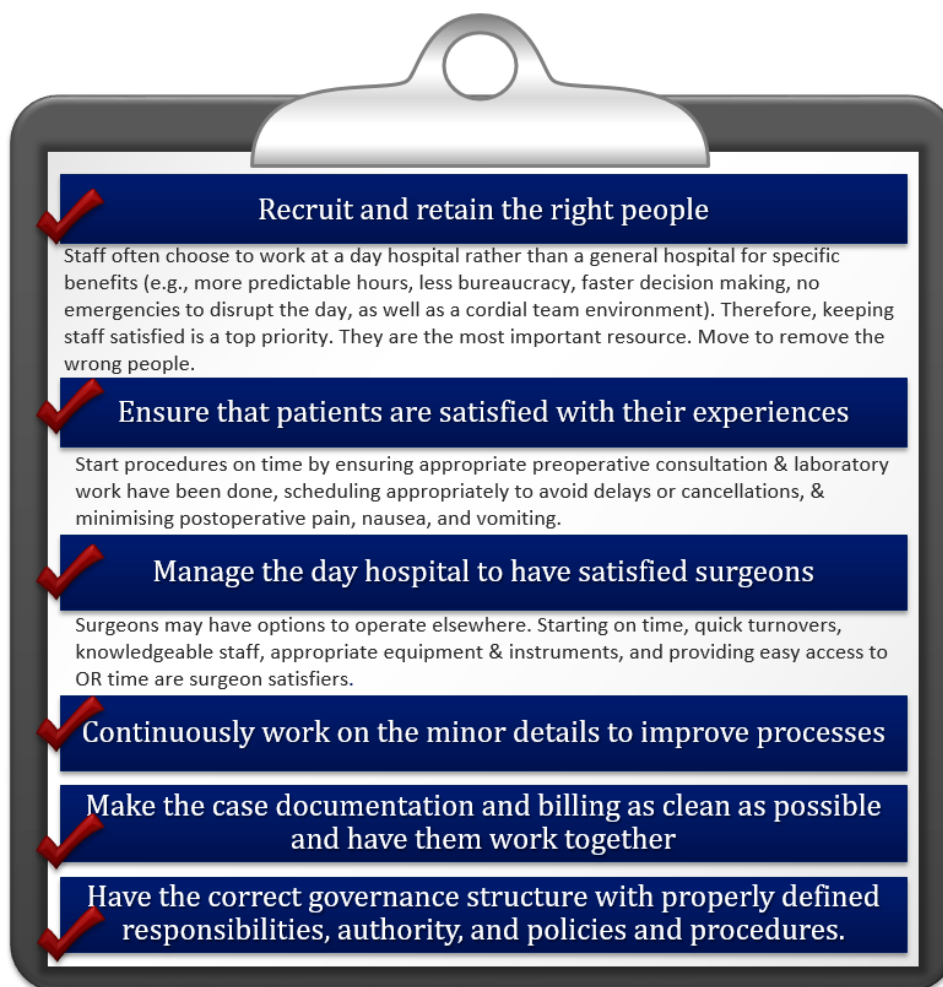


FIGURE 47: STRATEGIES FOR MEDICAL DIRECTORS TO MAINTAIN  
COMPILED FROM (Pash et al., 2014)

**5.3.2.8 PREOPERATIVE PHASE TABLE**

TABLE 26: BEST PRACTISES OF PREOPERATIVE PHASE

LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Dedicated facility design	Section 5.3.2.1	Day surgery should ideally occur in a self-contained unit, separate from in-patient facilities.	(Barnett, 2016; Beaussier et al., 2015; Gandhimani & Jackson, 2006; I Smith et al., 2006)
		Dedicated parking places must be available adjacent to the day hospital facility.	(Beaussier et al., 2015; Verma et al., 2011)
Stagger admission times	Section 5.3.2.2	The number of first-called patients should be in accordance with the number of operating rooms available.	(Beaussier et al., 2015; I Smith et al., 2006)
		Building a stagger admission time reduces unduly long preoperative waiting time.	(Beaussier et al., 2015)
Minimum patient beds	Section 5.3.2.3	Keeping a bed for a patient during the surgical procedure may prevent the admission of a new patient and occupy unnecessary resources.	(Beaussier et al., 2015)
		Trolleys can be used instead of traditional beds for day surgery, with one trolley being used for two or more patients per day.	(Barnett, 2016)
Continuous quality improvement & process improvement focus	Section 5.3.2.4	It is necessary for a day hospital to have a continuous quality improvement (CQI) program to monitor and modify the performance as well as resources.	(Barnett, 2016; Collins et al., 2001; Frezza et al., 2000; Joshi, 2008)
		Audit is an essential tool to assess, monitor and maintain efficiency and quality of patient care.	(Barnett, 2016; Collins et al., 2001; Joshi, 2008; I Smith et al., 2006; Verma et al., 2011)
		Three consistent steps proposed by Day & Belson (2015) have proven to be instrumental in improving efficiency in the operating room and have allowed for the enhancement of quality and patient care for surgical patients.	(Day & Belson, 2015)



LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Development of performance metrics	Section 5.3.2.5	The use of process and outcome metrics in the day hospital setting has proven to improve hospital efficiency, as well as improve patient safety by decreasing variability.	(Beaussier et al., 2015; Merrill & Laur, 2010)
		Clinical, operational, and financial metrics should all be measured and analysed as these three dimensions are all critical to the success of a day hospital facility.	(Merrill & Laur, 2010; I Smith et al., 2006; Verma et al., 2011)
Multi-disciplinary staff	Section 5.3.2.6	Using a multi-skilled workforce within a day hospital facility provides significant benefits as it saves money. Enabling the facility to offer more cost-effective healthcare services.	(Frezza et al., 2000; I Smith et al., 2006)
		Efficient use of resources is best achieved by a well-trained, flexible and multi-skilled workforce.	(Verma et al., 2011)
Appointed medical director	Section 5.3.2.7	Day surgery units should have a medical director with a specific interest in day surgery; who is responsible for the development of local policies, guidelines and clinical governance.	(Barnett, 2016; Verma et al., 2011)
		Appointing a medical director in charge of day surgery has been shown to encourage more efficient use of resources.	(I. Smith et al., 2006)
		A consultant anaesthetist with management experience is ideally suited for the position of medical director.	(Pash et al., 2014; Verma et al., 2011)

### 5.3.3 OPERATIVE PHASE

---

The focus areas relevant to the operative phase have been primarily identified through a literature review. The key concepts, practises, and sources relevant to the operative phase can be seen in Table 29. Each of the focus areas identified are detailed in this section.

#### 5.3.3.1 PERIOPERATIVE ANAESTHESIA MANAGEMENT

A more rapid recovery from anaesthesia results in quicker patient turn-around, improved patient experience, and reduced costs (Quemby & Stocker, 2013). Day surgery patients have a limited time on the day surgery unit before discharge that same day. Quicker patient discharge after day surgery can be advanced if patients experience (Quemby & Stocker, 2013):

- Quick onset and offset of anaesthesia with minimal dizziness, or drowsiness;
- minimal postoperative nausea and vomiting;
- minimal postoperative pain; and
- rapid return to full cognitive functions, oral nutrition and mobilisation.

While these are properties desirable for all anaesthetic techniques, they are particularly important in the day surgery patient due to the requirement for rapid return to oral nutrition, mobilisation, and full cognitive function (Quemby & Stocker, 2013).

As delays in postoperative anaesthesia recovery and discharge to home reduce day hospital efficiency, all attempts should be made to address the factors that delay postoperative anaesthesia recovery and patient discharge (Joshi, 2008).

#### Anaesthesia

Anaesthesia for day surgery includes local techniques, regional anaesthesia, and sedation (Barnett, 2016). The type of anaesthetic chosen will be influenced by surgical requirements, patient-specific considerations, the experience of the anaesthetist and the facilities and personnel available (Australian and New Zealand College of Anaesthetists, 2010).

Anaesthetic techniques should ensure minimum stress and maximum comfort for the patients and should take into consideration the risks and benefits of the individual techniques (Verma et al., 2011).

#### *Local techniques*

Infiltration of the surgical site with local anaesthetic is simple, safe and provides satisfactory analgesia after most types of surgery (Gandhimani & Jackson, 2006). Infiltration of local anaesthesia before skin incision provides better postoperative analgesia and may reduce intraoperative analgesic requirements (Gandhimani & Jackson, 2006). Topical local anaesthetic, such as eye drops or local anaesthetic creams (e.g. EMLA cream), provide effective postoperative analgesia for squint surgery and circumcision (Gandhimani & Jackson, 2006).

### *Regional anaesthesia*

Regional anaesthesia includes peripheral nerve blocks, as well as spinal anaesthesia (Rice, Muckler, Miller, & Vacchiano, 2015). Local infiltration and peripheral nerve blocks can provide excellent anaesthesia and pain relief after day surgery (Verma et al., 2011).

Patients may safely be discharged home with residual sensory or motor blockade, provided the limb is protected and appropriate support is available for the patient at home to help with the patient's daily needs (Barnett, 2016; Verma et al., 2011). The expected duration of the blockade must be explained and the patient must receive written instructions as to their conduct until normal power and sensation returns (Verma et al., 2011).

The introduction of low-dose spinal anaesthesia has increased the suitability of central neural blockade for day surgery (Gandhimani & Jackson, 2006). This can be useful for lower limb, perineal and lower abdominal procedures, and may allow more problematic patients to be treated as day cases (Gandhimani & Jackson, 2006).

With any regional anaesthesia it is important that oral analgesia is started before the local anaesthetic wears off, and that it is given regularly afterwards (Barnett, 2016).

### *Sedation*

Sedation is seldom needed but, if used, suggested discharge criteria should be met and the patient must receive an appropriate explanation (Verma et al., 2011).

### *Analgesia*

A rapid turnover and early discharge are expected after short day surgery procedures. Consequently, conditions must be optimised to ensure not only a fast emergence from anaesthesia, but avoidance of side effects and complications. Thus, special consideration must be given to the prevention of postoperative pain and PONV.

The success of day surgery depends significantly on the management of postoperative pain (Gandhimani & Jackson, 2006). Pain should be assessed throughout the stay, and oral analgesics should be started before the local anaesthesia begins to wear off and also given subsequently on a regular basis (Verma et al., 2011).

A multimodal approach to pain relief should be adopted for day surgery patients that involves (Barnett, 2016; Gandhimani & Jackson, 2006; Quemby & Stocker, 2013; Verma et al., 2011):

- Avoidance of long-acting opiates (morphine) and judicious use of short-acting opiates if required for the management of acute pain;
- supplementation with local anaesthesia where possible;
- administering prophylactic oral analgesia with paracetamol;
- combined with non-steroidal anti-inflammatory drugs to patients.

Longer-acting agents such as morphine should be used with caution because they may have unwanted side-effects such as nausea and sedation (Barnett, 2016). However, if a patient has

received morphine before, and has tolerated it well, it is reasonable to use it for procedures that may result in significant pain (Barnett, 2016).

Paracetamol has a well-established safety and analgesia profile. It reduces the need for more potent opioids with their unwanted side effects (Gandhimani & Jackson, 2006). Intravenous paracetamol is fast-acting and appears to be more effective than oral paracetamol, with analgesic effects comparable to Nonsteroidal anti-inflammatory drugs (Gandhimani & Jackson, 2006).

Nonsteroidal anti-inflammatory drugs should be given if not contraindicated. Intravenous or per rectum routes of administration are not necessary. There is evidence that administering the first dose nonsteroidal anti-inflammatory drugs orally about one hour before surgery produces better and longer-lasting pain relief (Gandhimani & Jackson, 2006).

### **Postoperative nausea and vomiting**

PONV is a common side-effect that patients experience after general anaesthesia and contributes to prolonging discharge after day surgery (Watkins & White, 2001). PONV is often a cause of unplanned admission following day surgery (Barnett, 2016). Day surgery patients have a finite time on the day surgery unit before discharge that same day, and if PONV is not properly addressed and treated it leads to patient re-admission. Therefore, prompt management of pain, nausea and vomiting and early mobilisation are paramount.

Postoperative nausea and vomiting should be risk assessed before operation and prophylactic anti-emetics given to patients stratified at high risk (Quemby & Stocker, 2013). There is still insufficient evidence to recommend the use of routine prophylactic anti-emetics in day surgery except in certain patient groups (I Smith et al., 2006). However, the use of anti-emetics in high-risk patients and none in low-risk patients may result in overall cost savings (I Smith et al., 2006).

It is important that any PONV is treated seriously and promptly. Therefore, policies should exist for the rapid management of any postoperative nausea and vomiting as this can significantly delay discharge (Quemby & Stocker, 2013; I Smith et al., 2006). A standard management protocol can aid the anaesthetist, nursing staff and patient on how to treat PONV when it occurs (I Smith et al., 2006)

Minimal starvation times and the judicious use of intravenous fluids can reduce the risk of PONV, as well as enhance a patient's feeling of well-being (Barnett, 2016; Quemby & Stocker, 2013; I Smith et al., 2006).

### **5.3.3.2 FAST-TRACKING**

The recovery period is a critical step within the day surgery pathway (Beaussier et al., 2015). Outpatients are normally transferred from the OR to the PACU, followed by transfer to the recovery room before discharge home (Watkins & White, 2001). Typically, supervision of the patient corresponding to their physical status and autonomy occurs within a dedicated area, the PACU, until the patient is considered ready to be moved to the recovery room. However, the availability of rapid- and short-acting drugs for induction and maintenance of general anaesthesia, as well as modern surgical techniques, have facilitated early recovery after day surgery that lead to a patient being able to bypass the PACU (Quemby & Stocker, 2013).

With conventional fast-tracking, it is possible to bypass the PACU and take patients directly from the OR to the recovery room (or the preoperative assigned ward if referring to South African context) if they meet specific criteria before leaving the OR (Watkins & White, 2001). Fast-tracking refers to assessing patients as they emerge from anaesthesia for readiness to bypass the post-anaesthesia care unit (PACU), and going directly to the less labour-intensive recovery room to facilitate a faster discharge from the facility (Rice et al., 2015). The PACU is a high acuity recovery unit in which there are low nurse-to-patient ratios and continuous monitoring (Rice et al., 2015). Bypassing the PACU may avoid unnecessary transfers, save time, and allow for a faster discharge from the unit without any change in outcome (Rice et al., 2015).

Due to delays in the PACU discharge and discharge to home reducing the day hospital efficiency, all attempts should be made to address the factors that delay PACU discharge and home discharge (Joshi, 2008). The fast-track process facilitates patient throughput and decreases the time spent in the postoperative period (Joshi, 2008). Fast-tracking has been proven to increase work flow efficiency and decrease both patient and hospital costs while promoting a more rapid discharge from the facility (Rice et al., 2015).

Shorter anaesthesia time, the ability to bypass the PACU, and a decreased length of stay in the step-down unit reduce total costs incurred by a day hospital facility (Watkins & White, 2001).

Preliminary studies have shown that outpatients who are fast-tracked can be discharged home earlier without any increase in complications or side effects. Importantly, fast-tracking after day surgery does not seem to compromise patient satisfaction with the surgical experience (Watkins & White, 2001).

Although the move toward fast-tracking has been driven largely by the growth of managed care and the need to control healthcare costs, the benefits of this paradigm are considerably broader than simple cost reduction and can include improved outcomes and increased patient satisfaction (Watkins & White, 2001). Fast-tracking leads to the use of fewer nurses and a mix of less highly-trained, lower-wage nursing aides and fully qualified nurses, which can reduce overall personnel costs (Watkins & White, 2001).

In the development of a fast-track plan, it is important to establish guidelines for ensuring safe patient care (Watkins & White, 2001). Therefore, the decision to bypass the PACU is determined by using a scoring system, known as the White Fast-Track Scoring (WFTS) system. This scoring system has been created by White to assess if patients are eligible to bypass the PACU without compromising their safety (Rice et al., 2015). This tool assesses the patient on a scale of 0 to 2 in five categories, as can be seen in Table 27.

TABLE 27: WHITE FAST-TRACK SCORING SYSTEM (RICE ET AL., 2015)

CRITERIA	SCORE
<b>Level of Consciousness</b>	
Awake and oriented	2
Aroused with minimal stimulation	1
Responsive only to tactile stimulation	0
<b>Physical activity</b>	
Able to move all extremities on command	2
Some weakness in movement of extremities	1
Unable to voluntarily move extremities	0
<b>Hemodynamic stability</b>	
Blood pressure $\pm 15\%$ of baseline mean arterial pressure value	2
Blood pressure $\pm 15\%$ to $30\%$ of baseline mean arterial pressure value	1
Blood pressure $\pm 30\%$ below baseline mean arterial pressure value	0
<b>Respiratory stability</b>	
Able to breathe deeply	2
Tachypnea with good cough	1
Dyspneic with weak cough	0
<b>Oxygen saturation status</b>	
Maintains value $>90\%$ on room air	2
Requires supplemental oxygen (nasal prongs)	1
Saturation $<90\%$ with supplemental oxygen	0
<b>Postoperative pain assessment</b>	
None or mild discomfort (0 to 3)	2
Moderate to severe pain controlled with IV meds (4 to 7)	1
Persistent severe pain (8 to 10)	0
<b>Postoperative emetic symptoms</b>	
None or mild nausea with no active vomiting	2
Transient vomiting or retching	1
Persistent moderate to severe nausea and vomiting	0
<b>TOTAL SCORE</b>	

A patient scoring one or two in each category and a minimum cumulative score of 12 is considered suitable for fast-tracking based on WFTS criteria (Rice et al., 2015). By using this score, a lot of patients who had loco-regional or general anaesthesia would be able to bypass the PACU and be directly admitted to the recovery room of the day hospital facility until they fulfilled the criteria for home discharge (Quemby & Stocker, 2013).

The anaesthesia provider is responsible for scoring the patient immediately before leaving the OR (Watkins & White, 2001). Once the patient enters the fast-track area, the nurse caring for the patient also evaluates the patient and documents an admission score. Patients who do not meet the criteria are transferred to PACU to receive the appropriate level of care (Watkins & White, 2001).

Use of fast-track anaesthesia techniques as well as anti-emetic and analgesic prophylaxis are crucial in achieving rapid emergence and reducing postoperative stay in the day hospital (Joshi, 2008).

The future of health care reimbursement is dependent on eliminating unnecessary wastes of time and money (Rice et al., 2015). Fast-tracking is one approach to help reduce this waste (Rice et al., 2015).

### 5.3.3.3 OPERATING ROOM SCHEDULING

Scheduling is an important tool for manufacturing and service industries, where it can have a major impact on the productivity of a process. Scheduling in service industries aims to maximize the efficiency of the operation and reduce costs (du Preez et al., 2009).

ORs generate substantial cost and revenue for healthcare facilities, and is one of its scarcest and expensive resources. It is therefore essential for day hospital managers to schedule procedures to maximise OR efficiency. Due to ORs acting as a major source of perioperative costs, considerable effort has been applied to optimise the operating room use (Joshi, 2008).

Although there is no single strategy to follow in pursuit of OR efficiency, it is still critical that the day hospital manager understands basic scheduling concepts, and adapts them to suit the needs of the relevant day hospital. The basic knowledge regarding day hospital scheduling is discussed below.

The goal is to maximise the number of surgical procedures that can be performed in each of the ORs in a regular workday while minimising expenses (Pash et al., 2014). As wages, salaries, and benefits of perioperative staff account for two-thirds of OR expenses, and overtime expenses are even higher, it is critical to minimise overtime (Pash et al., 2014).

#### Day hospital scheduling systems

There exist three systems for scheduling surgical procedures within day hospital settings, namely the Any Workday system, the Fixed Hours system, and the Reasonable Time system. These three systems can be visualised as seen in Figure 48.

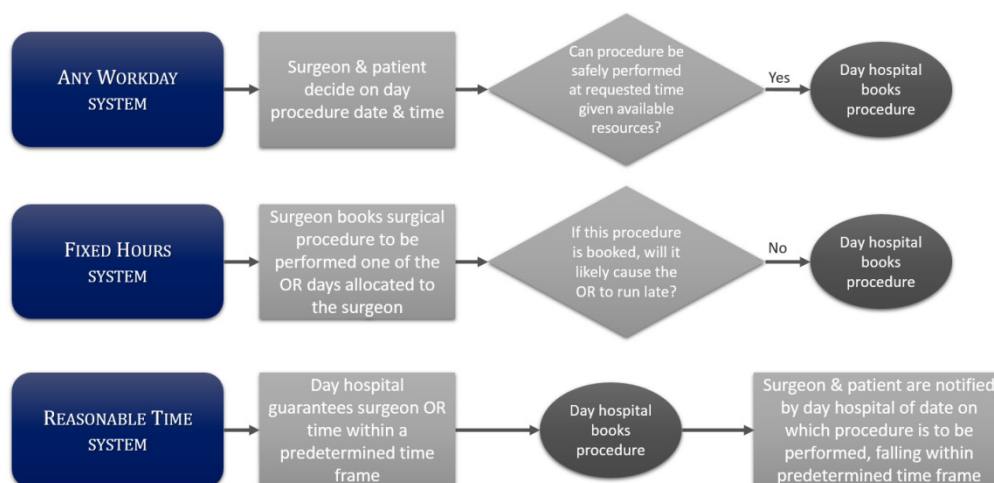


FIGURE 48: THREE SYSTEMS FOR SCHEDULING PROCEDURES WITHIN DAY HOSPITAL SETTINGS  
COMPILED FROM (PASH ET AL., 2014)

The most appropriate scheduling system should be chosen based on the particular day hospital facility under question, so as to ensure the following KPI's indicative of a well-functioning day hospital can be met. Table 28 depicts the KPI's that should be achieved.

TABLE 28: KPI'S OF A WELL-FUNCTIONING DAY HOSPITAL (MACARIO, 2006)

	KEY PERFORMANCE INDICATOR	IDEAL VALUE
1	Mean total delay of start times for day procedure per OR per day	Less than 45 minutes
2	Procedure cancellation rate	Less than 5%
3	Days with at least 1 delay greater than 10 minutes due to a full recovery room	Less than 10%
4	Average turnover times	Less than 25 minutes
5	Excess staffing costs	Less than 5%
6	Prolonged turnovers lasting longer than 60 minutes	Occur less than 10% of the time

### *The Any Workday system*

In the United States, the Any Workday system is the most common scheduling system used within day hospital settings (Pash et al., 2014). With this system patients and surgeons determine the date on which to schedule the day procedure, and the day facility complies with the requests, provided that all the available resources are available to safely perform the procedure (Pash et al., 2014). This type of scheduling is done months in advance through efficiency-based scheduling (Pash et al., 2014).

As surgeons are able to book day procedures for any date and time that suits them best, the challenges of the Any Workday system includes minimising the less obvious hidden, non-financial costs such as staff dissatisfaction with working overtime if the procedure is scheduled later in the day (Pash et al., 2014). This challenge can be managed by creating incentives for staff to be able to go home earlier on less busy days when their work is completed (Pash et al., 2014).

### *The Fixed Hours system*

The Fixed Hours scheduling is less commonly used within the United States, but is the primary system used within Canada (Pash et al., 2014). This system is based on the premise that surgeons are assigned block time during which they are to book their day procedures (Pash et al., 2014). Surgeons are given fixed blocks of OR time with clearly defined start and end times on specific days (Pash et al., 2014). The amount of block time assigned to physicians is based on the surgeon's or surgical specialty's historical OR usage or some other performance criteria (Erdogan & Denton, 2009).

Block time is a category of allocated OR time that ensures that a procedure is not scheduled within this allocated OR time if the procedure is expected to run late (Pash et al., 2014). The surgeon does, however, have the authority to book any combination of day procedures during this time, given that the surgeon ensures he/she does not run late and exceed the allocated block time (Pash et al., 2014).

This type of scheduling system ensures that rooms do not run late, thereby minimising overtime expenses and staff dissatisfaction (Pash et al., 2014). Ensuring that rooms do not run late is



especially relevant within the United States; as insurance companies often reimburse day hospitals with a fixed sum per procedure, regardless of the duration of the surgical procedure (Pash et al., 2014). Lotz (2016) also further indicated that this type of scheduling system is most beneficial to both parties, namely the physician, as well as the day hospital facility.

#### *The Reasonable Time system*

The Reasonable Time system is the scheduling system least used in day hospital settings (Pash et al., 2014). This system is based on the premise that the day hospital makes a commitment in advance that once the surgeon has booked a procedure, it will be scheduled within a predetermined time frame (Pash et al., 2014).

Assuming that a surgeon has an agreement with a day hospital that procedures be scheduled within 30 days of booking, the surgeon would be unable to guarantee a patient a specific date or time. The surgeon would only be able to guarantee the surgical date within a 30-day window. Having the day hospital choose the date on which the procedure is to be performed, which may conflict with work or personal plans, could be unacceptable to many patients (Pash et al., 2014). For this reason, specifically in the United States, where many patients are not limited to a specific surgeon or day hospital, this is the least desirable scheduling system (Pash et al., 2014).

#### **Prediction of procedure duration**

The accurate estimation of procedure duration is complex, and there are several reasons why the procedure duration may further vary from the predicted durations. These reasons to consider include (Pash et al., 2014):

- Procedure duration data is not normally distributed.
- The combination of a great variety of procedures and the large number of surgeons at many day hospital facilities.
- A day hospital facility may count multiple different procedure types and cases as the same when the patients are called into the scheduling office, because the required supplies, instruments, and surgical tray may be similar, even though the operation is different.
- Surgeons may try to underestimate the length of their procedures (so that the day hospital allows them to book more procedures in their block) or overestimate their procedure duration (so no other surgeon can book procedures in that OR).
- Some procedures may be particularly complex or easy compared with the typical so there is intrinsic variability that must be accepted and managed.
- Different information systems define procedure duration differently, so data may not be accurate.

As day hospital facilities most often do not know until the day of surgery which procedures are scheduled in an OR, and it is difficult to estimate the duration of any single procedure; the best way to optimise matching of staffing with workload is to allocate appropriate time to each surgical service based on the history of how long each surgeon operated each day (Pash et al., 2014; Strum, Vargas, & May, 1999).

### 5.3.3.4 IMPLEMENTATION OF LEAN MANAGEMENT PRINCIPLES

The business and production concepts of lean management principles can be applied to healthcare in the day hospital setting (Lin et al., 2013). Application of these lean principles within a day hospital setting can reduce patient flow time, improve work capacity, and minimise waste (Casey et al., 2009). The minimisation of waste and delay through the utilisation of lean principles in the day hospital setting has proven to improve quality of care, minimise errors, and improve patient satisfaction (Casey et al., 2009). All the relevant lean management principles applicable within the hospital environment have been extensively elaborated on in Section 3.11.

The most significant lean concepts that have been proven to increase efficiency within a day hospital setting is flow time, capacity, production batch management, and Just-in-time (JIT) management. These four concepts are further elaborated below.

#### Flow time

A very important, key lean management principle is limiting variability in a process. This concept can be applied to the goal of reducing the temporal mismatch between movement of patients waiting in the day hospital and those who have cycled through and exited (Casey et al., 2009). Pathways in a day hospital setting should be separated into sequential steps where the concepts of flow time and throughput should be applied (Beaussier et al., 2015). For each of these steps, wasted times must be detected and eliminated for the physician and the healthcare staff to have more time for more valuable tasks, and so that patients have to spend only the minimum required time at each step (Beaussier et al., 2015).

The time it takes for a patient to flow through the day hospital can be summarised by Equation 1, known as Little's Law.

EQUATION 1: LITTLE'S LAW

$$T = \frac{I}{R}$$

$T$  (measured in minutes) represents *flow time*, i.e. the time it takes for a patient to flow through the day hospital facility.  $I$ , can be thought of as inventory, or *WIP* (work in process), and represents the number of patients waiting that have not yet moved through the facility to complete their visit. Lastly,  $R$  can be viewed of as *throughput*, and represents the number of patients whose visits have already been completed (Casey et al., 2009).

The capacity for reducing the flow time of a patient visit is inversely proportional to the throughput of patients.  $T$  increases proportional to the number of patients waiting; if patients are not completing the process and departing from the day hospital (Casey et al., 2009).

To calculate flow time efficiency, both the theoretical and average time to visit completion must be established. Activities within the process must be categorised as critical or non-critical.

Critical activities can be viewed as any activity that is vital to the completion of the patient visit. A critical pathway is the summation of all these identified critical activities. Theoretical flow time

refers to the total time it takes to perform all the critical activities. The theoretical flow time will be less than the average time it takes to complete a visit because the non-critical activities must still be included (Casey et al., 2009).

Non-critical activities refer to activities that doesn't aid in the completion of the patient visit. Non-critical activities can be seen as causes of delay, and account for the difference between the average flow time and the theoretical flow time (Casey et al., 2009).

Flow time efficiency can be calculated by using Equation 1.

EQUATION 2: FLOW TIME EFFICIENCY

$$\text{Flow time efficiency} = \frac{\text{Theoretical flow time}}{\text{Average flow time}}$$

Optimal flow time efficiency would be a value of 1. Steps can be implemented to eliminate non-critical activities to move towards the theoretical flow time. The best way to reduce waste is to move non-essential activities off the critical pathway and run them in parallel (Casey et al., 2009).

### Capacity

Capacity is a lean management concept that describes the work ability of a particular resource within the day hospital. The average amount of time each resource spends with a patient determines the capacity of that resource and, collectively, the capacity of the process as a whole (Casey et al., 2009).

The total capacity of each resource is calculated from the average time that resource spends with a patient. There might be more than one resource that can increase the total capacity at certain points. The easiest way to increase capacity is to add resources, however, this is typically a very costly venture. It is therefore crucial to be able to create or grow capacity from existing resources (Casey et al., 2009).

The first step to increasing capacity within an existing process is to identify the bottleneck. The bottleneck refers to the narrowest point in the process, and determines the speed of the entire process, no matter what is done before and after this step (Casey et al., 2009).

An effective means of increasing capacity while maintaining high-quality care within a day hospital facility is to shift work from the bottleneck to non-bottleneck resources. According to lean management principles, this should be done by incrementally changing one variable at a time, so that the outcome can be measured and refined as needed (Casey et al., 2009).

Numerous unforeseen events can occur throughout the day within a day hospital facility. The implementation of lean principles addresses this by limiting variability within a process as far as possible. The subsequent minimisation of waste increases the work capacity of available resources, which is needed to manage the unforeseen delays in a timely fashion as they occur (Casey et al., 2009).

### **Management of the production batch**

The process of managing a batch of production units is known as level loading, or 'Heijunka'. Level loading is a form of production scheduling that purposely manufactures in much smaller batches by sequencing product variants within the same process. This scheduling tool is used to achieve a smoother production flow. Level loading is a scheduling practice which uses volume estimates to determine the level of supply required to meet the demand of a production system at any given time.

Level loading helps reduce delays and solve capacity shortages. Implementing this practice within a hospital setting benefits patients (through reduced waiting times), physicians (through improved productivity, which translates into higher pay), and the hospital. The overall goal of level loading is to achieve, what is referred to as, continuous flow or one-piece flow, which means that each part (a patient) moves through operations in a step-by-step fashion with no waiting between process steps. Applying this scheduling practise leads to shorter lead times, lower inventory levels (patient within the system), as well as improved utilisation of resources such as staff.

The principles of lean management dictate that, to reduce waste, steps with the least amount of variability should be performed before those that are more variable. This implies that day procedures that are likely to involve less variability from the average, should be scheduled for early in the day. Those cases with more potential for variability, such as more complex cases, should be scheduled for later in the day (Casey et al., 2009).

This principle requires the complexity of a patient visit to be accurately defined before they arrive at the day hospital, and for patients to be scheduled in the appropriate time slots according to their complexity (Casey et al., 2009). Defining complexity prior to patient visits facilitates more accurate assignment of slots, thereby reducing variability and delays (Casey et al., 2009).

Overbooking should be limited as much as possible, as it introduces variability and causes delays to accumulate (Casey et al., 2009).

Synchronisation is a concept similar to batch management, and describes a repeating scheduling pattern. If the time needed to process a patient, who has been at the day hospital facility before, is more predictable than that of a new patient requiring more time, the former can be front-loaded in the schedule. Alternatively, a repeating pattern can be employed to avoid scheduling visits with the potential for greater variability close together (Casey et al., 2009).

One pattern of synchronisation is to schedule three return patients, followed by one new patient, and then repeat. If the new patient case takes longer than predicated, the extra time taken can be balanced against that needed for the more predictable return patient visits. Different patterns of synchronisation can be used to generate an optimally balanced mixture of patients. The main idea is to schedule visits with greater potential variability at the end of the batch (Casey et al., 2009).

To achieve the benefits of continuous flow, day hospitals must level out the workload. This practise eliminates waste by levelling patient volume and levels out the demands placed on the day hospital staff, facilities, equipment and all other resources serving the system.

### **Just-in-time (JIT) management**

JIT production is a manufacturing philosophy which eliminates waste associated with time, labour, inventory, and storage space (Radisic, 2016). Section 3.11.3 elaborates on all types of wastes present within healthcare settings.

Basics of the JIT concept are that the organisation produces only what is needed, when it is needed and in the quantity that is needed (Radisic, 2016). The success of the JIT strategy relies on having what you need when and where you need it (Casey et al., 2009). The primary benefit of implementing JIT management is that this philosophy promotes productivity.

The JIT concept, is furthermore focused on improving business performance and efficiency (Radisic, 2016). Profits are realised by reducing stock turnaround time and increasing the velocity of high-quality, consistent production. JIT inventory ordering decreases the amount of 'standing' stock, thereby reducing costs and increasing cash flow (Casey et al., 2009).

When integrated with lean principles, JIT management concepts results in significant returns on investment and increase medical practise without sacrificing the provision of high-quality healthcare services to patients (Casey et al., 2009).

### 5.3.3.5 OPERATIVE PHASE TABLE

TABLE 29: BEST PRACTISES OF THE OPERATIVE PHASE

LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Perioperative anaesthesia management	Section 5.3.3.1	A more rapid recovery from anaesthesia results in quicker patient turn-around, improved patient experience, and reduced costs.	(Quemby & Stocker, 2013).
		Anaesthetic techniques should ensure minimum stress and maximum comfort for the patients and should take into consideration the risks and benefits of the individual techniques.	(I Smith et al., 2006; Verma et al., 2011).
		A multimodal approach to pain relief should be adopted for day surgery patients that involves: <ul style="list-style-type: none"> <li>• The judicious use of short-acting opiates;</li> <li>• supplementation with local anaesthesia;</li> <li>• administering prophylactic oral analgesia with paracetamol;</li> <li>• combined with non-steroidal anti-inflammatory drugs to patients.</li> </ul>	(Barnett, 2016; Gandhimani & Jackson, 2006; Quemby & Stocker, 2013; Verma et al., 2011):
		An approach to PONV should be adopted for day surgery patients that involves: <ul style="list-style-type: none"> <li>• Assessing the risk of PONV before operation and anti-emetics given to patients stratified at high risk;</li> <li>• policies should exist for the rapid management of any PONV;</li> <li>• minimal starvation times and the judicious use of intravenous fluids can reduce the risk of PONV.</li> </ul>	(Barnett, 2016; Quemby & Stocker, 2013; I Smith et al., 2006)
Fast-tracking	Section 5.3.3.2	The fast-track process facilitates patient throughput and decrease the time spent in the postoperative period.	(Joshi & Twersky, 2000; Joshi, 2008; Watkins & White, 2001)
		Fast-tracking has been proven to increase work flow efficiency and decrease both patient and hospital costs while promoting a more rapid discharge from the facility.	(Rice et al., 2015; Watkins & White, 2001)
		Fast-tracking benefits also include improved outcomes and increased patient satisfaction.	(Joshi & Twersky, 2000; Watkins & White, 2001).

LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Operating room scheduling	Section 5.3.3.3	<p>The three scheduling systems that are used by day hospitals are:</p> <ul style="list-style-type: none"> <li>• the Any Workday system;</li> <li>• the Fixed Hours system; and</li> <li>• the Reasonable Time system.</li> </ul> <p>The appropriate scheduling system to be implemented should be based on the particular day hospital facility under question.</p>	(Pash et al., 2014)
		The best way to optimise matching of staffing with workload is to allocate appropriate time to each surgical service based on the history of how long each surgeon operated each day.	(Pash et al., 2014; Strum et al., 1999).
Implementation of lean management principles	Section 5.3.3.4	Application lean principles in healthcare settings, including the day hospital setting, has proven to decrease patient flow time, increase work capacity, and reduce waste. The reduction of waste and delay through the utilisation of these lean principles within the day hospital setting have further proven to improve quality of care, minimise errors, as well as improve patient satisfaction.	(Beaussier et al., 2015; Casey et al., 2009; Cima et al., 2011; Lin et al., 2013; Manos et al., 2006)
		Utilising the key concepts of flow time, inventory, and throughput within a day hospital setting, can lead to improved patient flow through the identification and removal of non-critical activities from the process bottleneck.	(Beaussier et al., 2015; Casey et al., 2009)
		Implementation of the lean management concept of capacity within a day hospital, provides an approach to increasing work capacity by improving the efficiency of existing resources, rather than investing in additional resources. An increase in work capacity allows for a more efficient response to variability, that results in cost savings, more available time, and increased throughput of patients.	(Casey et al., 2009)
		Applying the lean management principles of production batch management, allows for variability to be minimised through the strategic scheduling of patients with differing needs.	(Casey et al., 2009)
		Application of the lean management principle of JIT allows for the continuous and systematic identification and elimination of waste.	(Casey et al., 2009)

### 5.3.4 POSTOPERATIVE PHASE

The focus areas relevant to the postoperative phase have been primarily identified through a literature review. The key concepts, practises, and sources relevant to the postoperative phase can be seen in Table 31. Each of the focus areas identified are detailed in this section.

#### 5.3.4.1 NURSE-LED DISCHARGE

Nurse-led discharge is key to day surgery and is appropriate if protocols have been developed to guide this discharge process (Barnett, 2016; Quemby & Stocker, 2013; I Smith et al., 2006).

The presence of an approved discharge protocol helps provide consistency to care processes (Ead, 2016). A checklist that indicates criteria that must be met before a patient can be discharged as can be seen Table 30.

TABLE 30: DISCHARGE CHECKLIST FOR DAY SURGERY (BRITISH ASSOCIATION OF DAY SURGERY, 2009)

CRITERIA	YES	NO	NOT APPLICABLE	INITIALS	DETAILS
Vital signs stable for one hour					
Orientated to time, place & person					
Passed urine (if applicable)					
Able to dress & walk (where appropriate)					
Oral fluids tolerated (if applicable)					
Minimal pain					
Minimal bleeding					
Minimal nausea / vomiting					
Cannula removed					
Responsible escort present					
Has carer for 24-h post op					
Written & verbal post op instructions					
Knows who to contact in an emergency					
Follow up appointment					
Removal of sutures required?					
Referrals made					
Dressings supplied					
Patient copy of GP letter					
Carbon copy of consent					
Sick certificate					
Has take-home medication					
Information leaflet for tablets					
Post op phone call required					

This discharge criteria checklist ensures for the timely discharge of patients once all the recovery milestones have been met (Quemby & Stocker, 2013).



### **5.3.4.2 POSTOPERATIVE INFORMATION & DISCHARGE**

All patients should receive verbal and written information regarding what to expect after discharge and their responsibilities, ensuring they go home feeling confident (Quemby & Stocker, 2013). Instructions should be given verbally, to assess understanding and consolidate written information (Barnett, 2016; Ead, 2016). Wherever possible, these instructions should be given in the presence of the responsible person who is to escort and care for the patient at home (Verma et al., 2011).

#### **Discharge information & instructions**

The information and instructions provided should be tailored to the specific surgery and needs to provide information about possible complications and how to seek help (Barnett, 2016). The information and instructions given to the patient should address and include (Ead, 2016; Gandhimani & Jackson, 2006; Verma et al., 2011):

- Expected symptoms that patients might experience during first 24 hours after surgery;
- warning signs of possible complications;
- what to do in an emergency;
- where to seek help should complications arise;
- a contact number where patients can access advice if urgent advice is needed;
- when it is appropriate for a patient to safely return to work;
- appropriate post-procedure diet;
- follow-up appointments;
- appropriate activity levels based on undergone procedure; and
- if applicable, when sutures can be removed.

Patients should be advised not to drink alcohol, operate machinery or drive for a period of 24 hours depending on the anaesthesia they received during their surgery (Barnett, 2016). Following administration of longer-acting volatile anaesthetics (isoflurane and halothane), current UK recommendation is that this period should be 72 hours. After this time, patients should not resume driving until their pain is sufficiently controlled and they can perform an emergency stop, and there are no procedure-specific limitations, as advised by the surgical team (Barnett, 2016).

#### **Analgesics**

One of the most prominent factors affecting patient satisfaction is the degree to which the patient experiences postoperative pain (Lotz, 2016). It is therefore of high importance to ensure that patients experience minimal pain by providing them with suitable analgesics (Lotz, 2016). It is furthermore important to emphasise that patients should take the analgesics as prescribed to ensure that minimal pain is experienced (Lotz, 2016).

All patients should receive appropriate analgesics to take home, as well as advice on dose, dosing interval and whether to take with food or not (Barnett, 2016; Ead, 2016). Day hospital facilities should have pre-packaged analgesia readily available to the nursing team, to prevent undue delays in discharge (Barnett, 2016; Quemby & Stocker, 2013; Verma et al., 2011).

**Discharge summary**

Discharge summaries should be given to the patient, with copies sent to the primary physician (Barnett, 2016; Verma et al., 2011). This summary must inform the physician of the type of anaesthetic given, the surgical procedure performed, and the postoperative instructions given (Verma et al., 2011). Patients should have a discharge summary available to them, as this can be vital if the patient requires assistance overnight (Verma et al., 2011).

**5.3.4.3 POSTOPERATIVE PHASE TABLE**

TABLE 31: BEST PRACTISES OF POSTOPERATIVE PHASE

LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Nurse-led discharge	Section 5.3.4.1	Nurse-led discharge is key to day surgery and is appropriate if protocols have been developed to guide this discharge process.	(Barnett, 2016; Quemby & Stocker, 2013; I Smith et al., 2006)
		An appropriate discharge checklist should be used to ensure the safe discharge of patients.	(British Association of Day Surgery, 2009)
Postoperative information& discharge	Section 5.3.4.2	All patients should receive verbal and written information regarding what to expect after discharge and their responsibilities.	(Barnett, 2016; Ead, 2016; Gandhimani & Jackson, 2006; Quemby & Stocker, 2013)
		All patients should receive appropriate analgesics to take home, as well as advice on dose, dosing interval and whether to take with food or not.	(Barnett, 2016; Ead, 2016)
		Day hospital facilities should have pre-packaged analgesia readily available to the nursing team, to prevent undue delays in discharge.	(Barnett, 2016; Quemby & Stocker, 2013; Verma et al., 2011).
		Discharge summaries should be given to the patient, with copies sent to the primary physician.	(Barnett, 2016; Verma et al., 2011)

### **5.3.5 POST-DISCHARGE PHASE**

---

The focus areas relevant to the post-discharge phase have been primarily identified through a literature review. The key concepts, practises, and sources relevant to the post-discharge phase can be seen in Table 32. Each of the focus areas identified are detailed in this section.

#### ***5.3.5.1 TELEPHONIC FOLLOW-UP***

Day hospital facilities must agree with their local primary care teams on how support is to be provided for patients in the event of postoperative problems (Verma et al., 2011). Best practise is a helpline for the first 24 hours after discharge and to telephone the patient the next day (Verma et al., 2011).

Routine telephonic follow-up with patients 24 hours after discharge is recommended (Ead, 2016; Verma et al., 2011). This call is typically performed by nurses. The American Association of PeriAnaesthesia Nurses also supports the completion of a follow-up phone call 24 to 72 hours postoperatively (Ead, 2016).

The telephonic follow-up serves the purpose of supporting patient safety, patient satisfaction, and compliance to discharge instructions (Ead, 2016). Telephone follow-up is highly rated by patients, provides support for any immediate complications, and is useful for auditing postoperative symptoms and patient satisfaction (Verma et al., 2011).

Nurse-led routine telephone follow-up 24 hours after surgery, provides a valuable resource for the following reasons (Ead, 2016):

- It provides immediate advice regarding any early complications that patients might experience;
- it minimises the burden on primary care;
- it is appreciated by patients thus improves patient satisfaction; and
- it is a powerful audit tool if a structured predetermined questionnaire regarding postoperative symptoms and satisfaction is completed. The questions can address assessment of continued pain and nausea management; ability to eat, drink and void; absence of fever and bleeding; and general assessment questions on their recovery.

### 5.3.5.2 POST-DISCHARGE PHASE TABLE

TABLE 32: BEST PRACTISES OF POST-DISCHARGE PHASE

LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Telephonic follow-up	Section 5.3.5.1	The telephonic follow-up after day surgery serves the purpose of supporting patient safety, patient satisfaction, compliance to discharge instructions, and is useful for auditing postoperative symptoms and patient satisfaction	(Ead, 2016; Verma et al., 2011)

### 5.3.6 GENERAL

The focus areas could not be categorised within one of the previously discussed perioperative phases are discussed in this section. These general focus areas have also been primarily identified through a literature review. The relevant key concepts, practises, and sources of the focus areas discussed in this section can be seen in Table 33. Each of the focus areas identified are detailed below in this section.

#### 5.3.6.1 UTILISE INFORMATION TECHNOLOGY

Electronically generated data can be used to evaluate current practise and optimise day hospital efficiency as well as the quality of patient care (Joshi, 2008; O'Meara, 2007). Implementing an electronic documentation system to support decision-making, ensures a positive return on investment in terms of patient safety and productivity (O'Meara, 2007). A systematic review was performed by Chaundry et al. (2006) to identify the impact of health IT systems on the quality, efficiency, and costs of healthcare services. This study concluded that health IT systems have a positive effect on improving quality of care by assisting healthcare professionals in adhering to protocols, improving disease management, and reducing medical errors (Joshi, 2008; O'Meara, 2007).

An electronic information system is more than just an alternative method of documenting patient information (O'Meara, 2007). A well-designed system can capture important data that can be used to support administrative and financial decisions. In a Decision Support System (DSS), raw data from an electronic health-record can be converted into useful information to make important patient-care decisions (O'Meara, 2007). A Decision Support System offers healthcare providers decision-making tools and identifies potential medical errors and deviations from best practises (O'Meara, 2007).

IT can add efficiency to the clinical and organisational processes of day hospitals. Using electronic documentation, reports can be easily generated, in a timelier fashion, and without manually going through medical records. The types of reports than can be generated, which will assist in improving the efficiency and quality of service of a day hospital include (O'Meara, 2007):

- Utilisation reports depicting idle times and turnover times;
- report depicting the trend of the number and types of procedures performed;
- reports indicating unusual scheduling patterns;
- computerised reports allow clinicians and providers the opportunity to carefully examine the workflow and to design strategies for improving processes;
- reports on case cancellations that may help expose systematic patterns and provide a better understanding of the causes for cancellations. Process improvement initiatives can be implemented as a result of this type of report;
- reports on daily case load and block time utilisation can also be monitored by computer-generated reports without requiring a staff member to go through the painful task of manually creating these reports;
- inventory reports can be vital in identifying overstocked items or items that are not commonly used and can lead to reduced overheads and costs; and
- reports that can identify item charges that have been inadvertently omitted or numbers that were entered inaccurately.

Historically, illegible handwriting in charts and on orders has been the cause of fatal medical errors. With electronic documentation, illegible handwriting is no longer of concern, thus improving overall patient safety (O'Meara, 2007).

### 5.3.6.2 CAPTURE PATIENT-FLOW DATA

Optimising patient flow through a day hospital facility is important for reducing wait times, minimising healthcare costs, improving patient satisfaction and providing high quality healthcare services (Vakili, Pandit, Singman, Appelbaum, & Boland, 2015). Managing processes involving a high workflow in a limited period of time requires the help of electronic record keeping systems (Beaussier et al., 2015). The utilisation of information management systems has been shown to improve patient throughput and improve day hospital efficiency (Joshi, 2008). Hospitals can combine process management with information technology to redesign patient flow for maximum efficiency and clinical outcomes (Ortiga et al., 2012).

Information is the foundation of any patient flow initiative. Patient flow is built upon the capture, integration and sharing of information, both within and across the different departments and staff (Ortiga et al., 2012). The capturing of patient flow information, however, requires the utilisation of real-time locating technology.

With this information, pathways in day surgery care can then be divided into sequential steps where the concepts of flow time and throughput can be applied to each of them in order to identify strategies to improve the overall flow of patients (Vakili et al., 2015).

Successful practise management necessitates assessments of patient flow so that the impact of interventions can be determined (Vakili et al., 2015). As standard management theory reveals, it is not possible to effectively manage that which cannot be measured (Vakili et al., 2015). Managing process involving a high workflow in a limited period of time can be difficult and may require the help of real-time locating systems (RTLS) to allow for such assessments. RTLS include a variety of technologies for asset tracking, including (Vakili et al., 2015):

- Bluetooth;
- iBeacon;
- Wi-Fi, camera vision;
- Ultrasound;
- radio frequency identification (RFID);
- infrared (IR);
- global positioning systems (GPS); as well as
- cellular signals.

For patient flow measurements in healthcare settings, the majority of RTLS methods incorporate RFID or IR technologies because these methods use designated transmitters and receivers for purportedly precise indoor room-level location information and involve setups suitable for clinics (Vakili et al., 2015).

A radio frequency identification device (RFID) maybe useful to detect non-added values in the patient's pathway and also to collect reliable data on the time spent by the patient at each step of the pathway (Beaussier et al., 2015). Radiofrequency identification tags act as automated triggers of

patient transition through stages of surgery that provide real-time information on patient throughput (Joshi, 2008). RFID offers the opportunity for an accurate collection of patient flow data making it useful to manage patient flow within day hospital facilities (Castro, Lefebvre, & Lefebvre, 2013; Coustasse, Tomblin, & Slack, 2013; Marchand-Maillet et al., 2015).

Marchand-Maillet et al. (2015) has shown that using RFID tracking system makes it possible to provide an accurate discharge time at or before the predicted time for 76% of patients.

With proper care and attention toward setup, both RFID and IR methods are equally effective at providing patient flow information (Vakili et al., 2015). While IR methods can be more reliable, more affordable RFID options may still be useful for data acquisition, particularly among day hospital facilities with more limited budgets (Vakili et al., 2015).

The method chosen to capture patient flow information should be based on the particular day hospital facility, its needs, and its current resources available.



**5.3.6.3 GENERAL TABLE**

TABLE 33: GENERAL BEST PRACTISES

LITERATURE FOCUS	SECTION REFERENCE	MOTIVATION FOR BEST PRACTISE	KEY SOURCES
Utilise Information Technology	Section 5.3.6.1	Electronically generated data can be used to evaluate current practise and optimise day hospital efficiency as well as the quality of patient care.	(Chaundry et al., 2006; Joshi, 2008; O'Meara, 2007).
Capture patient-flow data	Section 5.3.6.2	Hospitals can combine process management with information technology to redesign patient flow for maximum efficiency and clinical outcomes	(Joshi, 2008; Ortiga et al., 2012; Vakili et al., 2015).
		For patient flow measurements in day hospital settings, the most appropriate real-time locating systems are: <ul style="list-style-type: none"> <li>• Radio frequency identification systems; and/or</li> <li>• Infrared (IR) systems.</li> </ul>	(Castro et al., 2013; Coustasse et al., 2013; Marchand-Maillet et al., 2015; Vakili et al., 2015)

## **5.4 CHAPTER CONCLUSION**

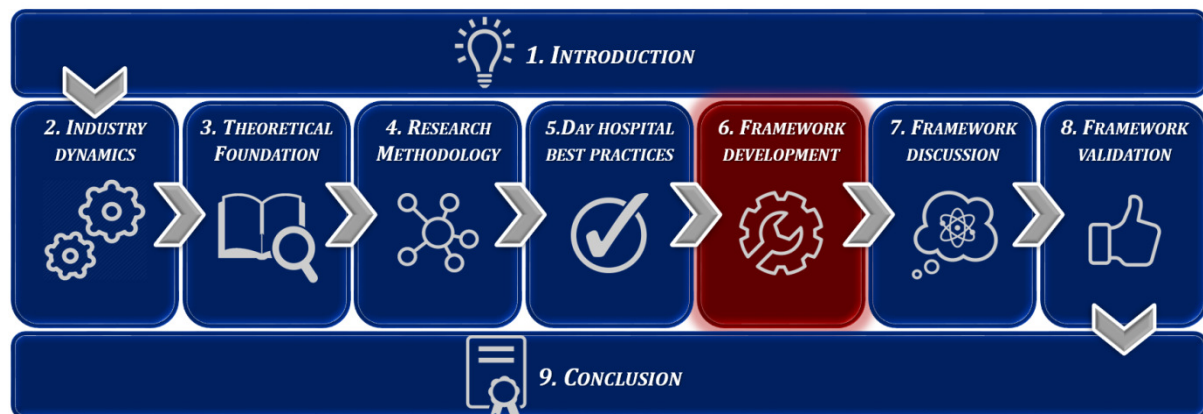
---

---

The purpose of this chapter was to investigate and identify all the various dimensions that should be included in the maturity model framework for day hospitals. Initially, this chapter investigated all the elements involved in day hospital operation with significant impact on day hospital efficiency, performance and profitability. These dimensions were identified through formulating a conceptual patient flow pathway. The relevant best practises associated with each of the patient flow phases was then investigated. The conceptual patient flow strategy followed to identify the dimensions of the maturity model framework for day hospitals, was validated as being representative of day hospital practises within the industry by a subject matter expert.

# Chapter 6 *FRAMEWORK DEVELOPMENT*

The purpose of Chapter 6 is to formulate the criteria that the various dimensions identified in Chapter 5 should meet to reach a specific maturity level. For the sake of comprehensiveness, this chapter also re-iterates and elaborates on the research strategy steps that should be completed in the development of a maturity model. This chapter addresses the first three phases of the research strategy as outlined in Chapter 4, excluding the final step of Phase III, namely, grouping the identified dimensions into main focus areas. This final step is addressed in Chapter 7.



## **6.1 CHAPTER INTRODUCTION**

---

---

The sections discussed in this chapter are aligned with the research strategy approach set out in Figure 37. This chapter addresses the first two phases of the research strategy, as well as the first three steps of Phase III. Phase I and Phase II are re-iterated for the sake of comprehensiveness. The remaining final step of Phase III, and Phase IV and V are addressed in Chapter 7 and Chapter 8.

## **6.2 PHASE I**

---

---

This is the first phase of the research strategy of this study. This first stage addresses the identification of the research problem. The two steps included in this phase are discussed below.

### **6.2.1 PROBLEM DEFINITION**

---

The first step in the development of a maturity model is comprehensively defining the problem for which a solution is to be proposed. The problem for this thesis has been identified as, the lack of a framework that allows day hospitals to measure and assess their evolvment towards day hospital management maturity.

Although various day hospitals are already operational throughout South Africa they are mostly managed by companies and people with experience in managing traditional, general hospitals. Consequently, day hospitals are still being managed according to traditional hospital management principles. As a result, they are not gaining all the benefits that could be acquired from operating day hospitals according to global day hospital best practices.

The solution to this problem has been identified as the development of a maturity model that allows day hospitals to assess their current management maturity against industry best practises.

### **6.2.2 DEFINE AIM**

---

This maturity model is primarily developed for benchmarking purposes. It thus specifies best practices that have been demonstrated to add value within the operation of a day hospital. This model provides an 'as-is' snapshot of the efficiency of a day hospital at a certain point. It does however not provide guidance in how to improve the maturity level of a day hospital. The day hospital maturity model developed in this thesis is thus purely descriptive in nature.

## **6.3 PHASE II**

---

---

The second phase of the research strategy for this study aims to understand and investigate the environment and context in which the maturity model is to be developed. The steps of this phase are discussed below.

### **6.3.1 IDENTIFY & SCOPE FUNCTIONAL DOMAIN**

---

The focus of the day hospital maturity model can be regarded as being domain-specific, rather than generic. The model is developed for the purpose of allowing day hospitals to benchmark their performance with best practises in the day hospital industry. The model is domain-specific for day hospital efficiency. The maturity model is developed to assess the efficiency, performance and profitability of day hospitals within the healthcare domain.

As the focus of this model is domain-specific within a relatively new domain of practise, it was especially important to gather information about the context, the idiosyncrasies and terminology of the specific domain. An extensive review of existing literature in the areas of day hospital efficiency and best practises (Chapter 5); maturity model development (Chapter 3); and day hospital operation (Chapter 2) was thus performed.

The day hospital domain was further scoped through the observation of various day hospitals operating within the private healthcare sector of South Africa. This is comprehensively discussed in Section 4.3.2.2.

From an integration of the various dimensions of the literature arising in the three research areas of the day hospital industry, related maturity models and day hospital best practises, and the knowledge gained from observation, an initial maturity model framework for day hospitals was developed. This initial model can be seen in Table 34.

### **6.3.2 IDENTIFY STAKEHOLDERS & AUDIENCE**

---

It is fundamental for success to clarify which stakeholders should be addressed by the model. The primary development stakeholder of the maturity model is the researcher of this thesis. Other stakeholders involved in the development of the model include, experts within the day hospital industry that assisted in the development process.

The model is developed with the focus on providing guidance to day hospital managers. The expected users can, however, include anyone involved in the management of day hospitals, such as upper management, physicians, nursing staff, or members of support staff.

### **6.3.3 COMPARISON OF EXISTING MODELS**

---

A systematic mapping study by Wendler (2012), revealed that the maturity model research is dominated by studies in the software engineering field. The number of studies that adapt these models to healthcare domain or propose healthcare-specific maturity models is very scarce (Tarhan, Turetken, & van den Biggelaar, 2015). The existing or related work on the use of maturity models in healthcare as identified by Tarhan, Turetken, & van den Biggelaar (2015) are discussed below.

Mettler & Blondiau (2012) propose a maturity model that is aimed to assist hospitals in evolving the required strategic, organisational, and technical capabilities in a systematic way so that the formation of collaborative structures and processes is efficient and effective. This maturity model was not addressed in depth as this thesis is not focused on assessing the quality of cooperation between and within hospitals. This study was however studied for background knowledge.

Gemmel et al. (2007) adapted an existing tool of BPO to the specific context of healthcare. This maturity model is comprehensively discussed in Section 3.10.1.

Cleven et al. (2014) declared an empirically grounded conceptualisation of process management capabilities, and presented a staged capability maturity model algorithmically derived on the basis of empirical data from 129 acute somatic hospitals in Switzerland. This model is also comprehensively discussed in Section 3.10.2.

Tarhan, Turetken, & van den Biggelaar (2015) performed a business process maturity assessment of the ophthalmology department of a hospital operating in the Netherlands. They shared their experience in using OMG's Business Process maturity model as the base for the assessment. This study was also studied for background knowledge.

The Hospital Supplier Relationship Management (HSRM) maturity model was developed and implemented by Mettler & Rohner (2009) to identify the strength and weaknesses of hospital supplier relationship management activities. The development method of this model was studied as it presents an approach to designing situational maturity models. This HSRM maturity model is detailed in Section 3.7.2.

Despite studying and comparing the various maturity models within the healthcare industry, no maturity model could be identified that was focused on assessing the maturity of a day hospital. This allowed for this research study to be conducted as there was no such research study previously performed.

## **6.4 PHASE III**

---

---

This chapter only addresses the first three steps of Phase II of the research strategy, as set out in Figure 37. These steps are discussed below. The remaining steps of the research strategy approach are elaborated on in the chapters to follow.

### **6.4.1 DETERMINE DIMENSIONS OF MATURITY MODEL**

---

Best practises for day hospital management was comprehensively discussed in Chapter 5. These best practices form the dimensions of the maturity model framework for day hospitals. How these best practises and dimensions were identified are discussed in Section 4.3.2.2.

### **6.4.2 DETERMINE MATURITY LEVELS**

---

Three to four maturity stages were identified for the maturity model framework for day hospitals. The appropriate number of stages was determined based on the relevant dimensions. The rationale and approach for determining the maturity stages is comprehensively discussed in Section 4.3.2.2. These maturity stages are visually depicted and defined in Section 7.2.2.

### **6.4.3 FORMULATE CELL TEXT OF MATURITY MODEL**

---

Based on the assumption of three to four maturity levels, the cell texts were subsequently formulated. These cell texts were formulated with the knowledge gained from the comprehensive study of day hospital best practices in Chapter 5. An initial maturity model can be seen in Table 34.

TABLE 34: FORMULATION OF CELL TEXT FOR MATURITY MODEL FRAMEWORK FOR DAY HOSPITALS

SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
<b>PRE-ADMISSION PHASE</b>				
Appropriate patient selection	No system in place to appropriately select fit patients for day surgery.	Only surgical factors are considered before clearing a patient for day surgery. Refer to Section 5.3.1.1 for a description of what entails surgical factors.	Surgical and medical factors are considered before clearing a patient for day surgery. Refer to Section 5.3.1.1 for a description of what entails surgical and medical factors.	All the required factors, namely surgical, medical and social factors are considered before clearing a patient for day surgery. Refer to Section 5.3.1.1 for a description of what entails surgical, medical and social factors.
Preoperative patient assessment	Patient does not undergo a preoperative assessment before day surgery.	A patient undergoes a pre-anaesthesia evaluation by an anaesthesiologist before day surgery that includes, a physical exam, obtaining surgical-related information from the patient, as well as obtaining the patient's medical history. Please refer to Section 5.3.1.2 for further details on what a pre-anaesthesia evaluation entails.	Patient undergoes pre-anaesthesia evaluation, and the subsequent tests required are not based on performing routine tests. Preoperative tests are thus ordered based on targeted interventions that considers the patient's individual co-morbidities.	Patient undergoes pre-anaesthesia evaluation; the subsequent testing is based on patient-directed, targeted intervention that consider the patient's individual co-morbidities; and the patient's medical risk factors are identified and medical conditions are optimised before day surgery.
Provide patient pathway information	No perioperative pathway information is provided to the patient before undergoing surgical day procedure.	Not all the required patient pathway information is provided. Only some information is preoperatively provided solely through verbal communication. Section 5.3.1.3 details all the patient pathway information that must be provided to the patient.	All the required patient pathway information is preoperatively provided to patient during the preoperative assessment. This information is provided to the patient through verbal communication. Section 5.3.1.3 details all the patient pathway information that must be provided to the patient.	Patient pathway information is given to the patient during the preoperative assessment. The information provided includes a passport intended to explain the surgical pathway, preoperative instructions and recommendations, information regarding postoperative recovery, as well as emergency numbers. This information is provided by written documentation, verbal communication provided by a nurse, as well as information available on a website.



SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
Preoperative telephonic patient screening	No procedures are in place that allows for preoperative telephonic patient screening.	No formal procedures in place that allow for preoperative telephonic patient screening. Patients are contacted on an ad hoc basis. No script is in place to educate the patient regarding preoperative policies and preparedness. Telephonic screening is solely performed by administrative staff. Refer to Section 5.3.1.4 for a detailed list of what a preoperative telephonic patient screening should address.	There are some formal structures in place that allows for preoperative telephonic patient screening. Patients are informed of most of the required information, but inconsistencies often occur, as no formal script exists to educate patients regarding preoperative policies and preparedness. Preoperative telephonic patient screening is inconsistently performed by administrative and nursing staff. Refer to Section 5.3.1.4 for a detailed list of what a preoperative telephonic patient screening should address.	Procedures are in place that allow for preoperative telephonic patient screening three days before the day surgery. Telephonic screening is performed by a registered nurse. A comprehensive script is in place to educate the patient regarding preoperative policies and preparedness. Refer to Section 5.3.1.4 for a detailed list of what a preoperative telephonic patient screening should address.
<b>PREOPERATIVE PHASE</b>				
Dedicated facility design	Day surgery cases are placed within a general ward of a general, in-patient hospital. Day cases and general cases are thus mixed within the same ward. Operating rooms are shared to handle day cases and general cases.	Day cases are placed within a dedicated day case ward. This ward is, however, still located within a general, in-patient hospital facility. Operating rooms are shared to handle day cases and general cases	Day surgery occurs within a self-contained and dedicated unit. This type of facility has its own OR's for handling solely day cases. It does, however, still share some of its resources with the in-patient facility such as admission & reception area, waiting rooms, and administrative staff.	Day surgery occurs within a self-contained and dedicated unit, separate from in-patient facilities. The day surgery has its own admission & reception area, waiting rooms, wards, theatres, operating lists, recovery rooms, dedicated staff and dedicated administrative facilities.
Stagger admission times	No procedures are in place for establishing patient admission times.	All patients undergoing a procedure are required to arrive in the morning at a certain time, irrelevant of the time of the particular patient's surgery is scheduled.	All patients undergoing surgery in the morning, all arrive at a specified time, the same applies for patient that are scheduled for afternoon surgery that all arrive at a specified time. The number of patients required to arrive for their surgery at a specified time is, however, not in accordance with the number of OR's available.	The number of first-called patients is in accordance with the number of available OR's. This applies for patients scheduled for surgery in the morning, as well as in the afternoon.

SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
Minimum patient beds	All patients are assigned a hospital bed for their entire stay in the day hospital facility from admission until discharge. The bed is thus occupied from the time the patient is admitted until the bed is covered with fresh linen. Only then can a new patient be assigned that particular hospital bed.		The patient is assigned a hospital bed during admission. The patient is taken into the OR on this bed. The patient is then transferred from the hospital bed to the operating bed/table. After the patient is discharged from the OR, the patient is once again placed in the hospital bed, and taken to the ward. The patient is then transferred to a chair for further recovery at the safest, earliest time so as to free up the bed for the next patient.	If the surgical procedure allows for it, the patient is not assigned a hospital bed at admission. The patient waits in a chair until surgery, when the patient walks to the OR and climbs onto the operating bed. When the patient is recovered from anaesthesia and discharged from the OR, the patient is placed in a lazy boy until able and comfortable to be discharged from the day facility. Beds are reserved only for more complex cases requiring the patient to lay down.
Continuous quality improvement & process improvement focus	The day hospital does not have a culture that is focused on continuous improvement of processes and quality. There is no system in place for the development of a continuous quality improvement programme.	The day hospital does not have culture focuses on quality improvements. Quality improvement projects are rarely undertaken and are performed on an ad hoc basis. No systems are in place for regular auditing. Staff are not involved or motivated to improve efficiency with the day hospital facility, only upper management is involved in these improvement projects.	The day hospital is in the process of developing a culture focused on continuous quality improvement. Some staff are involved and motivated to improve quality and efficiency. No value is attached to the inputs of staff. There are systems and procedures in place that allow for the development of continuous quality improvement projects. These systems and procedures are, however, not fully developed or successful and requires attention to be fully developed. No procedures and policies are in place for regular auditing.	Highly developed continuous quality improvement programs are in place to monitor and modify performance. Adequate procedures and policies are in place to ensure regular audits are performed. Staff are involved, motivated and invested in improving the overall quality and efficiency of the day hospital facility. Their ideas and inputs are encouraged and valued. The proper steps are followed to improve efficiency within a healthcare setting. Refer to Section 5.3.2.4

SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
Development of performance metrics	The day hospital has no established process and performance metrics that are measured on a regular basis.	The day hospital has some performance metrics that are measured on an ad hoc basis. These performance metrics are not updated or reviewed on a regular basis. The data obtained from the measured metrics are not consolidated into useful reports. No feedback obtained from the measured performance metrics is communicated to staff. Also, no committee is appointed to provide leadership and drive improvement initiatives.	The day hospital has well-developed performance metrics in each of the three relevant dimensions, namely: financial; operational; and clinical. These metrics are, however, not measured on a regular basis. Reports are generated from time-to-time in instances where metrics were measured. However, these reports are not utilised to drive improvement initiatives. There does exist a committee in charge of measuring metrics, analysing outcomes, and implementing improvement initiatives. Although this committee is not committed to actively perform their duties and seldom motivate and engage with staff. The results that are obtained from the measured metrics are communicated to staff from time-to-time.	The day hospital has established performance metrics in each of the following three dimensions: financial; operational; and clinical. These metrics are established by committee consisting out of various stakeholders within the facility. This committee successfully measures and analyses processes and outcomes important to the facility; and provides leadership to advance change initiatives that arise from measurement results. The change initiatives are consolidated into comprehensive improvement plans aligned with the day hospital's strategic initiatives. There are procedures in place to ensure that metrics are frequently updated as required. Measured data is always synthesised into reports on time and subsequently shared with all staff through various communication channels. All staff is actively committed and engaged in collecting accurate measurement data, analysing the data, and suggesting improvements.
Multi-disciplinary staff	Staff only has the ability to perform tasks that they are trained in. Staff are only focused on completing their own individual tasks, and are not willing to help others complete their tasks. There is no sign of staff working together as a team to complete tasks.	The minority of staff members are multi-skilled, and are mostly only able to perform tasks within a particular area within the day hospital facility. Staff members are primarily concerned with completing the tasks for which they are appointed. There is some willingness from some staff members to help others to ensure tasks are completed faster. Some staff members are thus focused on a team approach; however other members are not involved in completing tasks as a team.	The majority of the staff is multi-skilled and able to work in different areas within the day hospital facility. There are, however, staff members that still require training in some areas. The majority of staff are willing and able to do a variety of tasks. There is still development required to get staff to function effectively within teams, as there is not a high degree of multi-disciplinary team working.	Appointed staff consist out of a multi-disciplinary team. All appointed staff are multi-skilled and trained to be able to work in a variety of areas within the day hospital. Staff are able and willing to perform all types of tasks that must be completed within the day hospital facility. Staff are highly-focused on team work and are able to quickly and effectively complete tasks.

SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
Appointed medical director	No medical director is appointed for the development of local policies, guidelines, and clinical governance. There is only an appointed day hospital manager in charge of the day-to-day operations of the hospital, but without the support of a multi-disciplinary operational group in the operation of the day hospital facility.	No medical director is appointed by the day hospital facility, there is only a manager appointed. This day hospital is supported by a multi-disciplinary operational group in the day-to-day operations of the day hospital facility. The day hospital manager is responsible for manager duties, as well as for the some of the duties that a medical director would be responsible for. These duties that the medical director should be responsible for is detailed in Section 5.3.2.7.	The day hospital has an appointed medical director. The medical director is, however, not an anaesthesiologist. There is also an appointed day surgery manager, however there is no multi-disciplinary operational group to support the manager in charge of the day-to-day operations of the day hospital facility. The medical does not fulfil all his responsibilities as detailed in Section 5.3.2.7.	The day hospital has an appointed medical director. This medical director is a consultant anaesthesiologist with management experience. The medical director is focused on building positive relationships with all staff members. The medical director is further focused on encouraging a multi-disciplinary team approach to delivering high quality healthcare services. The medical director successfully performs the tasks as detailed in Section 5.3.2.7. There is an appointed day surgery manager in charge of day-to-day operations of the day hospital facility, supported by a multi-disciplinary operational group.
<b>OPERATIVE PHASE</b>				
Perioperative anaesthesia management	No consideration is given to choose the optimal anaesthetic techniques, analgesia management, and postoperative nausea and vomiting techniques. Purely routine protocol is followed regarding these three aspects.	Consideration is given to ensure that the optimal anaesthetic techniques are chosen based on the surgical procedure. However, no consideration is given to ensure that the anaesthetic techniques chosen are patient-specific. Solely, routine protocol is followed regarding the management of analgesia and postoperative nausea and vomiting.	Consideration is given to ensure that the optimal anaesthetic techniques are chosen based on the surgical procedure to be performed, as well as based on the individual patient undergoing the procedure. No consideration is given to ensure that optimal patient-specific analgesia management or postoperative nausea and vomiting management takes place. Solely routine protocol is followed regarding the management of analgesia and postoperative nausea and vomiting.	A high degree of consideration is given to ensure that the optimal anaesthetic techniques are chosen based on the surgical procedure to be performed, as well as based on the individual patient undergoing the procedure. Ensuring that the patient returns to normal function as fast and safely as possible after undergoing day surgery is of high importance to the day hospital. Attention is given to ensure that a patient-specific approach is given to ensure that the patient experiences the least amount of postoperative pain, is as comfortable, and can be discharged at the earliest safest time. Specific attention is further given to ensure that postoperative nausea and vomiting is optimally managed to ensure that the patient can be discharged at the earliest safest time.

SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
Fast-tracking	There are no protocols in place to fast-track patients after undergoing day surgery. A traditional approach is taken to discharging patients from the OR, where all patients recover within the PACU.		<p>Protocols are in place to ensure some patients are safely fast-tracked after day surgery. These protocols, however, require a high degree of refinement so as to increase the number of cases being safely fast-tracked in the day hospital.</p> <p>A trusted scoring system, such as the White Fast-Track Scoring system, is used to ensure patients are not prematurely discharged from the OR.</p> <p>The process of fast-tracking patients within the day hospital facility has not been proven to significantly increase hospital efficiency.</p>	Well-developed protocols are in place that ensure the majority of patients are safely fast-tracked after day surgery. Fast-tracking protocols are refined to levels that enable even highly complex cases to be fast-tracked. A trusted scoring system, such as the White Fast-Track Scoring system, is used to ensure patients are not prematurely discharged from the OR. The process of fast-tracking patients within the day hospital facility has proven to increase hospital efficiency.
Operating room scheduling	No formal scheduling system is implemented within the day hospital facility. Surgical day procedures are predominantly scheduled with an ad hoc approach. The day hospital manager has no knowledge regarding all the various scheduling techniques available for surgery scheduling within day hospitals.	The day hospital manager has very limited knowledge regarding all the various scheduling techniques available for surgery scheduling within day hospitals. OR scheduling is purely based on traditional scheduling as used in general hospitals. These traditional scheduling techniques used in general hospitals are not adapted or suited to the features of a day hospital.	The day hospital manager is aware and has knowledge regarding all the various scheduling techniques available for surgery scheduling within day hospitals. The scheduling techniques chosen on which OR scheduling is based is not adapted to the characteristics and needs of the specific day hospital facility under study. One of the scheduling techniques available for day hospitals is simply implemented without any adaption or integration of scheduling systems. The scheduling system used has not proven to significantly increase OR efficiency. KPI's are not developed to measure the efficiency of the facility. Subsequently, no protocols are in place to predict the average duration of various procedures.	The day hospital manager has an advanced knowledge regarding all the various scheduling techniques available for surgery scheduling within day hospitals. The chosen scheduling technique used in the day hospital facility is adapted to suit the characteristics and needs of the particular hospital. Various scheduling techniques have been integrated to develop an optimal scheduling system for the day hospital facility. This customised scheduling system has been proven to increase OR efficiency, and meets the general KPI's of an effective day hospital facility. These KPI's can be seen in Section 5.3.3.3. Protocols are in place to predict the average duration of various procedures based on historical data. This data is analysed and utilised to customise the scheduling system used within the facility.

SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
Implementation of lean management principles	There is no regard or consideration toward implementing lean principles within the day hospital. No attempt has been made to investigate the possibility of implementing lean principles.	The implementation of lean principles has been researched and considered. There has, however, not been any active attempts made by management to implement lean management within the day hospital.	Some lean principles have been implemented within the day hospital. These implemented principles are, however, not being actively managed to continually improve processes within the day hospital setting.	Lean thinking has been integrated into the day hospital as a fundamental quality improvement and management system to improve efficiency and productivity. All four lean principles crucial within the day hospital setting, namely flow time, capacity, production batch management, and JIT, are applied. Please refer to Section 5.3.3.4 for a detailed description of each of these lean principles.
<b>POSTOPERATIVE PHASE</b>				
Nurse-led discharge	The discharging of patients is exclusively performed by surgeons. There are no protocols in place within the day hospital that allows for patients to be discharged by nurses.		Patients are predominantly discharged by surgeons. Nurses only discharge very simple cases. There are no formal protocols in place that allow for nurse-led discharge. There exists a very simple checklist to guide the process of nurse-led discharge. This checklist does, however, require a high degree of development to ensure that patients are safely discharge at the earliest time.	Nurse-led discharge is the predominant approach followed for the discharge of patients. Only highly complex cases require discharge to be performed by the surgeon. A highly refined and approved discharge protocol exists to ensure the fastest, safest discharge of patients. A discharge checklist is developed for nurses that ensure patients are safely discharged. An example of such a checklist can be seen in Section 5.3.4.1.

SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
Postoperative information & discharge	Postoperative information is exclusively provided through verbal communication. Only very basic, routine postoperative information is given to patients.		Postoperative information is exclusively provided through verbal communication. This information is not always conveyed in the presence of an adult who is responsible for the patient postoperatively. The information and instructions provided are basic, routine information given to all patients. The postoperative information and instructions are thus not tailored to the specific patient or the surgical procedure the patient has undergone. The day hospital facility does not have pre-packed analgesia available for the patient at the time of providing discharge information and instructions. No discharge summary is provided to patients.	Postoperative information and instructions are provided through verbal and written communication. Instructions are only given to patients in the presence of the adult who is responsible for the patient postoperatively. The information and instructions provided to the patient is tailored specific to the patient and the procedure undergone. The information and instructions shared with the patients includes a complete list of information as can be seen in Section 5.3.4.2. The day hospital facility has pre-packed analgesia available for the patient at the time of providing discharge information and instructions. A discharge summary is also provided to the patients in case a postoperative emergency situation might arise.
<b>POST-DISCHARGE PHASE</b>				
Telephonic follow-up	Currently no form of contact is made with the patient after being discharged from the day hospital facility. The only form of postoperative contact is initiated by the patient.	Telephonic contact is being made with patient on an ad hoc basis, given staff have the time to contact patients. Administrative staff are responsible for making postoperative telephonic contact with patients. There is no script developed to guide staff in asking the correct questions and conveying the correct information. This contact is predominantly made 72 hours after patient discharge.	Telephonic contact is made with the majority of patients after discharge. This contact, however, does not always occur within 24 hours after the patient has been discharged. Administrative staff and nursing staff unsystematically make postoperative contact with patients. A script does exist that guides staff in asking the correct questions and conveying the correct information. However, this script is not always followed. There exists a lot of room for improvement regarding the development of the script.	A well-developed protocol is in place that allows for all patients to be telephonically contacted within 24 hours after being discharged. The telephonic contact with patients is made by nurses. A formal script exists that guides staff in asking the correct postoperative questions and conveying the correct information. This script is always rigidly followed and utilised by staff.
<b>GENERAL</b>				

SUB-DIMENSIONS	MATURITY LEVEL			
	Level 0	Level 1	Level 2	Level 3
Utilise Information Technology	Currently the capturing of patient information is exclusively paper-based. No electronic documentation system exists within the day hospital facility to capture and analyse data.	Some information is electronically captured. The majority of data is still captured on paper. Captured data is never analysed to evaluate current practise of the day hospital.	The majority of data is captured on an electronic information system. This data is not optimally utilised and analysed as no decision support system exists; which allows for the day hospital facility to use the captured data to make informed decisions.	Data and information is exclusively captured within an electronic information system. The day hospital facility utilises this captured data through a decision support system that allows for the facility to use the captured data to make informed decisions. Relevant reports are routinely generated and reviewed to assess and evaluate current practises. Refer to Section 5.3.6.1 to view important reports that should be generated to review efficiency and quality of service of the facility. Based on the results of these reports, decisions are made regarding how to further optimise the efficiency of the day hospital.
Capture patient-flow data	No systems are in place to track or capture patient-flow data within the day hospital facility. No attempts are made to capture patient-flow data.	Attempts have been made to manually capture patient-flow data. The majority of these attempts are unsuccessful as the data is mostly corrupt or not dependable. Subsequently, captured data is not reviewed or analysed on a regular basis.	Real-time locating technologies are implemented within the day hospital facility to capture patient-flow data. This captured data is not optimally utilised, as data is not analysed or reviewed on a regular basis to identify and implement improvement initiatives.	Sophisticated real-time locating systems, such as radio frequency identification technology or infrared technology, are in place to capture patient-flow data. This captured data is analysed and reviewed on a regular basis to identify and implement improvement initiatives.



## **6.5 CHAPTER CONCLUSION**

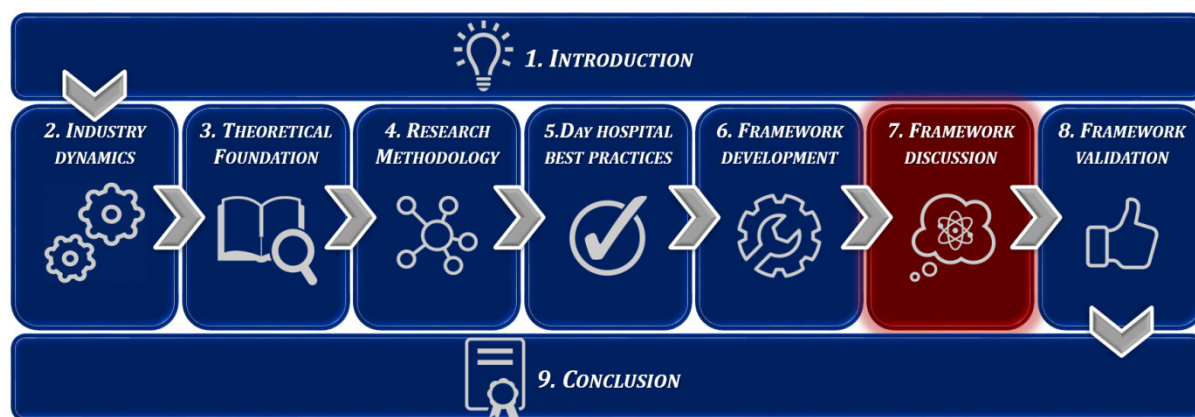
---

---

The purpose of this chapter was to formulate the criteria that the various best practise dimensions, as identified in Chapter 5, should meet to reach a specific maturity level. For the sake of comprehensiveness, this chapter also re-iterates and elaborates on the research strategy steps that should be completed in the development of a maturity model. This chapter, therefore, addressed the first three phases of the research strategy as outlined in Chapter 4, excluding the final step of Phase III, namely, grouping the identified dimensions into main focus areas. The remaining step of Phase III, as well as Phase IV that offers the final maturity model framework for day hospitals, is presented in Chapter 7. The final Phase V, of evaluating the maturity model, is addressed in Chapter 8.

# Chapter 7 FRAMEWORK DISCUSSION

Chapter 7 presents and proposes the final solution to the stated research problem. This chapter draws on all the knowledge gained from Chapter 3; investigating all the elements of maturity models. Chapter 5; investigating all the different dimensions affecting the efficiency of day hospitals, as well as Chapter 6 that establishes the context in which the framework is developed. Subsequently, this chapter consolidates and integrates all the knowledge acquired thus far to establish the final maturity model framework for day hospitals. The final maturity model framework for day hospitals is thus presented in this chapter. Chapter 7 comprehensively discusses the elements of a proposed framework for assessing and growing the capability maturity of day hospitals. These elements discussed include the main focus areas of the model, the various maturity levels, as well as the structure of the model. This chapter concludes by presenting an example on how this model can be used.



## 7.1 FRAMEWORK OVERVIEW

Chapter 5 investigated all the various dimensions affecting the efficiency of day hospital operation. The knowledge gained from this chapter and knowledge acquired from investigating the fundamentals of developing maturity models in Chapter 3 was consolidated into the final maturity model framework for day hospitals. The purpose of this framework is to enable day hospital management to assess the maturity of their facility in terms of efficiency.

## 7.2 FRAMEWORK ELEMENTS

The maturity model framework for day hospitals, presented in Section 7.3, consolidates three primary elements of maturity models namely, the main maturity dimensions and sub-dimensions, the maturity levels of the model, and the structure of the model. These three elements of the maturity model framework for day hospitals are elaborated on in this section.

### 7.2.1 FRAMEWORK MAIN FOCUS AREAS

All the various dimensions and components of maturity models were investigated in Chapter 3. From investigating the various critical focus areas of a number of business process maturity models, the main focus areas deemed relevant for the day hospital maturity model were identified. Section 4.3.2.2 details how these main focus areas were established. These identified main focus areas are visually depicted and defined in Figure 49.

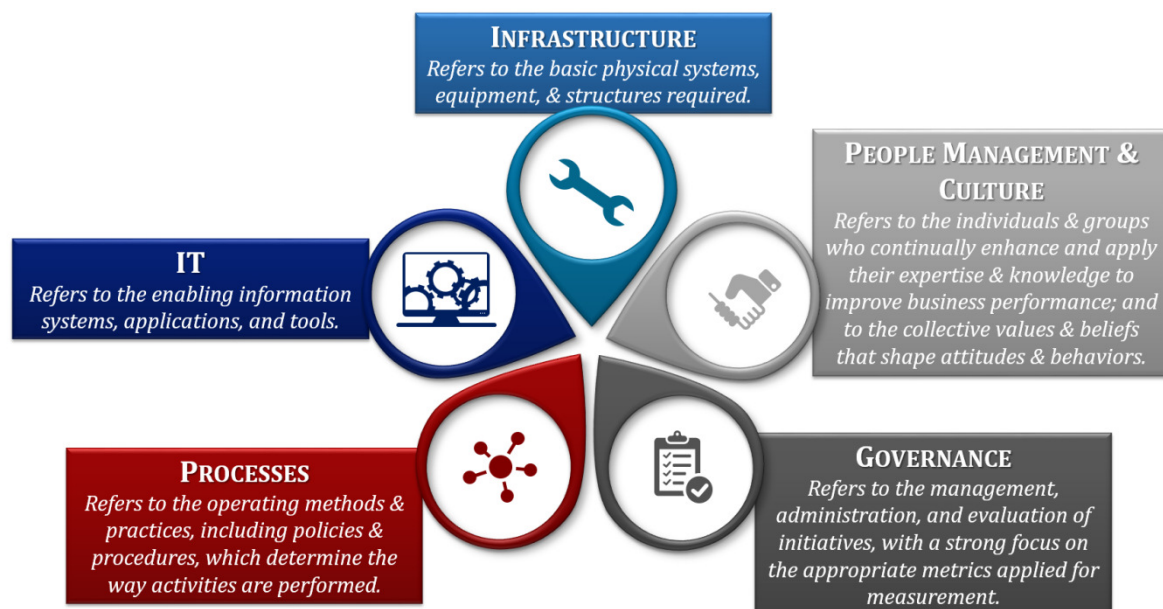


FIGURE 49: MAIN FOCUS AREAS OF THE MATURITY MODEL FRAMEWORK FOR DAY HOSPITALS

## 7.2.2 MATURITY PHASES

After all the dimensions affecting the efficiency of a day hospital facility were considered in Chapter 5, it was established that the majority of the dimensions can be broken down into three to four levels of maturity. Section 4.3.2.2 details how these maturity levels were established. The maturity levels for the maturity model framework for day hospitals are depicted and defined in Figure 50.

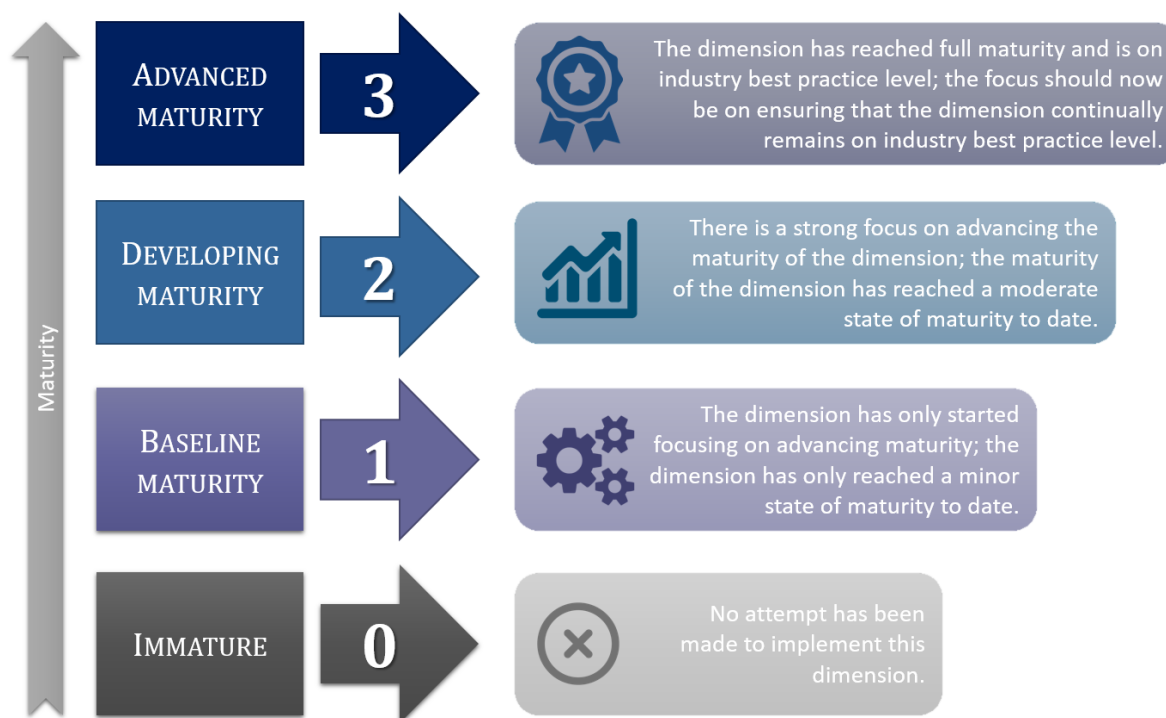


FIGURE 50: MATURITY LEVELS DEFINED FOR THE MATURITY MODEL FRAMEWORK FOR DAY HOSPITALS

## 7.2.3 THE MATURITY MODEL STRUCTURE

In order to understand the structure of the final maturity model framework for day hospitals in Section 7.3, a condensed depiction of the structure of the model is presented in Figure 51.











FIGURE 51: STRUCTURE OF THE MATURITY MODEL FRAMEWORK FOR DAY HOSPITALS









As can be seen from Figure 51, this figure depicts the main focus areas in relation to the maturity stages. Within the final maturity model framework for day hospitals, depicted in Table 35, the main focus areas are broken down into its constituent dimensions.




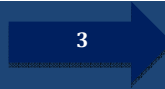




### **7.3 THE MATURITY MODEL FRAMEWORK FOR DAY HOSPITALS**

Utilising the main focus areas, maturity phases and structure of the model as defined in Section 7.2.1, Section 7.2.2, and Section 7.2.3, the final maturity model framework for day hospitals is presented in Table 35.









TABLE 35: MATURITY MODEL FRAMEWORK FOR DAY HOSPITALS









				
	 IMMATURE	 <b>BASELINE</b> MATURITY	 <b>DEVELOPING</b> MATURITY	 <b>ADVANCED</b> MATURITY
<b>PROCESSES</b>				
<b>Appropriate patient selection</b>	No system in place to appropriately select fit patients for day surgery.	Only surgical factors are considered before clearing a patient for day surgery. Refer to Section 5.3.1.1 for a description of what entails surgical factors.	Surgical and medical factors are considered before clearing a patient for day surgery. Refer to Section 5.3.1.1 for a description of what entails surgical and medical factors.	All the required factors, namely surgical, medical and social factors are considered before clearing a patient for day surgery. Refer to Section 5.3.1.1 for a description of what entails surgical, medical and social factors.
<b>Preoperative patient assessment</b>	Patient does not undergo a preoperative assessment before day surgery.	A patient undergoes a pre-anaesthesia evaluation by an anaesthesiologist before day surgery that includes, a physical exam, obtaining surgical-related information from the patient, as well as obtaining the patient's medical history. Please refer to Section 5.3.1.2 for further details on what a pre-anaesthesia evaluation entails.	Patient undergoes pre-anaesthesia evaluation, and the subsequent tests required are not based on performing routine tests. Preoperative tests are thus ordered based on targeted interventions that considers the patient's individual co-morbidities.	Patient undergoes pre-anaesthesia evaluation; the subsequent testing is based on patient-directed, targeted intervention that consider the patient's individual co-morbidities; and the patient's medical risk factors are identified and medical conditions are optimised before day surgery.
<b>Provide patient pathway information</b>	No perioperative pathway information is provided to the patient before undergoing surgical day procedure.	Not all the required patient pathway information is provided. Only some information is preoperatively provided solely through verbal communication. Section 5.3.1.3 details all the patient pathway information that must be provided to the patient.	All the required patient pathway information is preoperatively provided to the patient during the preoperative assessment. This information is provided to the patient through verbal communication. Section 5.3.1.3 details all the patient pathway information that must be provided to the patient.	Patient pathway information is given to the patient during the preoperative assessment. The information provided includes a passport intended to explain the surgical pathway, preoperative instructions and recommendations, information regarding postoperative recovery, as well as emergency numbers. This information is provided by written documentation, verbal communication provided by a nurse, as










				
	 IMMATURE	 BASELINE MATURITY	 DEVELOPING MATURITY	 ADVANCED MATURITY
				well as information available on a website.
Preoperative telephonic patient screening	No procedures are in place that allow for preoperative telephonic patient screening.	No formal procedures in place that allow for preoperative telephonic patient screening. Patients are contacted on an ad hoc basis. No script is in place to educate the patient regarding preoperative policies and preparedness. Telephonic screening is solely performed by administrative staff. Refer to Section 5.3.1.4 for a detailed list of what a preoperative telephonic patient screening should address.	There are some formal structures in place that allow for preoperative telephonic patient screening. Patients are informed of most of the required information, but inconsistencies often occur, as no formal script exists to educate patients regarding preoperative policies and preparedness. Preoperative telephonic patient screening is inconsistently performed by administrative and nursing staff. Refer to Section 5.3.1.4 for a detailed list of what a preoperative telephonic patient screening should address.	Procedures are in place that allow for preoperative telephonic patient screening three days before the day surgery. Telephonic screening is performed by a registered nurse. A comprehensive script is in place to educate the patient regarding preoperative policies and preparedness. Refer to Section 5.3.1.4 for a detailed list of what a preoperative telephonic patient screening should address.
Stagger admission times	No procedures are in place for establishing patient admission times.	All patients undergoing a procedure are required to arrive in the morning at a certain time, irrelevant of the time of the particular patient's surgery is scheduled.	All patients undergoing surgery in the morning, all arrive at a specified time, the same applies for patient that are scheduled for afternoon surgery that all arrive at a specified time. The number of patients required to arrive for their surgery at a specified time are, however, not in accordance with the number of OR's available.	The number of first-called patients is in accordance with the number of available OR's. This applies for patients scheduled for surgery in the morning, as well as in the afternoon.
Perioperative anaesthesia management	No consideration is given to choose the optimal anaesthetic techniques, analgesia management, and postoperative nausea and vomiting techniques. Purely routine protocol is followed regarding these three aspects.	Consideration is given to ensure that the optimal anaesthetic techniques are chosen based on the surgical procedure. However, no consideration is given to ensure that the anaesthetic techniques chosen are patient-specific. Solely routine protocol is followed regarding the management of analgesia and postoperative nausea and vomiting.	Consideration is given to ensure that the optimal anaesthetic techniques are chosen based on the surgical procedure to be performed, as well as based on the individual patient undergoing the procedure. No consideration is given to ensure that optimal patient-specific analgesia management or postoperative nausea and vomiting	A high degree of consideration is given to ensure that the optimal anaesthetic techniques are chosen based on the surgical procedure to be performed, as well as based on the individual patient undergoing the procedure. Ensuring that the patient returns to normal function as fast as safely possible after undergoing day surgery is of high









		 1	 2	 3
	 IMMATURE	 BASELINE MATURITY	 DEVELOPING MATURITY	 ADVANCED MATURITY
			management takes place. Solely routine protocol is followed regarding the management of analgesia and postoperative nausea and vomiting.	importance to the day hospital. Attention is given to ensure that a patient-specific approach is given to ensure that the patient experiences the least amount of postoperative pain, is as comfortable, and can be discharged at the earliest safest time. Specific attention is given to ensure that postoperative nausea and vomiting is optimally managed to ensure that the patient can be discharged at the earliest safest time.
Fast-tracking	There are no protocols in place to fast-track patients after undergoing day surgery. A traditional approach is taken to discharging patients from the OR, where all patients recover within the PACU.		<p>Protocols are in place to ensure some patients are safely fast-tracked after day surgery. These protocols, however, require a high degree of refinement so as to increase the number of cases being safely fast-tracked in the day hospital.</p> <p>A trusted scoring system, such as the White Fast-Track Scoring system, is used to ensure patients are not prematurely discharged from the OR.</p> <p>The process of fast-tracking patients within the day hospital facility has not been proven to significantly increase hospital efficiency.</p>	Well-developed protocols are in place that ensure the majority of patients are safely fast-tracked after day surgery. Fast-tracking protocols are refined to levels that enable even highly complex cases to be fast-tracked. A trusted scoring system, such as the White Fast-Track Scoring system, is used to ensure patients are not prematurely discharged from the OR. The process of fast-tracking patients within the day hospital facility has proven to increase hospital efficiency.
Operating room scheduling	No formal scheduling system is implemented within the day hospital facility. Surgical day procedures are predominantly scheduled with an ad	The day hospital manager has very limited knowledge regarding all the various scheduling techniques available for surgery scheduling within day	The day hospital manager is aware and has knowledge regarding all the various scheduling techniques available for surgery scheduling within day hospitals.	The day hospital manager has an advanced knowledge regarding all the various scheduling techniques available for surgery scheduling within day





















				
	 IMMATURE	 BASELINE MATURITY	 DEVELOPING MATURITY	 ADVANCED MATURITY
	<p>hoc approach. The day hospital manager has no knowledge regarding all the various scheduling techniques available for surgery scheduling within day hospitals.</p>	<p>hospitals. OR scheduling is purely based on traditional scheduling as used in general hospitals. These traditional scheduling techniques used in general hospitals are not adapted or suited to the features of a day hospital.</p>	<p>The scheduling techniques chosen on which OR scheduling is based is not adapted to the characteristics and needs of the specific day hospital facility under study. One of the scheduling techniques available for day hospitals is simply implemented without any adaption or integration of scheduling systems. The scheduling system used has not proven to significantly increase OR efficiency. KPI's are not developed to measure the efficiency of the facility. Subsequently, no protocols are in place to predict the average duration of various procedures.</p>	<p>hospitals. The chosen scheduling technique used in the day hospital facility is adapted to suit the characteristics and needs of the particular hospital. Various scheduling techniques have been integrated to develop an optimal scheduling systems for the day hospital facility. This customised scheduling system has been proven to increase OR efficiency, and meets the general KPI's of an effective day hospital facility. These KPI's can be seen in Section 5.3.3.3. Protocols are in place to predict the average duration of various procedures based on historical data. This data is analysed and utilised to customise the scheduling system used within the facility.</p>
Nurse-led discharge	<p>The discharge of patients is exclusively performed by surgeons. There are no protocols in place within the day hospital that allows for patients to be discharged by nurses.</p>		<p>Patients are predominantly discharged by surgeons. Nurses only discharge very simple cases. There are no formal protocols in place that allow for nurse-led discharges. There exists a very simple checklist to guide the process of nurse-led discharge. This checklist does, however, require a high degree of development to ensure that patients are safely discharge at the earliest time.</p>	<p>Nurse-led discharge is the predominant approach followed for the discharge of patients. Only highly complex cases require discharge to be performed by the surgeon. A highly refined approved discharge protocol exists to ensure the fastest, safest discharge of patients. A discharge checklist is developed for nurses that ensure patients are safely discharged. An example of such as checklist can be seen in Section 5.3.4.1.</p>
Postoperative information & discharge	<p>Postoperative information is exclusively provided through verbal communication. Only very basic, routine postoperative information is given to patients.</p>		<p>Postoperative information is exclusively provided through verbal communication. This information is not always conveyed in the presence of an adult who is responsible for the patient</p>	<p>Postoperative information and instructions are provided through verbal and written communication. Instructions are only given to patients in the presence of the adult who is</p>




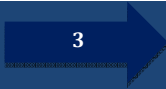




				
	 IMMATURE	 BASELINE MATURITY	 DEVELOPING MATURITY	 ADVANCED MATURITY
			postoperatively. The information and instructions provided are basic, routine information given to all patients. The postoperative information and instructions are thus not tailored to the specific patient or the surgical procedure the patient has undergone. The day hospital facility does not have pre-packed analgesia available for the patient at the time of providing discharge information and instructions. No discharge summary is provided to patients.	responsible for the patient postoperatively. The information and instructions provided to the patient are tailored specific to the patient and the procedure undergone. The information and instructions shared with the patients include a complete list of information as can be seen in Section 5.3.4.2. The day hospital facility has pre-packed analgesia available for the patient at the time of providing discharge information and instructions. A discharge summary is also provided to the patients in case a postoperative emergency situation might arise.
Telephonic follow-up	Currently no form of contact is made with the patient after being discharged from the day hospital facility. The only form of postoperative contact is initiated by the patient.	Telephonic contact is being made with patient on an ad hoc basis, given staff has the time to contact patients. Administrative staff is responsible for making postoperative telephonic contact with patients. There is no script developed to guide staff in asking the correct questions and conveying the correct information. This contact is predominantly made 72 hours after patient discharge.	Telephonic contact is made with the majority of patients after discharge. This contact however does not always occur within 24 hours after the patient has been discharged. Administrative staff and nursing staff unsystematically make postoperative contact with patients. A script does exist which guides staff in asking the correct questions and conveying the correct information. This script is however not always followed. There exists a lot of room for improvement regarding the development of the script.	A well-developed protocol is in place that allows for all patients to be telephonically contacted with 24 hours after being discharged. The telephonic contact with patient is made by nurses. A formal script exists that guides staff in asking the correct postoperative questions and conveying the correct information. This script is always rigidly followed and utilised by staff.

				
	 IMMATURE	 BASELINE MATURITY	 DEVELOPING MATURITY	 ADVANCED MATURITY
 GOVERNANCE				
Development of performance metrics	The day hospital has no established process and performance metrics that are measured on a regular basis.	The day hospital has some performance metrics that are measured on an ad hoc basis. These performance metrics are not updated or reviewed on a regular basis. The data obtained from the measured metrics are not consolidated into useful reports. No feedback obtained from the measured performance metrics are communicated to staff. Also, no committee is appointed to provide leadership and drive improvement initiatives.	The day hospital has well-developed performance metrics in each of the three relevant dimensions, namely: financial; operational; and clinical. These metrics are, however, not measured on a regular basis. Reports are generated from time-to-time in instances where metrics were measured. These reports are not utilised to drive improvement initiatives. There does exist a committee in charge of measuring metrics, analysing outcomes, and implementing improvement initiatives. However, this committee is not committed to actively perform their duties and seldom motivates and engages staff. The results that are obtained from the measured metrics from time-to-time are communicated to staff.	The day hospital has established performance metrics in each of the following three dimensions: financial; operational; and clinical. These metrics are established by a committee consisting of various stakeholders within the facility. This committee successfully measures and analyses processes and outcomes important to the facility; and provides leadership to advance change initiatives that arise from measurement results. The change initiatives are consolidated into comprehensive improvement plans aligned with the day hospital's strategic initiatives. There are procedures in place to ensure that metrics is frequently updated as required. Measured data is always synthesised into reports on time and subsequently shared with all staff through various communication channels. All staff are actively committed and engaged in collecting accurate measurement data, analysing the data, and suggesting improvements.
Implementation of lean management principles	There is no regard or consideration toward implementing lean principles	The implementation of lean principles has been researched and considered.	Some lean principles have been implemented within the day hospital.	Lean thinking has been integrated into the day hospital as a fundamental

				
	 IMMATURE	 <b>BASELINE</b> MATURITY	 <b>DEVELOPING</b> MATURITY	 <b>ADVANCED</b> MATURITY
	within the day hospital. No attempt has been made to investigate the possibility of implementing lean principles.	There have, however, not been any active attempts made by management to implement lean management within the day hospital.	These implemented principles are, however, not being actively managed to continually improve processes within the day hospital setting.	quality improvement and management system to improve efficiency and productivity. All four lean principles crucial within the day hospital setting, namely flow time, capacity, production batch management, and JIT, are applied. Please refer to Section 5.3.3.4 for a detailed description of each of these lean principles.
<b>PEOPLE</b> <b>MANAGEMENT &amp;</b> <b>CULTURE</b>				
<b>Continuous quality improvement &amp; process improvement focus</b>	The day hospital does not have a culture that is focused on continuous improvement of processes and quality. Thus, there is no system in place for the development of a continuous quality improvement program.	The day hospital does not have culture focuses on quality improvements. Quality improvement projects are rarely undertaken and are performed on an ad hoc basis. No systems are in place for regular auditing. Staff are not involved or motivated to improve efficiency with the day hospital facility, only upper management is involved in these improvement projects.	The day hospital is in the process of developing a culture focused on continuous quality improvement. Some staff are involved and motivated to improve quality and efficiency. No value is attached to the input of staff. There are systems and procedures in place that allow for the development of continuous quality improvement projects. Although, these systems and procedures are not fully developed or successful and requires attention to be fully developed. No procedures and policies are in place for regular auditing.	Highly developed continuous quality improvement programs are in place to monitor and modify performance. Adequate procedures and policies are in place to ensure regular audits are performed. Staff are involved, motivated and invested in improving the overall quality and efficiency of the day hospital facility. Their ideas and inputs are encouraged and valued. The proper steps are followed to improve efficiency within a healthcare setting. Refer to Section 5.3.2.4.
<b>Multi-disciplinary staff</b>	Staff only have the ability to perform that tasks that they are trained in. Staff are only focused on completing their own individual tasks, and is not willing	The minority of staff members are multi-skilled, and are mostly only able to perform tasks within a particular area within the day hospital facility.	The majority of the staff are multi-skilled and able to work in different areas within the day hospital facility. There are, however, staff members that	Appointed staff consist of a multi-disciplinary team. All appointed staff are multi-skilled and trained to be able to work in a variety of areas within the

		 1	 2	 3
	 IMMATURE	 BASELINE MATURITY	 DEVELOPING MATURITY	 ADVANCED MATURITY
	to help others complete their tasks. There is no sign of staff working together as a team to complete tasks.	Staff members are primarily concerned with completing the tasks for which they are appointed. There is some willingness from some staff members to help others to ensure tasks are completed faster. Some staff members are thus focused on a team approach; however other members are not involved in completing tasks as a team.	still require training in some areas. The majority of staff is willing and able to do a variety of tasks. There is still development required to get staff to function effectively within teams, as there is not a high degree of multi-disciplinary team working.	day hospital. Staff are able and willing to perform all types of tasks that must be completed within the day hospital facility. Staff are highly focused on team work and are able to quickly and effectively complete tasks.
Appointed medical director	No medical director is appointed for the development of local policies, guidelines, and clinical governance. There is only an appointed day hospital manager in charge of the day-to-day operations of the hospital, but without the support of a multi-disciplinary operational group in the operation of the day hospital facility.	No medical director is appointed by the day hospital facility, there is only a manager appointed. This day hospital is supported by multi-disciplinary operational group in the day-to-day operations of the day hospital facility. The day hospital manager is responsible for manager duties, as well as for the some of the duties that a medical director would be responsible for. These duties that the medical director should be responsible for is detailed in Section 5.3.2.7.	The day hospital has an appointed medical director. However, the medical director is not an anaesthesiologist. There is also an appointed day surgery manager, however there is no multi-disciplinary operational group to support the manager in charge of the day-to-day operations of the day hospital facility. The medical director does not fulfil all his responsibilities as detailed in Section 5.3.2.7.	The day hospital has an appointed medical director. This medical director is a consultant anaesthesiologist with management experience. The medical director is focused on building positive relationships with all staff members. The medical director is further focused on encouraging a multi-disciplinary team approach to delivering high quality healthcare services. The medical director successfully performs the tasks as detailed in Section 5.3.2.7. There is an appointed day surgery manager in charge of day-to-day operations of the day hospital facility, supported by a multi-disciplinary operational group.
 INFRASTRUCTURE				
Dedicated facility design	Day surgery cases are placed within a general ward of a general, in-patient hospital. Day cases and general cases	Day cases are placed within a dedicated day case ward. This ward is however still located within a general, in-patient	Day surgery occurs within a self-contained and dedicated unit. This type of facility has its own OR's for handling	Day surgery occurs within a self-contained and dedicated unit, separate from in-patient facilities. The day

				
	 IMMATURE	 BASELINE MATURITY	 DEVELOPING MATURITY	 ADVANCED MATURITY
	are thus mixed within the same ward. Operating rooms are thus shared to handle day cases and general cases.	hospital facility. Operating rooms are thus shared to handle day cases and general cases	solely day cases. It does, however, still share some of its resources with the in-patient facility such as admission & reception area, waiting rooms, and administrative staff.	surgery has its own admission & reception area, waiting rooms, wards, theatres, operating lists, recovery rooms, dedicated staff and dedicated administrative facilities.
Minimum patient beds	All patients are assigned a hospital bed for their entire stay in the day hospital facility from admission until discharge. The bed is thus occupied from the time the patient is admitted, until the bed is covered with fresh linen. Only then can a new patient be assigned that particular hospital bed.		The patient is assigned a hospital bed during admission. The patient is taken into the OR on this bed. The patient is then transferred from the hospital bed to the operating bed/table. After the patient is discharged from the OR, the patient is once again placed in the hospital bed, and taken to the ward. The patient is then transferred to a chair for further recovery at the safest, earliest time so as to free up the bed for the next patient.	If the surgical procedure allows for it, the patient is not assigned a hospital bed at admission. The patient waits in a chair until surgery, when the patient walks to the OR and climbs onto the operating bed. When the patient is recovered from anaesthesia and discharged from the OR, the patient is placed in a lazy boy until able and comfortable to be discharged from the day facility. Beds are reserved only for more complex cases requiring the patient to lay down.
 IT				
Utilise Information Technology	Currently the capturing of patient information is exclusively paper-based. No electronic documentation system exists within the day hospital facility to capture and analyse data.	Some information is electronically captured. The majority of data is still captured on paper. Captured data is never analysed to evaluate current practise of the day hospital.	The majority of data is captured on an electronic information system. This data is, however, not optimally utilised and analysed as not decision support system exists that allows for the day hospital facility to use the captured data to make informed decisions.	Data and information are exclusively captured within an electronic information system. The day hospital facility utilises this captured data through a decision support system that allows for the facility to use the captured data to make informed decisions. Relevant reports are routinely generated and reviewed to assess and evaluate current practises.

				
	 IMMATURE	 <b>BASELINE</b> MATURITY	 <b>DEVELOPING</b> MATURITY	 <b>ADVANCED</b> MATURITY
				Refer to Section 5.3.6.1 to view important reports that should be generated to review efficiency and quality of service of the facility. Based on the results of these reports, decisions are made as to how to further optimise the efficiency of the day hospital.
<b>Capture patient-flow data</b>	No systems are in place to track or capture patient-flow data within the day hospital facility. No attempts are made to capture patient-flow data.	Attempts have been made to manually capture patient-flow data. The majority of these attempts are unsuccessful as the data is mostly corrupt or not dependable. Subsequently, captured data is not reviewed or analysed on a regular basis.	Real-time locating technologies are implemented within the day hospital facility to capture patient-flow data. This captured data is, however, not optimally utilised, as data is not analysed or reviewed on a regular basis to identify and implement improvement initiatives.	A sophisticated real-time locating systems, such as radio frequency identification technology or infrared technology, are in place to capture patient-flow data. This captured data is analysed and reviewed on a regular basis to identify and implement improvement initiatives.

## 7.4 FRAMEWORK USE AND EXAMPLE

An example of what a typical day hospital might assess its maturity after completing its positioning in the maturity model framework can be seen in Figure 52.

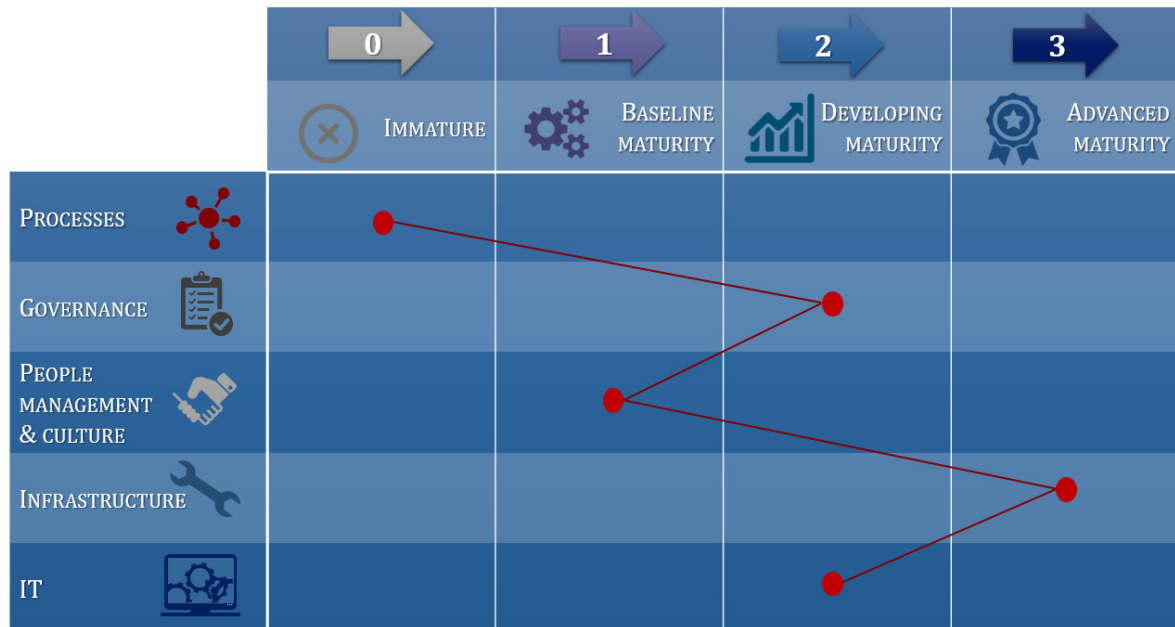


FIGURE 52: TYPICAL EXAMPLE OF A DAY HOSPITAL ASSESSING ITSELF WITH THE MATURITY MODEL FRAMEWORK

This example indicates that the day hospital must be focused on advancing its maturity in the processes maturity area as this is their lowest maturity measured in all focus areas. The day hospital has reached full maturity within its infrastructure focus area, and as a result can only focus on maintaining this maturity as is. The second focus will be on advancing the maturity of the people management and culture focus area, as this is the second weakest maturity focus area within the day hospital.

The ultimate goal of the day hospital should be to reach full maturity in all focus areas and dimensions. This type of maturity model that day hospitals should strive for is visually depicted in Figure 53.













		0	1	2	3
		 IMMATURE	 BASELINE MATURITY	 DEVELOPING MATURITY	 ADVANCED MATURITY
PROCESSES 					
GOVERNANCE 					
PEOPLE MANAGEMENT & CULTURE 					
INFRASTRUCTURE 					
IT 					

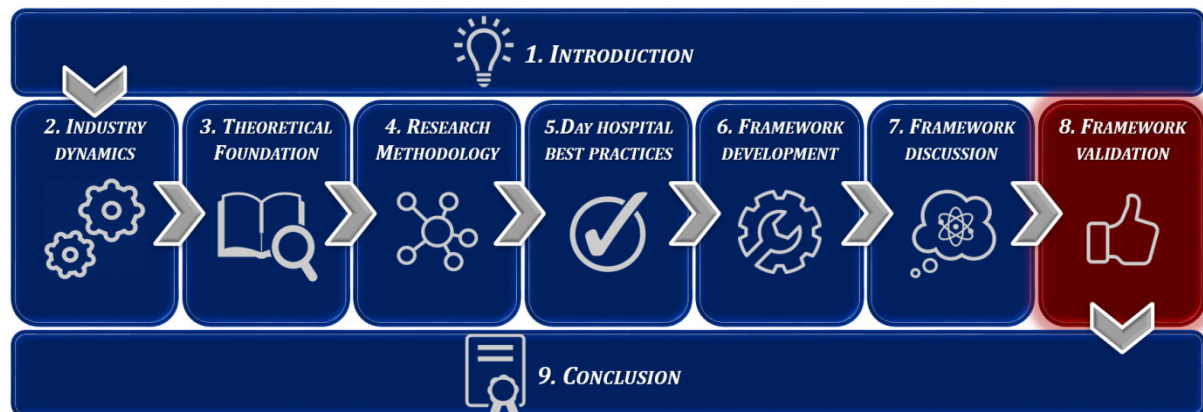
FIGURE 53: DAY HOSPITAL MATURITY STRUCTURE THAT DAY HOSPITALS SHOULD STRIVE FOR REACHING

## 7.5 CHAPTER CONCLUSION

This chapter explained and proposed the final maturity model framework for day hospitals. The purpose and use of assessing the various dimensions affecting the efficiency, performance and profitability was also detailed in this chapter. The next chapter of this research study will focus on the validation of the maturity model framework.

# Chapter 8 FRAMEWORK VALIDATION

Chapter 7 introduced and detailed the maturity model framework developed to assess the maturity of a day hospital. The aim of this chapter is to validate the maturity model framework proposed in Chapter 7, with regards to its potential of meeting the addressed problem in Chapter 1 and its functional correctness. This chapter focuses on the evaluation of the research done during this study. The purpose of this chapter is to validate the maturity model, highlight shortcomings and test the response of industry leaders and subject matter experts within the healthcare and industrial engineering field. This chapter sets out with an introduction and the presentation of validation considerations leading to the determination of the validation approach for this study. Both the validation approach and its outcomes are then described in detail. Finally, the undertaken framework improvements resulting from the validation are presented.



## 8.1 INTRODUCTION TO VALIDATION

Validation and verification are both solution evolution methods that are closely related, but each address different aspects of the solution evaluation. The principles of validity and reliability are fundamental cornerstones of the scientific method. In order for research data to be of value and of use, they must be both reliable and valid. Both of these concepts are elaborated below.

### 8.1.1 VALIDITY

Validity reflects the integrity of conclusions drawn from research and ensures that the research output is truly addressing the investigated concept and provides the correct answers (Kriege, 2015). Thus, the focus lies on the link between the purpose and context of the research project and research conclusions. Validation is summarised as, the process of assessing whether the developed solution addresses the defined problem (Kothari, 2004).

Validity can be distinguished in different ways. Two main forms are internal validity and external validity (Kothari, 2004). Internal validity refers to the source of error within the experiment by assessing if the right conclusions are drawn from the available data. While, external validity focuses on the extent to which an experiment can be generalised, by looking at their relevance to a larger population (Kothari, 2004). It is important to test both the internal validity and external validity of research outcomes (Kothari, 2004).

Furthermore, internal validity is often distinguished into three concepts that must also be considered (Kothari, 2004):

- Criterion validity;
- face validity (also known as content validity); and
- construct validity.

These three validity concepts are defined and elaborated on in Table 36.

TABLE 36: CONCEPTS OF VALIDITY (Kothari, 2004; Rupp & Pant, 2007)

TYPE OF VALIDITY	DESCRIPTION
Criterion validity	Criterion validity is tested by evaluating if the test results from the developed measure align with the results from an already defined criterion measure. The criterion to measure against may already exist (concurrent validity) or be of future nature (predictive validity).
Face validity	Face validity refers to the extent to which a measuring instrument provides adequate coverage of the topic which is being studied. This type of validity is demonstrated by evaluating relevance and representativeness of the test content through a group of experts.
Construct validity	This type of validity is the most complex and abstract. Construct validity refers to the degree to which scores on a test can be accounted for by the explanatory constructs of a sound theory. This type of validity is established by testing if a measure is assessing the primary theoretical constructs it intends to assess. Thus, it is required to test both, if the measure assesses what it claims to measure, and that the measure does not assess irrelevant attributes.

Criterion validity relies on the availability of suitable test criteria that the framework can be measured against (Kriege, 2015). However, regarding the nature of this study, no similar test cases or criteria exist to measure the framework application results against. To establish construct validity of this study, it needs to be tested if the framework is actually measuring the primary construct it aims to assess.

Face validity aims to test the internal validity of measures or programmes. In other words, face validity is established by testing if the developed concept or instrument seems to measure what it intends to measure and if the measurement of the concept appears appropriate at first sight (Kriege, 2015).

The establishment of face validity could be approached by conducting interviews to investigate if the framework is addressing the problem it intends to address (Kriege, 2015). The accuracy of face validity is highly related to the expertise of individuals tested. In order to improve the quality of face validation, experts in the field, rather than laypeople, should be consulted to judge if the particular research outcome is addressing what it intends to address (Kothari, 2004).

For the purpose of validating this study, face validation is selected to investigate the potential of the proposed framework in order to improve the maturity of day hospitals. Since the framework concept is clearly defined and can be thoroughly presented to an appropriate target group in the day hospital field, face validation is considered as an appropriate test for validity despite its identified shortcomings. However, it is understood that additional validity tests should be conducted in future research to ensure true validity of the framework.

### **8.1.2 RELIABILITY**

Verification can be described as the process of assessing whether the solution was developed in a correct manner. Verification will help to determine whether the solution is of high quality, but it will not ensure that the solution is useful in addressing the original problem statement (Srai et al., 2013).

More formally, verification refers to the mechanisms used during the process of framework development to incrementally contribute to reliability and validity and, thus, demonstrate the rigour of the study (Srai et al., 2013). The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability (Srai et al., 2013).

The test of reliability is another important test of sound measurement. A measuring instrument is reliable if it provides consistent results (Kothari, 2004). A reliable measuring instrument does contribute to validity, but a reliable instrument need not be a valid instrument (Kothari, 2004).

## **8.2 TYPES OF VALIDATION**

There are three approaches as to how the day hospital maturity model developed in this research study can be validated:

- Interviews with subject matter experts,
- implementation, and
- case studies.

Each of these approaches has benefits and drawbacks as validation methods. Each will be discussed as to why or why not the validation method is applicable within this research study.

## **8.2.1 INTERVIEWS WITH SUBJECT MATTER EXPERTS**

The purpose of conducting interviews with SME's is so that the interviewer would, in the case of validating the maturity model framework for day hospitals, gather knowledge from the interviewee to ultimately disprove or validate the claims of the maturity model.

### **8.2.1.1 INTERVIEW TYPES**

Interviews can be unstructured, structured, or semi-structured interviews. These three types of interviews are elaborated on below.

#### **Structured interview**

To investigate face validity, structured interviews are used to test if the framework is clearly capturing what it intends to address. Structured interviews are characterised by standardised questions. This entails that the questions are identical and read out in the same sequence for each participant. Such interviews involve the use of a set of predetermined questions and of highly standardised techniques of recording (Kothari, 2004). Thus, the interviewer in a structured interview follows a rigid procedure laid down, asking questions in a form and order prescribed (Kothari, 2004). Structured interviews are held on a one-on-one basis.

#### **Semi-structured interview**

This method of interviewing has features of both structured and unstructured interviews. The semi-structured interview thus utilises closed-, as well as open questions. As a result, it has the benefits of both methods of interviewing.

Initially, the combination of focus groups and interviews is considered in order to receive higher interactions and facilitate broader thinking. However, group interviews may also lead to problems of group effects; such as the suppression of individual perceptions differing from the groups view, uncritical thinking of a group member's point of views, and discomfort due to hierarchical relationships (Kriege, 2015). By taking these limitations of focus groups into consideration and ensuring openness towards the questions asked, the interviews are conducted individually.

#### **Unstructured interview**

Unstructured interviews are characterised by a flexibility of approach to questioning. Unstructured interviews do not follow a system of pre-determined questions and standardised techniques of recording information. The direction of the interview is determined by both the interviewee and interviewer, not predetermined. In a non-structured interview, the interviewer is allowed much greater freedom to ask, in case of need, supplementary questions or at times he may omit certain questions if the situation so requires. He may even change the sequence of questions (Kriege, 2015).

The questionnaire serves as the measure of face validity. Therefore, it incorporates questions to identify whether or not the proposed framework is addressing the problem that has been researched.

This research study requires SME's to provide their opinion on the usability, reliability and feasibility of the maturity model framework for day hospitals. A semi-structured interview is the chosen interview type to validate this study. These interviews are performed as a one-on-one interview. The one-on-one interviewing process allows for the research to gather an open opinion on some open-ended questions.

### **8.2.2 IMPLEMENTATION**

---

The implementation of the maturity model within a day hospital setting is one that would refute or validate the framework. The use of implementation as a validation method is not feasible to the research at this time, due to the time-constraints in which this study needs to be completed that does not allow for full implementation of the maturity model framework within a day hospital. The amount of time that will be required to practically test the results of the maturity model framework for day hospitals could be significant as maturity growth takes time, particularly when testing growth enablement through all four maturity phases.

### **8.2.3 CASE STUDIES**

---

Yin (1999) defines the case study research method as, "an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used".

For this research study, a case study would not have been viable as a method for validation as it would require the maturity model framework for day hospitals, to be implemented and tested in a day hospital. As mentioned in Section 8.2.2, the timeframe in which this research study must be conducted does not allow for a comprehensive case study to be performed due to time constraints.

### **8.2.4 RESULT**

---

Validation through interviews with SME's is identified as the most appropriate approach to evaluate the validity of the maturity model framework for day hospitals. This method of validation was chosen for this research study as:

- It allows for direct contact with day hospital role-players that leads to specific, constructive suggestions;
- interviews allow the researcher to obtain detailed information; and
- only a few participants are needed to gather rich and detailed data.

### **8.3 INTERVIEWS WITH SUBJECT MATTER EXPERTS**

---

The maturity model framework was evaluated through responses to an evaluation questionnaire and interview-based discussions. Four industry experts within the healthcare and industrial engineering fields were identified to evaluate the maturity model framework.

To investigate face validity, semi-structured interviews are used to evaluate if the maturity model framework is capturing what it intends to address. Evaluating the validity of this research study through interviews with SME's ensures that problems are uncovered.

For this thesis, the semi-structured interview seemed to be a suitable method. This chosen interview type allowed for the interview to be structured to a certain extent, as all important theoretical issues were addressed and all the various dimensions of the model could be discussed. The fact that the interview was not fully structured enabled the interviewer and SME to elaborate on personal opinions and expertise of the SME's in a non-constraining way. A structured interview might have inhibited the possibility to go deeper into upcoming topics.

The objective of each interview was to determine to what degree the SME's agreed or disagreed with the various facets of the maturity model framework for day hospitals. These SME's had to provide motivations and recommendations for their answers.

Each interview was structured in the following sequence:

- a) Presentation of the research methodology, including background, problem statement, and approach of the study.
- b) Presentation of the framework, containing an explanation of each step and their interrelations in the framework.
- c) Discussion of possible questions or misunderstandings.
- d) Issuing of questionnaire to collect the required data for the validation of the framework.

#### **8.3.1 INTERVIEWEES**

---

The maturity model framework for day hospital settings was developed from an extensive literature study and visits to various day hospitals operating within the Western Cape. This maturity model was then presented to the experts, who gave feedback and input. Finally, the maturity model framework was adjusted and refined to incorporate the feedback and input from the experts. Some future work was also determined from the validation.

A description of the four interviewees, their relevant background as well as the focus of each evaluation can be seen in Table 37.

TABLE 37: INTERVIEWEE BACKGROUND SUMMARY AND REASON FOR INCLUSION IN RESEARCH EVALUATION

INTERVIEWEE	POSITION	ROLE	EDUCATION	DATE OF INTERVIEW
Pieter Lotz	Operations Manager: Day Clinics	Responsible for the role out of a Day Clinic (hospital) strategy.	Industrial Engineer	31 October 2016
Dirk Kotzé	Process Improvement Engineer	Concerned with improving of business performance through business process engineering, enterprise engineering, and operations research interventions.	Industrial Engineer	1 November 2016
Johan Stadler	Process Improvement Engineer	Concerned with improving of business performance through business process engineering, enterprise engineering, and operations research interventions.	Industrial Engineer	1 November 2016
Yvette Jordaan	Day Clinic Manager	Manages the day-to-day operations of a day hospital facility. Responsible for ensuring that high quality patient care is given and that there is economical and efficient performance. Monitors patient volumes, quality of care, and performance of staff to identify areas for improvement.	Registered Nurse	28 October 2016

### 8.3.2 EVALUATION PROCESS

The evaluation process was initiated by electronically sending each SME a version of the research document that elaborated on the theories and methodologies that were used to develop the maturity model framework for a day hospitals. This research document also included an explanation and description of the maturity model, as well as the research-evaluation questionnaire.

This research document provided the SME with some knowledge on and a basic understanding of the topic. Upon receiving the document, the SME's could work through the research summary and consider the maturity model framework for day hospitals in their own time.

The researcher subsequently had a face-to-face meeting with each of the SME's in which the maturity model framework for day hospitals was explained in more detail. Any questions and queries that the SME's might have had were addressed.

The SME's were subsequently asked to fill out the research-evaluation questionnaire. These filled-out questionnaires were electronically obtained back from SME's after they have had adequate time review the research document, and formulate their responses. The cumulative responses of the SME's to the questionnaire is discussed in the following Section 8.3.3.

### 8.3.3 INTERVIEW QUESTIONS

As mentioned previously, a questionnaire and accompanying research document was chosen as means to facilitate a semi-structured interviewing process. This included discussing the accuracy of the interviewer's research methodology as well as the accuracy, applicability and usability of the maturity model framework for day hospitals.



The questionnaire contained four background contextualisation questions, four research methodology and six framework-specific questions as well as a section for further comments. These questions were chosen to systematically cover all aspects of the research methodology as well as the framework, and the intention was to hereby create platform for a comprehensive discussion of the author's research. The complete questionnaire presented to the subject matter experts can be seen in Appendix E.

## 8.4 EXPERT EVALUATION FEEDBACK

All four SME's were contacted to ensure that they are comfortable with their names being mentioned together with their feedback. All the SME's confirmed that they were comfortable with being referenced. If required, proof of this confirmation can be supplied.

This section elaborates on the feedback received for each question in the questionnaire. The research methodology related questions are discussed, after which the framework related questions are discussed. Appendix F contains all the completed questionnaires of the four SME's.

### 8.4.1 RESEARCH METHODOLOGY RELATED QUESTIONS

- a) To what extent do you agree or disagree with the research methodology that was followed in the development of the maturity model framework for day hospitals, as visually depicted in Figure 37?***

There is consensus regarding the research methodology followed to conduct this study. It appears that none of the SME's have any reservations regarding the approach followed. Furthermore, none of the SME's suggested any improvements regarding the research methodology.

- b) Considering the research methodology that was followed, what is your opinion of the potential of the framework as guidance to establish the current maturity of a day hospital?***

All the SME's agree that the potential of the framework, to act as a guide to establish the current maturity of a day hospital, is regarded as effective. The model addresses all the key dimensions that affect the efficiency, performance, and profitability of a day hospital. There seems to be consensus amongst the SME's that the process followed to build the framework ensured that a comprehensive model was formulated; that allows for great potential to serve as guidance in establishing the current maturity of a day hospital.

Stadler (2016) further commented that the value to be gained from the framework will be dependent on how well the framework can be translated into a practical assessment tool. In addition, how well the assessment tool can be complemented by a tool which can aid a day hospital to take practical steps to improve on the level of maturity per key dimension, as measured by the assessment tool.

- c) To what degree do you agree with the process followed in identifying all the various dimensions that influences the efficiency of a day hospital?***

Lotz (2016) indicated that the success of a day hospital is fully dependent on the number of admissions it can efficiently take through the system in the shortest possible time. Measuring the maturity of the patient flow pathway will be an ideal indication of the maturity of the day hospital. Lotz (2016) further indicated that he is in full agreement with the process followed in identifying all the various dimensions that influence the efficiency of a day hospital.

Kotzé (2016) recommended that care should be taken to ensure that the sources within the literature, utilised to identify the dimensions refer more to practical, actual and general experiences; as opposed to purely theoretical or very focused research. On the other hand, the more sources which are able to corroborate a certain dimension, the more applicable it ought to be. He agrees that the process followed would be applicable if this was the case; as the results in this project show. The fact that the framework is also validated by actual operators of day hospitals strengthens it further. Kotzé (2016) concluded that he is satisfied with the process that was followed.

Stadler (2016) indicated that he strongly agrees with the ‘patient flow approach,’ utilised to identify dimensions affecting efficiency, performance and profitability; as it makes for logical reasoning. Additionally, it is increasingly critical in healthcare to design processes and metrics around the patient flow and patient experience, rather than around the hospital’s processes.

Thus, there was full consensus that the process which was followed, in identifying all the various dimensions that influence the efficiency of a day hospital, was appropriate.

#### **8.4.2 FRAMEWORK RELATED QUESTIONS**

***a) Do you believe that the dimensions identified in the maturity model comprise a comprehensive framework for the assessment of day hospital maturity?***

All the SME’s agreed that the identified dimensions in the maturity model comprise a comprehensive framework for the assessment of day hospital maturity.

Stadler (2016) proposed that the “People Management and Culture” dimension should be expanded to include a sub-dimension for “Workforce Management System and Practices”. This “Workforce Management System and Practises” would refer to the process of annual budgeting, advanced and JIT planning. As well as scheduling of nursing staff, time and attendance management and monitoring of actuals versus plans, schedules, budgets and other benchmarks. There should be different indicators of the degree of maturity with which this sub-dimension is placed. In any hospital environment, the management of staff hours worked, hours absent and the accompanying costs are typically one of the biggest focus areas. Staff cost, particularly nursing staff cost, is typically one of the biggest cost drivers.

Stadler (2016) further added that in South Africa in private healthcare, the management of doctors’ hours will typically not fall within the hospital’s jurisdiction. However, optimal planning and scheduling of doctors (together with the supporting nursing teams), in order to optimise patient flow and efficient theatre and bed utilisation, could be made part of the broader workforce management efforts in a day hospital.

The overall consensus is that dimensions identified in the maturity model comprise a comprehensive framework for the assessment of day hospital maturity. Although adding the additional element of

“Workforce Management System and Practices”, as proposed by Stadler (2016), would further enhance the comprehensiveness of the model.

**b) How would you rate the easiness of understanding the framework?**

All the SME’s agree that the framework was very easy to understand.

**c) How well does the framework allow the establishment of the maturity of a day hospital?**

Kotzé (2016) stated that the framework provides a practical and actionable view of the important factors which are applicable with regards to determining the maturity of a day hospital. The actual value, is however, more in the cell text than in the framework, and in some cases this text may have to be refined or made more specific to make the framework more practical.

Stadler (2016) commented that the effectiveness of the framework will be dependent on how well it can be used in a real-life setting; as a practical tool for assessment. That could require further work to make it easier for an assessor to be able to identify practical things which should be in place, as well as to gauge the degree to which those things are in place.

Having a questionnaire with a list of tick boxes (potentially weighted) to mark whether certain things are in place or not could serve as a practical tool. Such a tool could potentially be electronically available, such as in an “app” format. For example, when rating the maturity level in terms of sub-dimension, “Development of performance metrics,” it could help an assessor to be able to “tick off” and/or provide a rating to indicate the degree to which a facility does have all the elements in place. The elements are described in the “Development of performance metrics” dimension which appears in the maturity model framework, as required to be in place in a mature environment. However, Stadler (2016) stated that using the framework as is would already be a pretty useful aid to consider most key dimensions (aspects) of a day hospital. It would also be effective in assessing qualitatively, or through a basic interrogation process, how well those dimensions are actually in place.

The remaining two SME’s further agreed that the framework successfully allows for the establishment of the maturity of a day hospital.

**d) In your opinion, what are strong points of the proposed maturity model framework for day hospitals?**

Lotz (2016) indicated that the strong points of the framework are that the model allows for day hospitals to identify opportunities for improvement, and focus on those areas. This is in consensus with Kotzé (2016) who stated that the model provides a very clear view on the important factors to focus on; when attempting to improve the maturity of a day hospital’s operations.

Lotz (2016) also added that the model can be further utilised to determine the maturity level of a group of hospitals.

Stadler (2016) indicated that he feels that the model covers most, if not all, of the key dimensions of a day hospital and that he believes the framework is quite clear and understandable. He further stated that the logic behind the model’s development is also sound and based on thorough research.

Jordaan (2016) stated that she liked the fact that it doesn't just look at normal management tasks, but for instance, at the structure and the effect it might have on the department is also included. Jordaan (2016) concluded that the model has a very holistic approach to establishing the maturity of a day hospital.

***e) In your opinion, what are weak points of the proposed maturity model framework for day hospitals, and what improvements can you suggest?***

Lotz (2016) indicated that the model could be made more comprehensive by adapting it to measure the maturity of a day hospital at task level.

Kotzé (2016) stated that the weak points of the model included that some of the terms, used to describe a specific maturity level for a specific dimension, are vague. This results in the actual determining of the maturity level quite subjective, e.g. "A well-developed protocol is in place..." What does a well-developed protocol look like?

Stadler (2016) proposed that the "People Management and Culture" dimension is expanded to add a sub-dimension for "Workforce Management System and Practices". This comment is described in the first question under Framework related questions.

***f) Please comment on the applicability and usability of this framework, from your professional viewpoint, to establish the maturity of a day hospital.***

All the SME's indicated that the model seemed very applicable in the establishment of the maturity of a day hospital, and to identify opportunities for improvement and focus areas. Kotzé (2016) added the cell text in some cases should be made more specific; to assist in accurately and objectively identifying the most relevant maturity level for a specific dimension. Stadler (2016) also stated the model is very applicable; provided that the user is familiar with the detailed dimensions that are elaborated on in Section 5.3.

Jordaan (2016) stated that she is definitely planning on utilising the model. She indicated that the model will aid her in developing goals and objectives for her department. She added that the first dimension she has already decided on improving, after studying the maturity model for day hospitals, is to contact the patients after surgery to find out how they are doing. She further stated that although she would not be able to implement the entire model at this time, she is very interested in the dimensions addressing the lean concepts and would focus on implementing those dimensions first.

## **8.5 VALIDATION CONCLUSION**

The results of the interviews and questionnaires indicated that the interviewees were overall content with the proposed framework and founded that it added value, and provides a model that allows day hospitals to assess their maturity. The strong degree of positive feedback indicates that the model is very comprehensive and developed with sound approaches and principles that resulted in a usable maturity model framework for day hospitals.

## **8.6 CHAPTER CONCLUSION**

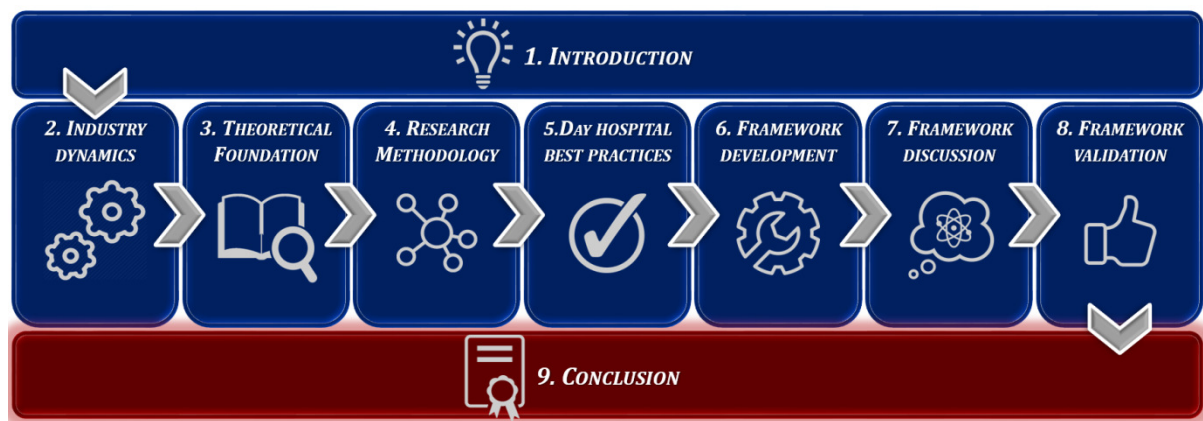
---

---

The purpose of this chapter was to evaluate and validate the maturity model framework developed for day hospitals. This process included interviewing four subject matter experts and subsequently asking them to complete a questionnaire regarding the validity of the framework. The outcome of this validation process was of a positive nature.

# Chapter 9 CONCLUSION & FUTURE WORK

The purpose of this chapter is to conclude the research and findings found in this project by confirming that all the project objectives, as set out in Section 1.3, have been indeed been met in the development of a day hospital maturity model. This chapter also discusses opportunities and recommendations for future project expansion.



## **9.1 OVERVIEW**

---

This research study proposes a maturity model framework for day hospitals. The primary purpose of this model is to provide a framework that enables day hospitals to assess and potentially advance their capability maturity in pursuit of increased efficiency, performance and profitability. Chapter 1 served as an introduction to this research idea.

This chapter provided the background and outline of the study and defined the research focus by establishing the problem statement. The path and scope of the study were defined by establishing the research questions which were used to guide the study. This chapter also elaborated on the limitation and delimitations, followed by a discussion on the research design, and ethical implications of the research. Finally, the study was divided into nine chapters that collectively aimed to address the defined research questions.

The following two chapters served as the literature review. Chapter 2 elaborated on the current context of the day hospital industry. This chapter addressed the type of day facilities, as well as the type of procedures that can be performed in these facilities. This chapter concluded by identifying the various barriers that prohibit the further proliferation of day surgery within the South African context.

The second part of the literature was addressed in Chapter 3. This chapter initially introduced the concept of Enterprise Engineeringfield along with its key concepts, tools and methodologies. This chapter then shifted its focus to investigating the fundamentals of maturity model development. Various types of maturity models were investigated, as well as their development methods. The chapter then further investigated the concept of Business Process maturity models, along with some existing maturity model. The chapter concluded with a review of lean principles, as well as the fundamentals of continuous improvement relevant within the healthcare industry.

Chapter 4 detailed the approach that will be followed in the development of the maturity model framework for day hospitals. This chapter, therefore, covered the research methodology of the dissertation. The main purpose of this chapter was to present the research methodology and methods used in this study to address the identified research problem. The discussion on this chapter was initiated by re-iterating the research aim and objectives of this study. The reasons for the choice of methodology used in this research study was also clarified. The discussion in this chapter further outlined the research design and approach, the research strategy, as well as the methods of data collection that were employed.

The purpose of Chapter 5 was to investigate and identify all the various dimensions that should be included in the maturity model framework for day hospitals. Initially, the chapter investigated all the elements involved in day hospital operation, with significant impact on day hospital efficiency, performance and profitability. These dimensions were identified through formulating a conceptual patient flow pathway, and subsequently investigating all the relevant best practises associated with each of the patient flow phases. This conceptual patient flow strategy followed to identify the dimensions of the maturity model framework for day hospitals, was validated as being representative of day hospital practises within the industry by a subject matter expert.

The aim of Chapter 6 was to formulate the criteria that the various dimensions, identified in Chapter 5, should meet to reach a specific maturity level. For the sake of comprehensiveness, this chapter

also re-iterated and elaborated on the research strategy steps that should be completed in the development of a maturity model.

Chapter 7 presented and proposed the final solution to the stated research problem. This chapter drew on all the knowledge gained from Chapter 3, investigated all the elements of maturity models from Chapter 5. Additionally, investigated all the different dimensions affecting the efficiency of day hospitals, as well as Chapter 6 which established the context in which the framework was developed.

Subsequently, this chapter consolidated and integrated all the knowledge acquired thus far to establish the final maturity model framework for day hospitals. The final maturity model framework for day hospitals was thus presented in this chapter. Chapter 7 comprehensively discussed the elements of a proposed framework for assessing and growing the capability maturity of day hospitals. These elements discussed include; the main focus areas of the model, the various maturity levels, as well as the structure of the model. Finally, this chapter concluded by presenting an example on how this model could be implemented.

The proposed framework was validated in Chapter 8. Different validation methods were reviewed first in order to identify the most suitable validation technique for this study. The appropriate validation process – face validation with structured interviews – is then discussed, along with a thorough presentation of the interview responses and validity results. Lastly, framework improvements undertaken after the validation process were highlighted.

The last chapter presents the closing of the research study by providing the conclusion of the research, addressing the research questions, as well as discussing the limitations and recommendations for future research.

## **9.2 ADDRESSING THE RESEARCH QUESTIONS**

---

In order to develop this framework, a few research questions were set in Section 1.3 to guide this research study in reaching the main research aim. These questions have been answered throughout this dissertation in pursuit of addressing the main research aim, as stated in 1.3.1. The research questions and the locations of where these questions were addressed in this dissertation are discussed below.

### **1. What are the fundamentals of developing a maturity framework?**

Chapter 3 presents the second part of the literature review, and comprehensively elaborates on the all the relevant fundamentals of maturity models. These fundamentals include the various types of maturity models, examples of maturity models, as well as how these models can be developed.

#### **a. What is the enterprise engineering concepts, tools and methodologies applicable in framework development?**

Section 3.1 discusses the concept of enterprise engineering, elaborates on the enterprise life cycle, and finally provides an overview of the enterprise architecture frameworks. This discussion on enterprise architecture frameworks concludes by establishing that maturity models are the appropriate framework for addressing the problem statement of this research study.



**b. What is the appropriate methodology for developing a new maturity framework?**

All the fundamentals of maturity models are discussed in Section 3.2 to Section 3.5. The development of maturity models, including the five approaches to designing these models are elaborated on in Section 3.6 and Section 3.7.

**c. What maturity frameworks, developed for the hospital industry, currently exist?**

The maturity models considered as relevant are discussed in Section 3.10. The various maturity frameworks in healthcare, and why they were, or were not included in the literature review are discussed in 6.3.3.

**2. What features and dimensions affect the efficiency, performance, and profitability of a day hospital?**

This question is comprehensively detailed in Chapter 5. However, the current context of the day hospital industry had to be investigated first, as outlined by the following research question.

**a. What is the current context of the day hospital industry?**

The dynamics of the day hospital industry are discussed in Chapter 2. This chapter is initiated by providing an overview of the current global and local context of the day hospital industry in Section 2.1.1 and Section 2.2. This research question also added barriers to the investigation that prohibits the growth and development of day surgery.

**b. What appropriate techniques should be followed to identify dimensions affecting day hospital efficiency, performance, and profitability?**

This research question is comprehensively addressed in Section 4.3.2.2. It outlines the patient flow pathway approach that was used in the identification of the various dimensions.

**3. What are the relevant capability clusters and capability dimensions that should be considered when assessing day hospital efficiency, performance, and profitability?**

This research question is addressed in Chapter 5, and outlines the patient flow pathway approach taken to identify all the various dimensions of the maturity model framework for day hospitals.

**a. What are all the various elements involved in the operation of a day hospital?**

Each of the identified stages of the patient flow was used as a guide to identify all the various elements involved in the operation of a day hospital. This can be seen in Section 5.2.

**b. Which of these elements have a significant impact on day hospital efficiency, performance and profitability?**

Each of the identified elements that have a significant impact on the operations of a day hospital are comprehensively discussed in Section 5.3. These elements were identified through investigation of best practises for day hospitals according to the patient flow pathway phases addressed by the previous research question.

- c. Which of these elements should be included in the framework as dimensions that should be considered when assessing day hospital efficiency, performance and profitability?**

The elements included in the final maturity model framework for day hospitals are indicated in Section 6.4.3. Twenty of the elements were considered relevant and included in the final maturity model.

- 4. How should the maturity level for each of the capability dimensions be established when assessing a day hospital?**

A top-down approach was used in establishing the various maturity stages. The followed approach is discussed in Section 4.3.2.2.

- a. What is the criteria, in terms of the identified capability dimensions, that define a mature day hospital?**

The various criteria that forms the cell text of the maturity model, that need to be met in order to achieve a specific level of maturity, are discussed in Section 6.4.3. These criteria were obtained from investigating best practises for day hospitals as elaborated on in Section 5.3.

- b. How can day hospitals establish which level of maturity they have reached in each of the capability dimensions?**

This research question was addressed in correspondence with the previous research question by investigating the various best practises for day hospitals as elaborated on in Section 5.3.

- 5. With knowledge gathered from previous questions, how should a comprehensive framework be consolidated that assesses day hospitals according to each of the capability dimensions?**

This research question addresses the final maturity model that is presented in Chapter 7. This framework consists of five main focus areas constituting twenty elements that have an impact on the efficiency, performance and profitability of day hospital operation.

- a. How should the final maturity framework be structured that integrates all the various and relevant components of day hospital operation and management?**

The structure of the maturity model framework for day hospitals is in the form of a maturity matrix. This matrix structure is discussed in Section 7.2.3.

- b. How can this proposed framework be validated?**

Three possible validation methods were considered for evaluating this framework. It was decided that validating this maturity model through approaching four subject matter experts to evaluate the framework would be appropriate. The rationale of why this would be the best validation method for this research study is discussed in Section 8.2.

***c. Does this proposed framework prove valid when evaluated by subject matter experts within the day hospital industry?***

The outcome of the validation process of validating the maturity model framework for day hospitals was of a positive nature. The comments and inputs of the four subject matter experts are shown in Section 8.4.

### **9.3 LIMITATIONS**

An important part of scientific research is acknowledging its unavoidable limitations. Limitations are characterised by the unique context and circumstances of a research effort and may restrict and influence its outcomes. The development and validation of the proposed maturity model framework for day hospitals is influenced by several limitations:

- The maturity model framework is developed solely for assessing the maturity of day hospitals. Adapting the framework to be applicable to general hospitals would require extensive research, that would result in an entirely new framework due to the major differences between these two types of hospitals.
- The available resources of the study, such as time and funding, do not allow for an extensive validation process with the actual application of the framework in practice. The most suitable validation method identified for the given research context; is the test for face validity with industry experts. Although the industry experts confirmed the validity of the maturity model framework for day hospitals, it does not necessarily prove true validity when applying it in practise.
- The industry experts interviewed provided valuable inputs and feedback; which validated the maturity model framework for day hospitals. These industry experts work at such a high strategic level within the healthcare industry that their feedback was of immense value. Additionally, the positive nature of their feedback highly validated the model. Including additional day hospital personnel within the validation process, who deal with the operation of day hospital facilities on day-to-day basis, would further validate the model.
- Some features of the developed maturity model framework might be applicable within the public healthcare sector. However, the framework is primarily developed with the focus on advancing day hospital efficiency within the private healthcare sector of South Africa. Extending the framework to be applicable within the public healthcare sector would require approaching SME's particularly operational within the public sector.
- The dimensions of the maturity model were identified through an extensive literature review. This literature review, however, revealed that the majority of research performed on day hospitals were not conducted within the South African healthcare context. These dimensions were subsequently adapted to the South African context by approaching the afore mentioned industry experts. However, it would be beneficial to also include operational day hospital personnel, mentioned in the previous limitation, in adapting these dimensions to the South African healthcare context.

Recognising these limitations of this research study, possible recommendations for future research are proposed in the following section.

## **9.4 RECOMMENDATIONS FOR FUTURE WORK**

---

Limitations of this study, feedback received during the validation process, as well as the acquired insight into the study field lead to considerations that may be valuable to address in future research.

The most prominent recommendation for future work would be to fully implement the maturity model framework for day hospitals. Performing a case study would not only further validate the model, but would also expose any shortcomings that can be improved upon.

The dimensions of the formulated maturity model were primarily identified through sources within the literature. Performing a case study would bring to light any additional dimensions, obtainable solely through experience and actual, practical application.

Although the validation process followed was sufficient for the purpose of this research study, it could be beneficial to include more managers of day hospitals to validate the maturity model framework. The reason for this is, day hospital managers being the final users of the maturity model framework for day hospitals.

Future research for this study can include developing strategies and recommendations on how day hospitals can progress from one maturity stage to the next for each dimension. This would require refining the cell text of the maturity model and developing a practical assessment tool that can aid a day hospital in taking practical steps to improve the maturity level per key dimension. Developing such an assessment tool, together with practical improvement steps would, however, require a full implementation and case study of the implemented model. This would be needed to ensure an accurate and dependable tool is developed. Although, this would require an extended amount of time and was therefore not addressed; due to the time constraints of this research study.

---

# REFERENCES

---

- Abusalem, O. T. (2012). Day case versus inpatient surgery in Gaza Jordanian Military Field Hospital. *Rawal Medical Journal*, 37(4): 421–424.
- Advanced Health. (2014). Day-hospitals company to list shares. Retrieved from <http://www.advancedhealth.co.za/uploads/Advanced-Leaflet-2014-04-22.pdf>
- Almeida, R., Paterson, W. G., Craig, N., & Hookey, L. (2016). A Patient Flow Analysis: Identification of Process Inefficiencies and Workflow Metrics at an Ambulatory Endoscopy Unit. *Canadian Journal of Gastroenterology and Hepatology*.
- Australian and New Zealand College of Anaesthetists. (2010). *Recommendations for the perioperative care of patients selected for day care surgery*. Retrieved from <papers2://publication/uuid/4649E443-0E77-42E4-ABA2-F75104D7035B>
- Australian Day Hospital Association. (2015). *Profile of the Australian Day Hospital Association and the day hospital industry*.
- Australian Institute of Health and Welfare. (2014). Australian hospital statistics 2012-13. *Health Services Series*, 54.
- Barnett, G. (2016). Developing an Effective day surgery service. *Update in Anaesthesia*, 31(1): 9–13.
- Basu, S., Babajee, P., Selvachandran, S. N., & Cade, D. (2001). Impact of questionnaires and telephone screening on attendance for ambulatory surgery. *Annals of the Royal College of Surgeons of England*, 83(5): 329–331.
- Beaussier, M., Marchand-Maillet, F., Dufeu, N., & Sciard, D. (2015). Organizational aspects to optimize patient's ambulatory pathway. *Current Opinion in Anaesthesiology*, 28(6): 636–641.
- Becker, J., Knackstedt, R., & Pöppelbuß, D. W. I. J. (2009). Developing Maturity Models for IT Management – A Procedure Model and its Application. *Business & Information Systems Engineering*, 1(3): 213–222.
- Bonney, L., Clark, R., Collins, R., & Fearne, A. (2007). From serendipity to sustainable competitive advantage: insights from Houston's Farm and their journey of co-innovation. *Supply Chain Management: An International Journal*, 12(6), 395–399.
- Bragg, K., Vanbalen, N., & Cook, N. (2005). Future trends in minimally invasive surgery. *AORN Journal*, 82(6): 1005–1018.
- British Association of Day Surgery. (2009). Nurse led discharge. London.
- Brökelmann, J. (2012). Comparison of hospital- and office-based ambulatory surgery in Germany: Surgery in small free standing units offers many advantages. *Ambulatory Surgery*, 17(4): 83–85.

- Brooks, P., El-Gayar, O., & Sarnikar, S. (2013). Towards a Business Intelligence Maturity Model for Healthcare. In *2013 46th Hawaii International Conference on System Science* (pp. 3807–3816). IEEE.
- Burger, R., Bredenkamp, C., Grobler, C., & van der Berg, S. (2012). Have public health spending and access in South Africa become more equitable since the end of apartheid? *Development Southern Africa*, *29*(5): 681–703.
- Burgess, N., & Radnor, Z. (2013). Evaluating lean in healthcare. *International Journal of Health Care Quality Assurance*, *26*(3): 220–235.
- Burns, L. R., David, G., & Helmchen, L. A. (2011). Strategic response by providers to specialty hospitals, ambulatory surgery centers, and retail clinics. *Population Health Management*, *14*(2): 69–77.
- Burns, N., & Grove, S. K. (2001). Introduction to qualitative research. In *The practice of nursing research. Conduct, critique and utilization*.
- Buttigieg, S. A. C., Gauci, D., & Dey, P. K. (2016). Business process management in health care: current challenges and future prospects. *Innovation and Entrepreneurship in Health*, *3*, 1–13.
- Cambridge Dictionary. (2016). *Framework definition*. Retrieved from <http://dictionary.cambridge.org/dictionary/english/framework>
- Carey, K., Burgess, J. F., & Young, G. J. (2011). Hospital competition and financial performance: the effects of ambulatory surgery centers. *Health Economics*, *20*(5): 571–81.
- Casey, J. T., Brinton, T. S., & Gonzalez, C. M. (2009). Utilization of lean management principles in the ambulatory clinic setting. *Nature Clinical Practice Urology*, *6*(3): 146–153.
- Castano, R. (2014). Towards a framework for business model innovation in health care delivery in developing countries. *BMC Medicine*, *12*(1): 233–239.
- Castoro, C., Bertinato, L., Baccaglioni, U., Drace, C. A., & Mckee, M. (2007). *Day Surgery: making it happen*.
- Castro, L., Lefebvre, E., & Lefebvre, L. A. (2013). Adding intelligence to mobile asset management in hospitals: The true value of RFID. *Journal of Medical Systems*, *37*(5), 9963.
- Chaundry, B., Wang, J., Wu, S., Maglione, M., Mojica, W., Roth, E., ... Shekelle, P. (2006). Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care. *Annals of Internal Medicine*, *144*(10): 742–752.
- Chung, F., Yuan, H., Yin, L., Vairavanathan, S., & Wong, D. T. (2009). Elimination of preoperative testing in ambulatory surgery. *Anesthesia and Analgesia*, *108*(2): 467–475.
- Cima, R. R., Brown, M. J., Hebl, J. R., Moore, R., Rogers, J. C., Kollengode, A., ... Deschamps, C. (2011). Use of Lean and Six Sigma Methodology to Improve Operating Room Efficiency in a High-Volume Tertiary-Care Academic Medical Center. *Journal of the American College of Surgeons*,

213(1): 83–92.

- Cleven, A. K., Winter, R., Wortmann, F., & Mettler, T. (2014). Process management in hospitals: an empirically grounded maturity model. *Business Research*, 7, 191–216.
- Collins, L. M., Padda, J., & Vaghadia, H. (2001). Mini-audits facilitate quality assurance in outpatient units. *Canadian Journal of Anaesthesia*, 48(8): 737–741.
- Competition Commission, S. A. (2014). *Draft Statement of Issues Market Inquiry into the Private Healthcare Sector*.
- Correll, D. J., Bader, A. M., Hull, M. W., Hsu, C., Tsen, L. C., & Hepner, D. L. (2006). Value of preoperative clinic visits in identifying issues with potential impact on operating room efficiency. *Anesthesiology*, 105(6): 1254–1259.
- Coustasse, A., Tomblin, S., & Slack, C. (2013). Impact of radio-frequency identification (RFID) technologies on the hospital supply chain: a literature review. *Perspectives in Health Information Management / AHIMA, American Health Information Management Association*, 10, 1d. <http://doi.org/10.1016/j.ijpe.2010.07.039>
- Cullen, K. A., Hall, M. J., & Golosinskiy, A. (2009). Ambulatory Surgery in the United States, 2006. *National Health Statistics Reports*, 11, 1–25.
- Day Hospital Association of South Africa. (2016a). DHASA Newsletter. Retrieved November 15, 2016, from <http://dhasa.co.za/wp-content/uploads/DHA-Newsletter-June-2016.pdf>
- Day Hospital Association of South Africa. (2016b). Facts about day hospitals with the Day Hospital Association of South Africa.
- Day Hospital Association of South Africa. (2016c). *Private Healthcare Market Inquiry: public hearing*.
- Day, L. W., & Belson, D. (2015). Studying and Incorporating Efficiency into Gastrointestinal Endoscopy Centers. *Gastroenterology Research and Practice*, 1–10.
- Day, L. W., Belson, D., Dessouky, M., Hawkins, C., & Hogan, M. (2014). Optimizing efficiency and operations at a California safety-net endoscopy center: A modeling and simulation approach. *Gastrointestinal Endoscopy*, 80(5): 762–773.
- de Bruin, T., & Rosemann, M. (2007). Using the Delphi technique to identify BPM capability areas. *ACIS 2007 Proceedings*, 643–653. Retrieved from <http://www.scopus.com/inward/record.url?eid=2-s2.0-84869146829&partnerID=tZ0tx3y1>
- de Bruin, T., Rosemann, M., Freeze, R., & Kulkarni, U. (2005). Understanding the main phases of developing a maturity assessment model. In *Proceedings of the 16th Australasian Conference on Information Systems* (pp. 8–19). Sydney, Australia.
- de Vaus, D. (1993). What is research design? In *Research design in social research* (pp. 1–16). London: SAGE publications.



- Dimitriadis, P. A., Iyer, S., & Evgeniou, E. (2013). The challenge of cancellations on the day of surgery. *International Journal of Surgery*, 11(10), 1126–1130. <http://doi.org/10.1016/j.ijisu.2013.09.002>
- Dodaro, C. A., Grifasi, C., Lo Conte, D., & Romagnuolo, R. (2013). Advantages and disadvantages of day surgery in a department of general surgery. *Annali Italiani Di Chirurgia*, 84 (4), 441–444. Retrieved from <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=medl&NEWS=N&AN=23103718>
- Doğan, N. Ö., & Unutulmaz, O. (2014). Lean production in healthcare: a simulation-based value stream mapping in the physical therapy and rehabilitation department of a public hospital. *Total Quality Management & Business Excellence*, 1–17.
- Downer, S. R., Meara, J. G., & Da Costa, A. C. (2005). Use of SMS text messaging to improve outpatient attendance. *Medical Journal of Australia*, 183(7): 366–368.
- du Preez, N., Essman, H., Louw, L., Schutte, C., & Marais, S. (2009). *Enterprise Engineering textbook*.
- Duska, L. R., Mueller, J., Lothamer, H., Pelkofski, E. B., & Novicoff, W. M. (2015). Lean methodology improves efficiency in outpatient academic Gynecologic Oncology clinics. *Gynecologic Oncology*, 138(3): 707–711.
- Ead, H. M. (2016). Ensuring a Smooth Discharge Home After Ambulatory Surgery. *Journal of PeriAnesthesia Nursing*, 31(3): 254–256.
- Econex. (2013). *The South African Private Healthcare Sector : Role and Contribution to the Economy*.
- Edwards, A. F., & Slawski, B. (2016). Preoperative Clinics. *Anesthesiology Clinics*, 34(1): 1–15.
- Erdogan, S. A., & Denton, B. T. (2009). Surgery Planning and Scheduling: A Literature Review. *Working Paper*, (August 2016). Retrieved from <https://docs.google.com/viewer?url=http://www.ise.ncsu.edu/bdenton/Papers/pdf/Erdogan2009.pdf\npapers2://publication/uuid/209AE3B2-9D45-449E-AC2B-5BB22BEC1369>
- Essmann, H. E. (2009). *Toward Innovation Capability Maturity*. University of Stellenbosch. Retrieved from <http://scholar.sun.ac.za/handle/10019.1/1308>
- Fearne, A., Martinez, M. G., & Dent, B. (2012). Dimensions of sustainable value chains: implications for value chain analysis. *Supply Chain Management: An International Journal*, 17(6): 575–581.
- Ferschl, M. B., Tung, A., Sweitzer, B., Huo, D., & Glick, D. B. (2005). Preoperative Clinic Visits Reduce Operating Room Cancellations and Delays. *The Journal of the American Society of Anesthesiologists*, 103(4): 855–859.
- Fisher, D. M. (2004). The business process maturity model: a practical approach for identifying opportunities for optimization. *Business Process Trends*, 9(4), 11–15. Retrieved from [http://www.bpmg.orgwww.bptrends.com/publicationfiles/10-04\\_ART\\_BP\\_Maturity\\_Model\\_-\\_Fisher.pdf](http://www.bpmg.orgwww.bptrends.com/publicationfiles/10-04_ART_BP_Maturity_Model_-_Fisher.pdf)
- Frezza, E. E., Girnys, R. P., Silich, R. J., & Coppa, G. F. (2000). Commentary: Quality of care and cost



- containment are the hospital-based ambulatory surgery challenges for the future. *American Journal of Medical Quality*, 15(3): 114–118.
- Furukubo, M., Ohuchi, A., & Morimoto, N. (2004). Maturity model of hospital (MMH) for continuous improvement. In *Proceedings of the 2nd International Conference on Information Technology for Application (ICITA 2004)* (pp. 356–361).
- Gandhimani, P., & Jackson, I. J. B. (2006). UK guidelines for day surgery. *Surgery (Oxford)*, 24(10): 346–349.
- Gaucher, S., Boutron, I., Marchand-Maillet, F., Baron, G., Douard, R., & Béthoux, J.-P. (2016). Assessment of a Standardized Pre-Operative Telephone Checklist Designed to Avoid Late Cancellation of Ambulatory Surgery: The AMBUPROG Multicenter Randomized Controlled Trial. *PLoS One*, 11(2), e0147194.
- Gemmel, P., Vandaele, D., & Tambreur, W. (2007). *Hospital Process Orientation (HPO): The development of a measurement tool*.
- Gericke, A., Gericke, A., Rohner, P., Rohner, P., Winter, R., & Winter, R. (2006). Networkability in the Health Care Sector - Necessity, Measurement and Systematic Development as the Prerequisites for Increasing the Operational Efficiency of Administrative Processes. *Proceedings of the 17th Australasian Conference on Information Systems*, (April), 10.
- Gilliard, N., Egli, Y., & Halfon, P. (2006). A methodology to estimate the potential to move inpatient to one day surgery. *BMC Health Services Research*, 6(1): 78–89.
- Godinho Filho, M., Boschi, A., Rentes, A. F., Thurer, M., & Bertani, T. M. (2015). Improving Hospital Performance by Use of Lean Techniques: An Action Research Project in Brazil. *Quality Engineering*, 27(2): 196–211.
- Gorenflo, G., & Moran, J. W. (2009). The ABCs of PDCA Phases of the PDCA Model. *Google School*, (June).
- Grobler, S., & Potgieter, A. (2009). Office-based surgery – why it is important. *Continuing Medical Education*, 27(9): 394–396.
- Gupta, A. (2009). Preoperative screening and risk assessment in the ambulatory surgery patient. *Current Opinion in Anaesthesiology*, 22(6): 705–11.
- Hall, R., Belson, D., Murali, P., & Dessouky, M. (2006). Modeling Patient Flows Through the Healthcare System. *International Series in Operations Research & Management Science*, 91, 1–44.
- Hammer, M. (2007). The Process Audit. *Harvard Business Review*, 85(4): 111–123.
- Harmon, P. (2014). Processes and Capabilities. *BPTrends*, (October 2014), 1–6.
- Haufler, K., & Harrington, M. (2011). Using Nurse-to-Patient Telephone Calls to Reduce Day-of-Surgery Cancellations. *AORN Journal*, 94(1): 19–26.

- Henrique, D. B., Rentes, A. F., Godinho Filho, M., & Esposto, K. F. (2015). A new value stream mapping approach for healthcare environments. *Production Planning & Control: The Management of Operations*, (August 2015), 1–25.
- Hevner, A. R. (2007). A Three Cycle View of Design Science Research. *Scandinavian Journal of Information Systems*, 19(2): 87–92.
- Hevner, A. R., March, S. T., Park, J., & Ram, S. (2004). Design Science in Information Systems Research. *MIS Quarterly*, 28(1): 75–105.
- Hofer, J., Chung, E., & Sweitzer, B. J. (2013). Preanesthesia evaluation for ambulatory surgery: do we make a difference? *Current Opinion in Anesthesiology*, 26(6): 669–676.
- Hollenbeck, B. K., Dunn, R. L., Suskind, A. M., Strobe, S. A., Zhang, Y., & Hollingsworth, J. M. (2015). Ambulatory surgery centers and their intended effects on outpatient surgery. *Health Services Research*, 50(5): 1491–1501.
- Hollenbeck, B. K., Dunn, R. L., Suskind, A. M., Zhang, Y., Hollingsworth, J. M., & Birkmeyer, J. D. (2014). Ambulatory surgery centers and outpatient procedure use among Medicare beneficiaries. *Medical Care*, 52(10): 926–931.
- Hukins, G. B. ., Richter, A. ., & van Staden, N. (2001). Day clinics and hospitals - A cost comparison. *South African Medical Journal*, 91(1): 66–72.
- Jabareen, Y. (2011). Building a conceptual framework. Philopspohy, definition, procedure. *International Journal of Qualitative Methods*, 8(4): 49–62.
- Jha, A. (2011). 21st Century Medicine, 19th Century Practices. *Harvard Business Review*. Retrieved from <http://blogs.hbr.org/innovations-in-health-care/2011/02/21st-century-medicine-19th-cen.html>
- Joosten J., Bongers I., & Janssen R. (2009). Application of lean thinking to health care. *International Journal for Quality in Health Care*, 21(5): 341–347.
- Jordaan, Y. 2016. Personal interview. 28 October, Durbanville.
- Joshi, G. P. (2008). Efficiency in ambulatory surgery center. *Current Opinion in Anaesthesiology*, 21(6), 695–698. <http://doi.org/10.1097/ACO.0b013e328311d1b2>
- Joshi, G. P., & Twersky, R. S. (2000). Fast tracking in ambulatory surgery. *Ambulatory Surgery*, 8(4): 185–190.
- Kahn, T. (2015). Advanced health: Get it done in a day. Retrieved from <http://www.financialmail.co.za/moneyinvesting/2015/05/28/advanced-health-get-it-done-in-a-day>
- Kaplinsky, R., & Morris, M. (2002). *A handbook for value chain research*.
- Kim, C. S., Spahlinger, D. a., Kin, J. M., & Billi, J. E. (2006). Lean health care: what can hospitals learn

- from a world-class automaker? *Journal of Hospital Medicine (Online)*, 1(3): 191–199. <http://doi.org/10.1002/jhm.68>
- Kloss, A. (2010). The integration of expatriates: How expatriates living in Denmark define integration. *Integration The Vlsi Journal*, (February).
- Kollberg, B., Dahlgaard, J. J., & Brehmer, P.-O. (2007). Measuring lean initiatives in health care services: issues and findings. *International Journal of Productivity and Performance Management*, 56(1):7–24.
- Kothari, C. R. (2004). *Research Methodology: Methods & Techniques*. New Delhi: New age international publishers.
- Kotze, D. 2016. Personal interview. 1 November, Stellenbosch.
- Kriege, L. (2015). *A Framework for Establishing a Human Asset Register for the Improved Management of People in Asset Management*. University of Stellenbosch.
- Lee, J., Lee, D., & Kang, S. (2007). An overview of the business process maturity model (BPMM). *Advances in Web and Network Technologies, and Information Management*, 384–395.
- Lee, J., Lee, D., & Kang, S. (2009). vPMM: A Value Based Process Maturity Model. *Computer and Information Science*, 208, 193–202.
- Lemos, P., Jarrett, P., & Philip, B. (2006). *Day Surgery development and practice*. London: International Association for Ambulatory Surgery.
- Liles, D. H., Johnson, M. E., & Meade, L. (1995). The Enterprise Engineering discipline. *Society for Enterprise Engineering Conference Proceedings*, 6, 45–47.
- Lin, S. Y., Gavney, D., Ishman, S. L., & Cady-Reh, J. (2013). Use of lean sigma principles in a tertiary care otolaryngology clinic to improve efficiency. *The Laryngoscope*, 123(11): 2643–2648.
- Lloyd, J., Lockhart, J., Sisak, K., & Middleton, R. (2012). Acute care: Optimising day of surgery admissions. *Health Serv J*, 122(6295): 28–30.
- Lockamy, A., & McCormack, K. (2004). The development of a supply chain management process maturity model using the concepts of business process orientation. *Supply Chain Management: An International Journal*, 9(3-4): 272–278.
- Lotz, P. 2016. Personal interview. 31 October, Stellenbosch.
- Lucas, D. P. (2013). *Disruptive transformations in health care: technological innovation and the acute care general hospital*. Virginia Commonwealth University.
- Macario, A. (2006). Are your hospital operating rooms “efficient”? *Anesthesiology*, 105(2): 237–240.
- Maier, A. M., Moultrie, J., & Clarkson, J. P. (2012). Assessing Organizational Capabilities: Reviewing and Guiding the Development of Maturity Grids. *IEEE Transactions on Engineering*

*Management*, 59(1), 138–159.

- Makholwa, A. (2014). Day hospital group to list on AltX. Retrieved from <http://www.bdlive.co.za/business/healthcare/2014/03/28/day-hospital-group-to-list-on-altx>
- Manos, A., Sattler, M., & Alukal, G. (2006). Make Healthcare Lean. *Quality Progress*, 39(7), 24–30. Retrieved from [http://content.ebscohost.com.proxy.library.ohiou.edu/pdf25\\_26/pdf/hww/01027/2v7l6/rf7.pdf?T=P&P=AN&K=501277677&S=R&D=asf&EbscoContent=dGJyMMTo50SeprU4y9fwOLCmr0yep7JSsKy4TbGWxWXS&ContentCustomer=dGJyMPGusky1rrdKuePfgex43zx](http://content.ebscohost.com.proxy.library.ohiou.edu/pdf25_26/pdf/hww/01027/2v7l6/rf7.pdf?T=P&P=AN&K=501277677&S=R&D=asf&EbscoContent=dGJyMMTo50SeprU4y9fwOLCmr0yep7JSsKy4TbGWxWXS&ContentCustomer=dGJyMPGusky1rrdKuePfgex43zx)
- Marchand-Maillet, F., Debes, C., Garnier, F., Dufeu, N., Sciard, D., & Beaussier, M. (2015). Accuracy of patient's turnover time prediction using RFID technology in an academic ambulatory surgery center. *Journal of Medical Systems*, 39(2): 12.
- Marketing, E. (2006). *Event Marketing in IMC 7. Communication*.
- Massachusetts Medical Society. (2011). *Office-Based Surgery Guidelines*. Retrieved from [www.massmed.org/officebasedsurgery](http://www.massmed.org/officebasedsurgery)
- McAuliffe, J. (2007). Six practices of the lean operating room. *OR Manager*, 23(3): 10.
- McCormack, K., & Johnson, B. (2001). Business process orientation, supply chain management and the e-corporation. *IIE Solutions*. Retrieved from <http://elibrary.ru/item.asp?id=6037083>
- McCormack, K., Willems, J., van den Bergh, J., Deschoolmeester, D., Willaert, P., Štemberger, M. I., ... Vlahovic, N. (2009). A global investigation of key turning points in business process maturity. *Business Process Management Journal*, 15(5): 792–815.
- MediClinic. (2016). *Private Healthcare Market Inquiry: public hearing*.
- Merrill, D. G., & Laur, J. J. (2010). Management by outcomes: efficiency and operational success in the ambulatory surgery center. *Anesthesiology Clinics*, 28(2): 329–351.
- Mettler, T., & Blondiau, A. (2012). HCMM - A maturity model for measuring and assessing the quality of cooperation between and within hospitals. *Proceedings - IEEE Symposium on Computer-Based Medical Systems*, (ii).
- Mettler, T., & Rohner, P. (2009). Situational maturity models as instrumental artifacts for organizational design. In *Proceedings of the 4th International Conference on Design Science Research in Information Systems and Technology* (p. 22). Philadelphia.
- Mettler, T., Rohner, P., & Winter, R. (2009). Towards a Classification of Maturity Models in Information Systems. In *6th Conference of the Italian Chapter of the Association for Information Systems* (pp. 333–340).
- Munnich, E. L., & Parente, S. T. (2014). Procedures take less time at ambulatory surgery centers, keeping costs down and ability to meet demand up. *Health Affairs*, 33(5): 764–769.

- Noble, J. (2015). The challenges of same day surgery: a Medscheme perspective. In *Day Hospital Association Conference*.
- O'Meara, E. (2007). The effects of electronic documentation in the ambulatory surgery setting. *AORN Journal*, 86(6): 970–979.
- Ortiga, B., Salazar, A., Jovell, A., Escarrabill, J., Marca, G., & Corbella, X. (2012). Standardizing admission and discharge processes to improve patient flow: A cross sectional study. *BMC Health Services Research*, 12(1): 180–186.
- Pallardy, C., & Becker, S. (2013). 50 Things to know about the ambulatory surgery center industry.
- Pan, C., Zhang, D., Kon, A. W. M., Wai, C. S. L., & Ang, W. B. (2015). Patient flow improvement for an ophthalmic specialist outpatient clinic with aid of discrete event simulation and design of experiment. *Health Care Management Science*, 18(2): 137–155.
- Pash, J., Kadry, B., Bugrara, S., & Macario, A. (2014). Scheduling of procedures and staff in an ambulatory surgery center. *Anesthesiology Clinics*, 32(2): 517–527.
- Patel, R. I., & Hannallah, R. S. (1992). Preoperative screening for pediatric ambulatory surgery: evaluation of a telephone questionnaire method. *Anesthesia & Analgesia*, 75(2): 258–261. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/1632540>
- Paulk, M. C., Curtis, B., Chrissis, M. B., & Weber, C. V. (1993). Capability maturity model version 1.1. *IEEE Software*, 10(4): 18–27.
- Paulk, M. C., Weber, C. V., Garcia, S. M., Chrissis, M. B. C., & Bush, M. (1993). *Key Practices of the Capability Maturity Model (CMM) Version 1.1*.
- Peffer, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2008). A design science research methodology for information systems research. *Journal of Management Information Systems*, 24(3): 45–77.
- Pelly, N., Zealle, B., Reed, M., & Martin, L. (2013). Utilizing integrated facility design to improve the quality of a pediatric ambulatory surgery center. *Paediatric Anaesthesia*, 23(7): 634–638.
- Pitso, R. (2015). Proliferation of day hospitals a blessing for patients and medical aids. Retrieved from <http://www.bdlive.co.za/business/healthcare/2015/07/23/proliferation-of-day-hospitals-a-blessing-for-patients-and-medical-aids>
- Poonja, N. (2013). Pre-Operative Optimization of Surgical Patients. *World Journal of Medical Education and Research*, 3(1): 17–19.
- Pöppelbuß, J., & Röglinger, M. (2011). What makes a useful maturity model? A framework of general design principles for maturity models and its demonstration in business process management. In *European Conference on Information Systems 2011 Proceedings* (p. Paper 28). Retrieved from <http://aisel.aisnet.org/ecis2011/28/>
- Porter, M. E. (1985). *Competitive advantage, creating and sustaining superior performance*. New

York: Free Press.

- Quemby, D. J., & Stocker, M. E. (2013). Day surgery development and practice: key factors for a successful pathway. *Continuing Education in Anaesthesia, Critical Care & Pain*, 14(6): 256–261.
- Rai, M. R., & Pandit, J. J. (2003). Day of surgery cancellations after nurse-led pre-assessment in an elective surgical centre: The first 2 years. *Anaesthesia*, 58(7): 692–699.
- Ramis, F. J., Palma, J. L., & Baesler, F. F. (2001). The use of simulation for process improvement at an ambulatory surgery center. In *Proceedings of the 2001 Winter Simulation Conference* (pp. 1401–1404).
- Rice, A. N., Muckler, V. C., Miller, W. R., & Vacchiano, C. A. (2015). Fast-Tracking Ambulatory Surgery Patients Following Anesthesia. *Journal of PeriAnesthesia Nursing*, 30(2): 124–133.
- Röglinger, M., Pöppelbuß, J., & Becker, J. (2012). Maturity models in business process management. *Business Process Management Journal*, 18(2): 328–346.
- Rohleder, T. R., Lewkonja, P., Bischak, D., Duffy, P., & Hendijani, R. (2011). Using simulation modeling to improve patient flow at an outpatient orthopedic clinic. *Health Care Management Science*, 14(2): 135–145.
- Rohloff, M. (2009). Process Management Maturity Assessment. In *AMCIS 2009 Proceedings* (pp. 631–642).
- Rosemann, M., & Brocke, J. vom. (2015). *Handbook on Business Process Management 1. Handbook on Business Process Management 1*.
- Rosemann, M., & de Bruin, T. (2005). Towards a Business Process Management Maturity Model. In *ECIS 2005 Proceedings of the Thirteenth European Conference on Information Systems*. Germany, Regensburg.
- Roure, M., Halley, Q., & Augusto, V. (2015). Modelling and simulation of an outpatient surgery unit. In *Proceedings of the 2015 Winter Simulation Conference* (pp. 1525–1536).
- Rupp, A., & Pant, H. (2007). Validity theory. In *Encyclopedia of Measurement and Statistics* (pp. 1033–1036). SAGE publications.
- Rutman, L., Stone, K., Reid, J., Woodward, G. A. T., & Migita, R. (2015). Improving Patient Flow Using Lean Methodology: an Emergency Medicine Experience. *Current Treatment Options in Pediatrics*, 1(4):359–371.
- Saunders, M., Lewis, P., & Thornbill, A. (2007). Formulating the research design. In *Research methods for business students* (pp. 130–161).
- Schultz, K., Carayon, P., Hundt, A. S., & Springman, S. R. (2007). Care transitions in the outpatient surgery preoperative process: Facilitators and obstacles to information flow and their consequences. *Cognition, Technology and Work*, 9(4):219–231.



- SEI CMMI Product Team. (2002). *Capability Maturity Model Integration (CMMI) Version 1.1*.
- SEI CMMI Product Team. (2005). *Capability Maturity Model Integration (CMMI) Overview*.
- Shank, J. K., & Govindarajan, V. (1992). Strategic cost management: the value chain perspective. *Journal of Management Accounting Research*, 4(1):177–197.
- Simon, R. W., & Canacari, E. G. (2012). A Practical guide to applying lean tools and management principles to health care improvement projects. *AORN Journal*, 95(1):85–103.
- Simpson, J. A., & Weiner, E. S. C. (1989). *The Oxford English Dictionary*. Oxford, UK: Oxford University Press.
- Singh, S. K. (2013). *Development of service quality measurement scale for grocery retail stores*. Jaypee Institute of Information Technology.
- Smith, C. (2015, September 1). Private health sector only serves 17% of SA. *Fin24*. Cape Town. Retrieved from <http://www.fin24.com/Money/Health/Private-health-sector-only-serves-17-of-SA-20150901>
- Smith, I. (2007). Day surgery for all: Updated selection criteria. *Current Anaesthesia & Critical Care Critical Care*, 18(4): 181–187.
- Smith, I., Cooke, T., Jackson, I., & Fitzpatrick, R. (2006). Rising to the challenges of achieving day surgery targets. *Anaesthesia*, 61(12): 1191–9.
- Souza, L. B. De. (2009). Trends and approaches in lean healthcare. *Leadership in Health Services*, 22(2): 121–139.
- Srai, J. S., Alinaghian, L. S., & Kirkwood, D. A. (2013). Understanding sustainable supply network capabilities of multinationals : A capability maturity model approach. *Journal of Engineering Manufacture*, 227(4):595–615.
- Stadler, J. 2016. Personal interview. 1 November, Stellenbosch.
- Strum, D. P., Vargas, L. G., & May, J. H. (1999). Surgical subspecialty block utilization and capacity planning: a minimal cost analysis model. *Anesthesiology*, 90(4):1176–1185.
- Suskind, A. M., Zhang, Y., Dunn, R. L., Hollingsworth, J. M., Strobe, S. A., & Hollenbeck, B. K. (2015). Understanding the diffusion of ambulatory surgery centers. *Surgical Innovation*, 22(3): 257–265. <http://doi.org/10.1177/1553350614546004>
- Tarhan, A., Turetken, O., & Reijers, H. (2015). Do Mature Business Processes Lead to Improved Performance ? - A Review of Literature for Empirical Evidence. In *ECIS 2015 Completed Research Papers* (p. Paper 178).
- Tarhan, A., Turetken, O., & Reijers, H. A. (2016). Business Process Maturity Models: A Systematic Literature Review. *Information and Software Technology*, 75, 122–134.

- Tarhan, A., Turetken, O., & van den Biggelaar, F. J. H. M. (2015). Assessing Healthcare Process Maturity: Challenges Of Using A Business Process Maturity Model. In *Proceedings of the 2015 9th International Conference on Pervasive Computing Technologies for Healthcare, PervasiveHealth 2015* (pp. 339–342).
- Thomas, D. R. (2006). A General Inductive Approach for Analyzing Qualitative Evaluation Data. *American Journal of Evaluation*, 27(2): 237–246.
- Tinkham, M. R. (2012). The importance of the preoperative history and physical. *OR Nurse*2, 6(3): 40–46.
- Toussaint, J. S., & Berry, L. L. (2013). The promise of lean in health care. *Mayo Clinic Proceedings*, 88(1):74–82.
- Triegaardt, M. (2013). *Picture archiving and communication systems in the South African public healthcare environment: a suitable structure and guidelines to assist implementation and*. University of Stellenbosch. Retrieved from <https://ir1.sun.ac.za/handle/10019.1/85615>
- Tucker, M. E. (2014). Rooms with a view: Kaizen events put things in their proper place. *OR Manager*, 30(7):1–6.
- Urman, R. D., Punwani, N., & Shapiro, F. E. (2012). Office-based surgical and medical procedures: educational gaps. *The Ochsner Journal*, 12(4):383–388.
- Vakili, S., Pandit, R., Singman, E. L., Appelbaum, J., & Boland, M. V. (2015). A comparison of commercial and custom-made electronic tracking systems to measure patient flow through an ambulatory clinic. *International Journal of Health Geographics*, 14(32):1–7.
- Van Der Raadt, B., & Van Vliet, H. (2008). Designing the enterprise architecture function. *Quality of Software Architectures. Models and Architectures*, 103–118.
- Van Looy, A., De Backer, M., & Poels, G. (2010). Which maturity is being measured? a classification of business process maturity models. In *5th SIKS/BENAIIS Conference on Enterprise Information Systems* (pp. 7–16).
- Van Looy, A., De Backer, M., & Poels, G. (2011). Defining business process maturity. A journey towards excellence. *Total Quality Management & Business Excellence*, 22(11):1119–1137.
- Van Looy, A., De Backer, M., & Poels, G. (2014). A conceptual framework and classification of capability areas for business process maturity. *Enterprise Information Systems*, 8(2): 188–224.
- Van Looy, A., De Backer, M., Poels, G., & Snoeck, M. (2013). Choosing the right business process maturity model. *Information & Management*, 50(7): 466–488.
- van Steenberg, M. (2011). *Maturity and effectiveness of enterprise architecture*. University of Utrecht. Retrieved from <http://igitur-archive.library.uu.nl/dissertations/2011-0609-200519/UUindex.html>
- van Steenberg, M., Bos, R., Brinkkemper, S., van de Weerd, I., & Bekkers, W. (2010). The Design of



- Focus Area Maturity Models. In *International Conference on Design Science Research in Information Systems* (pp. 17–19).
- van Steenberg, M., Bos, R., Brinkkemper, S., van de Weerd, I., & Bekkers, W. (2013). Improving IS Functions Step by Step: The Use of Focus Area Maturity Models. *Scandinavian Journal of Information Systems*, 25(2), 35–56. Retrieved from <http://aisel.aisnet.org/sjis/vol25/iss2/2>
- Varkey, P., Reller, M. K., & Resar, R. K. (2007). Basics of quality improvement in health care. *Mayo Clinic Proceedings. Mayo Clinic*, 82(6): 735–739.
- Verma, R., Alladi, R., Jackson, L., & Al, E. (2011). Day case and short stay surgery: 2. *Anaesthesia*, 66(5), 417–434.
- Watkins, A. C., & White, P. F. (2001). Fast-tracking after ambulatory surgery. *Journal of Perianesthesia Nursing*, 16(6):379–387.
- Weber, D. O. (2006). Toyota-style management drives Virginia Mason. *The Physician Executive*, 32(February), 12–17.
- Weber, E. (2014). Measuring welfare from ambulatory surgery centers: a spatial analysis of demand for healthcare facilities. *The Journal of Industrial Economics*, 62(4):591–631.
- Wendler, R. (2012). The maturity of maturity model research: A systematic mapping study. *Information and Software Technology*, 54(12):1317–1339.
- Wier, L. M., Steiner, C. A., & Owens, P. L. (2015). Surgeries in hospital-owned outpatient facilities, 2012, 1–14.
- Willaert, P., Van den Bergh, J., Willems, J., & Deschoolmeester, D. (2007). The process-oriented organisation: a holistic view developing a framework for business process orientation maturity. In *Business Process Management* (pp. 1–15). Springer Berlin Heidelberg.
- Williams, T. J., Li, H., Bernus, P., Uppington, G., & Nemes, L. (1999). The Life Cycle of an Enterprise. In A. Molina, J. M. Sánchez, & A. Kusiak (Eds.), *Handbook of Life Cycle Engineering: Concepts, Models and Technologies* (pp. 153–180). Springer Science & Business Media.
- Winter, A. (2003). Comparing the mix of patients in various outpatient surgery settings. *Health Affairs*, 22(6): 68–75.
- Womack, J. P., & Jones, D. . (2003). *Lean thinking*. London: Simon & Schuster.
- Woodbridge, N. (2014). Chapter 3 Research design and methodology. *Conspectus: The Journal of the South African Theological Seminary*, 40–77.
- Xue, W., Yan, Z., Barnett, R., Fleisher, L., & Liu, R. (2013). Dynamics of Elective Case Cancellation for Inpatient and Outpatient in an Academic Center. *J Anesth Clin Res*, 4(5): 314–323.
- Yin, R. K. (1999). Enhancing the quality of case studies in health services research. *Health Services Research*, 34(5 Pt 2), 1209–1224.

# Appendix A

	Stage 1 Encouragement of process orientation	Stage 2 Case-by-case handling	Stage 3 Defined processes	Stage 4 Occasional corrective action	Stage 5 Closed loop improvement
<b>Culture</b>	<ul style="list-style-type: none"> <li>Employees are encouraged to contribute their own ideas for (care) process improvement.</li> <li>Communication in our hospital spans hierarchical levels (vertical).</li> </ul>	<ul style="list-style-type: none"> <li>We practice a culture of open communication.</li> <li>Communication in our hospital spans departmental and clinical borders (horizontal).</li> </ul>	<ul style="list-style-type: none"> <li>Our senior management does not apply an authoritarian leadership style.</li> </ul>	×	×
<b>Strategy</b>	<ul style="list-style-type: none"> <li>Cross-departmental and cross-clinical cooperation is a fundamental element of our strategy.</li> <li>Cross-departmental and cross-clinical exchange of information is a fundamental element of our strategy.</li> </ul>	<ul style="list-style-type: none"> <li>Adherence to strategic objectives is continuously reviewed.</li> </ul>	×	×	<ul style="list-style-type: none"> <li>The strategy of our hospital is consistently supported on all hierarchical levels.</li> </ul>
<b>Structure</b>	<ul style="list-style-type: none"> <li>We regularly employ interdisciplinary teams consisting of members from different medical professions.</li> </ul>	×	<ul style="list-style-type: none"> <li>There are no or little barriers between the departments (clinics) of our hospital.</li> </ul>	<ul style="list-style-type: none"> <li>Decisions (on both patient care and hospital organisation) are made collectively.</li> </ul>	×
<b>Practices</b>	×	×	<ul style="list-style-type: none"> <li>All work in our hospital is fundamentally process-oriented (following the patient flow).</li> <li>(Care) processes are broadly documented and/or modelled.</li> <li>Our staff is able to name and describe the different (care) processes of up-stream and downstream departments (clinics).</li> </ul>	<ul style="list-style-type: none"> <li>Performance measurement results are used to change and adapt (care) processes.</li> </ul>	<ul style="list-style-type: none"> <li>Process owners (e.g. case managers) have sufficient authority to issue directives.</li> <li>The performance of all (care) processes is reviewed on a regular basis.</li> </ul>
<b>IT</b>	×	×	<ul style="list-style-type: none"> <li>Our IT team facilitates a timely and high-quality availability of required (patient) data</li> </ul>	<ul style="list-style-type: none"> <li>Our hospital information systems are well integrated and support a smooth flow of complete patient care.</li> </ul>	<ul style="list-style-type: none"> <li>Our hospital information systems are easy to use and support clear and understandable interaction.</li> </ul>

FIGURE 54: A CMM FOR HOSPITAL PROCESS MANAGEMENT  
COMPILED FROM (Cleven et al., 2014)

# Appendix B

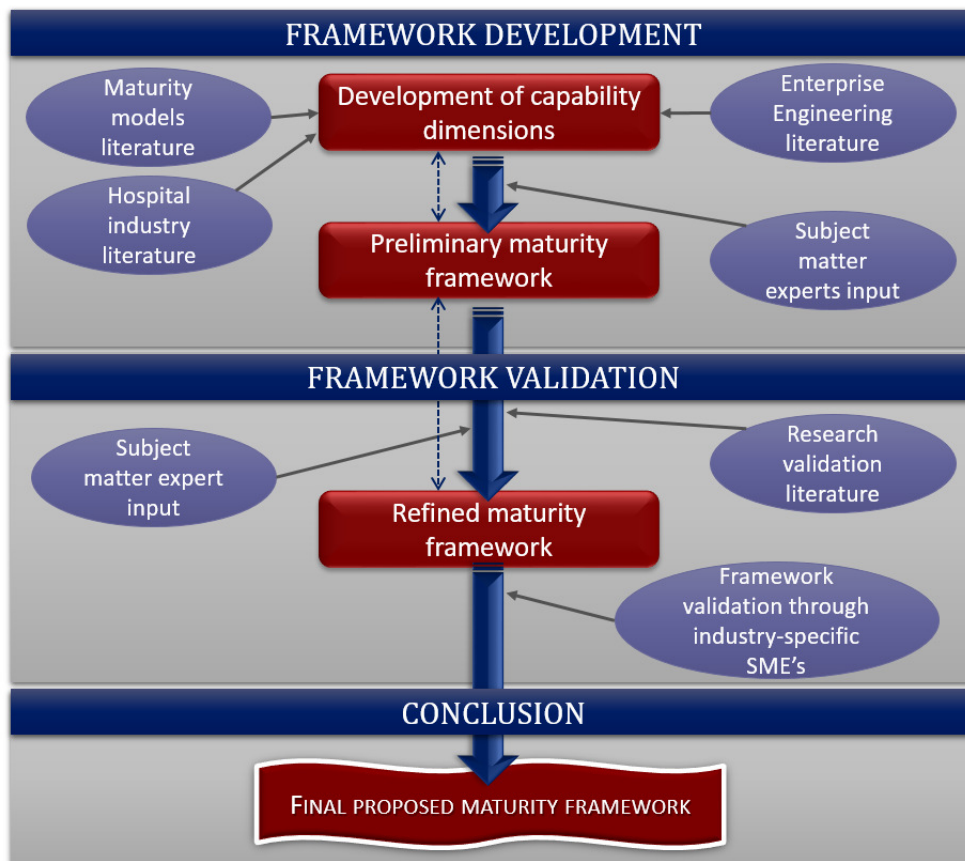


FIGURE 55: RESEARCH APPROACH  
COMPILED FROM (Srai et al., 2013)

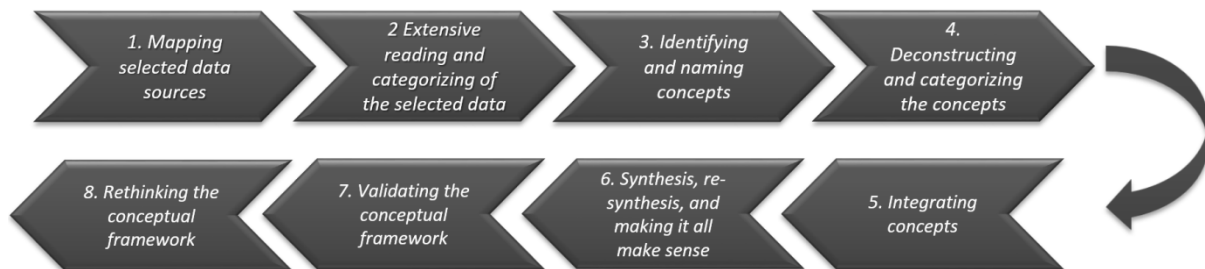


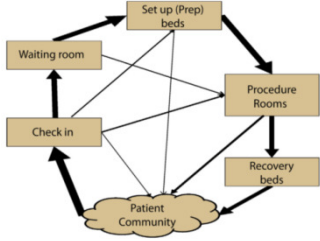
FIGURE 56: CONCEPTUAL FRAMEWORK ANALYSIS  
COMPILED FROM (Jabareen, 2011)

TABLE 38: MATCHING MATURITY MODEL DEVELOPMENT LITERATURE PHASES OF THE RESEARCH STRATEGY TO DEVELOP THE MATURITY MODEL FRAMEWORK FOR DAY HOSPITALS

PHASE AND STEP OF DAY HOSPITAL MATURITY MODEL	MATCHING PHASE	SOURCE	SECTION IN DISSERTATION
<b>PHASE I: PROBLEM IDENTIFICATION PHASE</b>			
1. Problem definition	Phase 1	(Mettler & Rohner, 2009)	Section 3.7.2
	Phase 1	(Becker et al., 2009)	Section 3.7.3
2. Define aim of maturity model	Phase I, step 1	(Tonia de Bruin <i>et al.</i> , 2005)	Section 3.7.1
	Phase 2	(Mettler & Rohner, 2009)	Section 3.7.2
	Phase 1, step 2	(Maier et al., 2012)	Section 3.7.4
<b>PHASE II: UNDERSTAND &amp; INVESTIGATE</b>			
3. Identify & scope functional domain of maturity model	Phase I, step 1	(Tonia de Bruin <i>et al.</i> , 2005)	Section 3.7.1
	Phase 1, step 3	(Maier et al., 2012)	Section 3.7.4
	Phase 1, step 1	(van Steenberg, 2011)	Section 3.7.5
4. Identify stakeholders of maturity model	Phase I, step 2	(Tonia de Bruin <i>et al.</i> , 2005)	Section 3.7.1
	Phase 1, step 1	(Maier et al., 2012)	Section 3.7.4
5. Comparison of existing maturity models	Phase 2	(Becker et al., 2009)	Section 3.7.3
<b>PHASE III: DETERMINE DIMENSIONS OF MATURITY MODEL</b>			
6. Determine dimensions of maturity model	Phase 3, step 5	(Tonia de Bruin <i>et al.</i> , 2005)	Section 3.7.1
	Phase 3, step 3	(Mettler & Rohner, 2009)	Section 3.7.2
	Phase 4	(Becker et al., 2009)	Section 3.7.3
	Phase 2, step 1	(Maier et al., 2012)	Section 3.7.4
	Phase 2, step 2	(van Steenberg, 2011)	Section 3.7.5
7. Determine maturity levels	Phase 2, step 3	(Tonia de Bruin <i>et al.</i> , 2005)	Section 3.7.1
	Phase 3, step 2	(Mettler & Rohner, 2009)	Section 3.7.2
	Phase 4	(Becker et al., 2009)	Section 3.7.3
	Phase 2, step 2	(Maier et al., 2012)	Section 3.7.4
	Phase 2, step 3	(van Steenberg, 2011)	Section 3.7.5
8. Formulate cell text of maturity model	Phase 4	(Becker et al., 2009)	Section 3.7.3
	Phase 2, step 3	(Maier et al., 2012)	Section 3.7.4
	Phase 2, step 5	(van Steenberg, 2011)	Section 3.7.5
9. Group dimensions into main focus areas	Phase 2, step 4	(van Steenberg, 2011)	Section 3.7.5
<b>PHASE IV: PROPOSE SOLUTION</b>			

PHASE AND STEP OF DAY HOSPITAL MATURITY MODEL	MATCHING PHASE	SOURCE	SECTION IN DISSERTATION
10. Final maturity model framework for day hospitals			
<b>PHASE V: EVALUATE SOLUTIONS</b>			
11. Test maturity model construct	Phase 4, step 7	(Tonia de Bruin et al., 2005)	Section 3.7.1
	Phase 3, step 4	(Mettler & Rohner, 2009)	Section 3.7.2
	Phase 7	(Becker et al., 2009)	Section 3.7.3
	Phase 3, step 1 & 2	(Maier et al., 2012)	Section 3.7.4

# Appendix C

SOURCE OF PATIENT FLOW	PATIENT FLOW DIAGRAM
(DAY ET AL., 2014)	 <p>FIGURE 57: SAN FRANCISCO GENERAL HOSPITAL ENDOSCOPY CENTRE PATIENT FLOW</p>

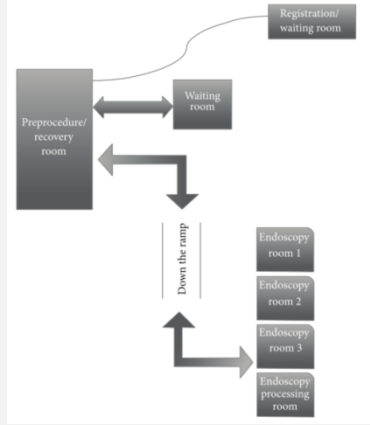
SOURCE OF PATIENT FLOW	PATIENT FLOW DIAGRAM
(ALMEIDA ET AL., 2016)	 <p>The diagram illustrates the patient flow through the endoscopy unit. It begins at the 'Registration/waiting room', which leads to a 'Waiting room'. From the 'Waiting room', patients proceed to the 'Preprocedure/recovery room'. A vertical arrow labeled 'Down the ramp' indicates the transition to the 'Endoscopy processing room'. Following the processing room, the flow continues through 'Endoscopy room 3', 'Endoscopy room 2', and finally 'Endoscopy room 1'.</p>

FIGURE 58: THE HOTEL-DIEU HOSPITAL (KINGSTON, ONTARIO) ENDOSCOPY UNIT WORKFLOW

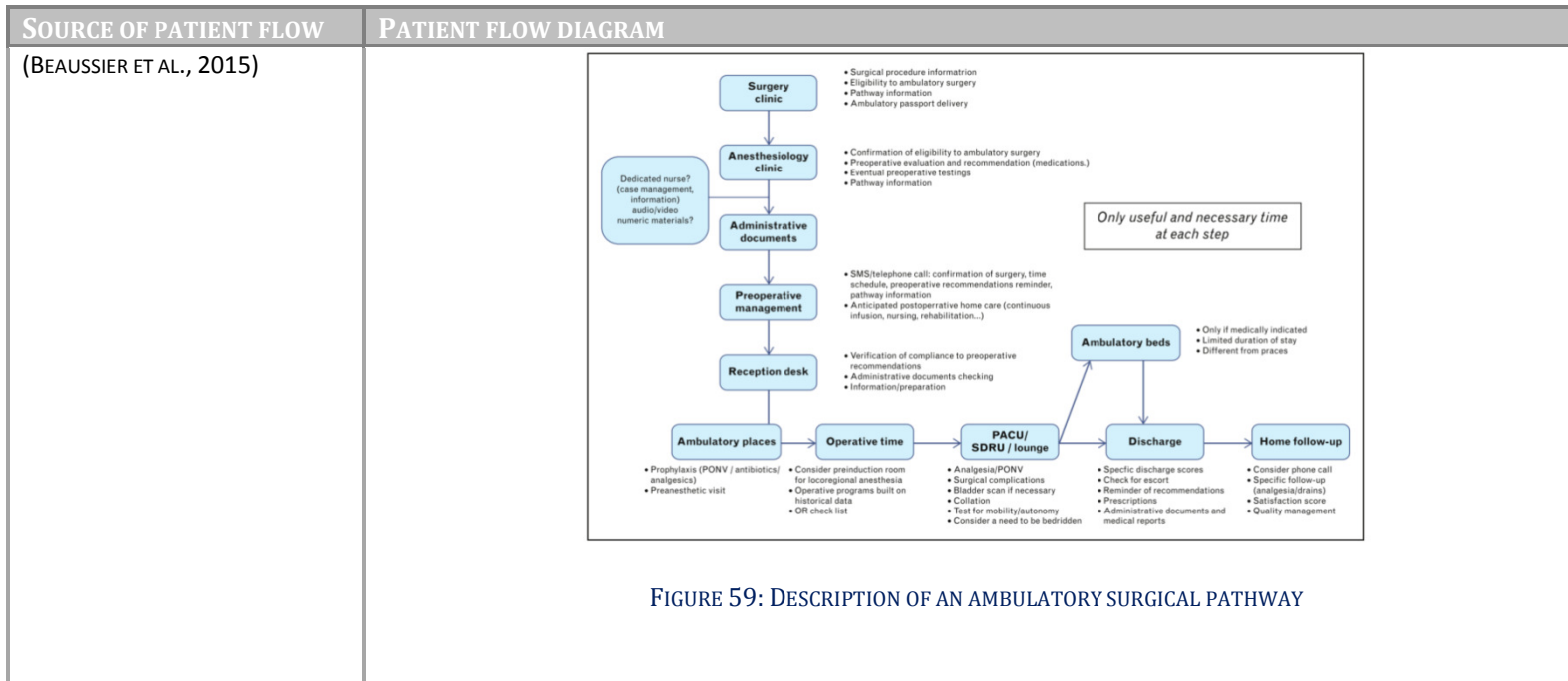
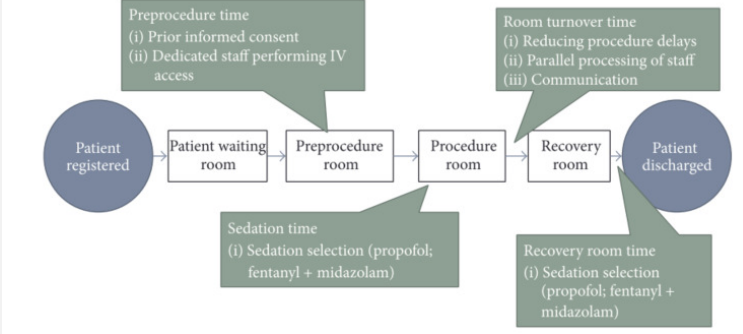
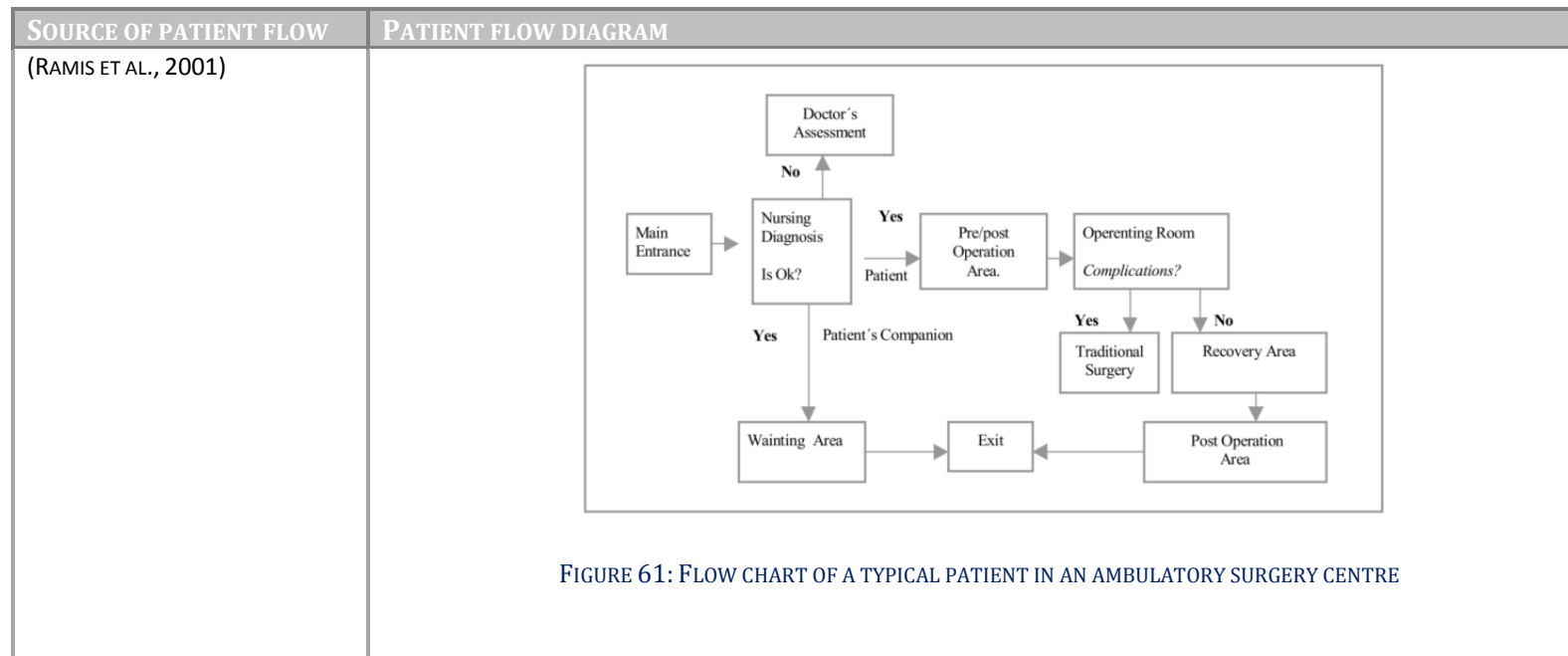


FIGURE 59: DESCRIPTION OF AN AMBULATORY SURGICAL PATHWAY



SOURCE OF PATIENT FLOW	PATIENT FLOW DIAGRAM
(DAY & BELSON, 2015)	 <p>The diagram illustrates the endoscopy centre workflow processes. It begins with a blue circle labeled 'Patient registered', which leads to a box 'Patient waiting room'. From there, an arrow points to a box 'Preprocedure room', which then leads to a box 'Procedure room', followed by a box 'Recovery room', and finally a blue circle 'Patient discharged'. Four callout boxes provide additional details: 'Preprocedure time' (i) Prior informed consent, (ii) Dedicated staff performing IV access; 'Sedation time' (i) Sedation selection (propofol; fentanyl + midazolam); 'Room turnover time' (i) Reducing procedure delays, (ii) Parallel processing of staff, (iii) Communication; and 'Recovery room time' (i) Sedation selection (propofol; fentanyl + midazolam).</p> <p>FIGURE 60: ENDOSCOPY CENTRE WORKFLOW PROCESSES</p>



SOURCE OF PATIENT FLOW	PATIENT FLOW DIAGRAM
<p>(Pan, Zhang, Kon, Wai, &amp; Ang, 2015)</p>	<pre> graph TD     Start([1, Registration]) --&gt; D1{Require pre-consultation services?}     D1 -- Yes --&gt; P2[2, Pre-consultation services]     D1 -- No --&gt; P3[3, Consultation]     P2 --&gt; P3     P3 --&gt; D2{Require post-consultation services?}     D2 -- Yes --&gt; P4[4, Post-consultation services]     D2 -- No --&gt; D3{Need operation?}     P4 --&gt; D4{Need second / third consultation?}     D4 -- Yes --&gt; P3     D4 -- No --&gt; D3     D3 -- Yes --&gt; P5[5, Listing and pre-operation tests and counseling]     D3 -- No --&gt; P6([5, Payment and appointment booking])     P5 --&gt; P6     </pre>

FIGURE 62: PATIENT FLOW IN THE SPECIALIST OUTPATIENT CLINIC

SOURCE OF PATIENT FLOW	PATIENT FLOW DIAGRAM
<p>(QUEMBY &amp; STOCKER, 2013)</p>	<pre> graph TD     A[Patient listed for a procedure suitable for day surgery] --&gt; B[Nurse-based preoperative assessment]     C[Anaesthetic review] --&gt; B     B --&gt; D[Patient fit for surgery]     D --&gt; E[Patient given day surgery operation date with operative information and preoperative instructions]     E --&gt; F[Day of admission Routine preoperative checks]     F --&gt; G[Day surgery procedure]     G --&gt; H[Discharge with analgesia, postoperative information, and instructions]     H --&gt; I[Telephone follow-up]          A --&gt; J[Minimize this time] --&gt; B          B --&gt; K[optimization] --&gt; D          C --&gt; L[Unsuitable for day surgery]     L --&gt; M[Consider: • LA procedure • Is surgery necessary? • Inpatient pathway]     </pre> <p style="text-align: center;">FIGURE 63: AN IDEAL DAY SURGERY PATHWAY</p>

SOURCE OF PATIENT FLOW	PATIENT FLOW DIAGRAM
(Roure, Halley, & Augusto, 2015)	<p><b>FIGURE 64: PRE-SURGERY PROCESS IN THE AMBULATORY UNIT</b></p>
(Roure et al., 2015)	<p><b>FIGURE 65: SURGERY PROCESS IN THE OPERATING THEATRE</b></p>

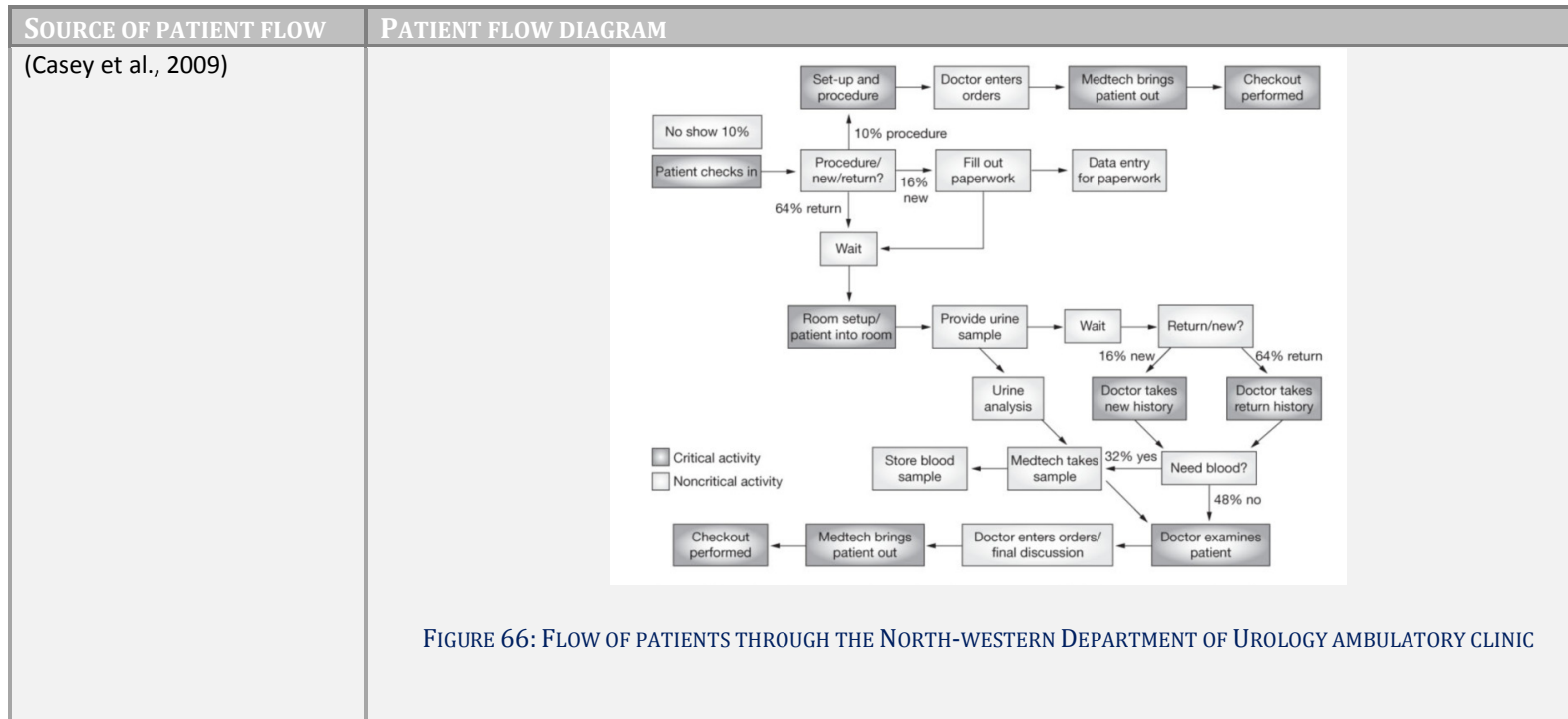


FIGURE 66: FLOW OF PATIENTS THROUGH THE NORTH-WESTERN DEPARTMENT OF UROLOGY AMBULATORY CLINIC

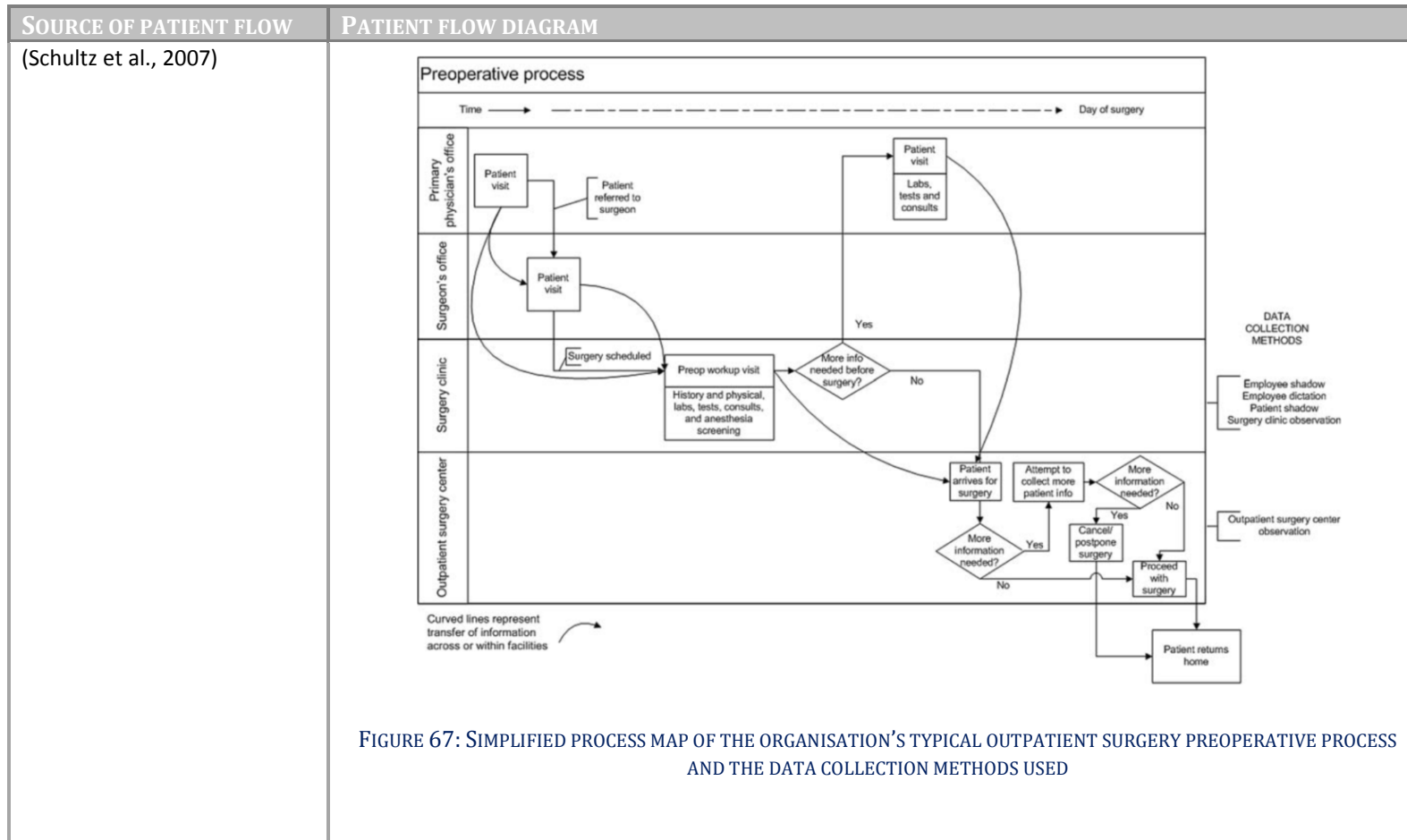


FIGURE 67: SIMPLIFIED PROCESS MAP OF THE ORGANISATION'S TYPICAL OUTPATIENT SURGERY PREOPERATIVE PROCESS AND THE DATA COLLECTION METHODS USED

# Appendix D

---

## **Summary of the validation meeting regarding the conceptual patient flow pathway and each of its steps.**

This meeting took place on the 23<sup>rd</sup> of September 2016. The most relevant improvements and/or feedback that were given by Pieter Lotz, Operational Manager of Mediclinic's Day Hospital division, regarding the patient flow pathway (this patient flow pathway is visually depicted in Figure 38) are discussed below.

### **Comment 1**

The most prominent comment made by Pieter focused on the difference between day hospital terminology used within South African context, and the terminology used within the majority of the literature. Pieter stressed the importance of explicitly stating the patient flow terminology and process followed in South Africa, as this may lead to confusion and incorrect interpretation of concepts. The terminology as provided by Pieter is comprehensively distinguished and elaborated on in Section 5.2.

### **Comment 2**

The operative phase of the main patient flow pathway should include all activities that take place from the moment the patient enters the OR to the moment the patient exists the recovery area, rather than when existing the OR after the day surgical procedure has been performed. This implies that the subsequent phase, the postoperative phase should refer to all the activities that takes place from the moment the patient exists the recovery area after day surgery to the moment the patient is discharged and exists the day facility to return home.

### **Comment 3**

The activities of the pre-admission phase, visually depicted in Figure 42, should include a step that indicates that the patient obtains authorisation from the medical aid for the surgery to be performed. Without this medical aid authorisation, the surgical day procedure cannot be performed, and the patient flow pathway is terminated. He further stressed that within the South African context, the responsibility of obtaining medical aid authorisation lies with the patient.

### **Comment 4**

During the preoperative phase, the importance of minimising the time the patient must wait in the waiting room as much as possible was emphasised. This step was identified as a critical step in which time waste must be eliminated.



**Comment 5**

During the final step of the preoperative phase in which the patient is transported to the OR, Pieter emphasised that a shift towards rather motivating the patient to walk to the OR if possible must be considered. This will lead to the minimisation of time waste and the use of resources, as it would not require a nurse or porter to push the patient in a hospital bed to the OR.

**Comment 6**

Pieter indicated that it must be noted that the nurse evaluating the patient in the recovery area after exiting the OR, is a theatre nurse trained to work in the recovery area. This must be noted as this type of nurse must be appointed to specifically perform this task in the recovery area. It is thus not possible to share and utilise nursing resources working in the ward, and those working in the recovery area throughout the day hospital facility.

**Comment 7**

During the first step of the postoperative phase, the literature indicated that the patient recovers in a recovery room. This recovery room was identified as a different ward the patient returns to after surgery than the room the patient was allocated to before surgery. Pieter however indicated that within South African context, the patient is returned to the same ward after surgery. This implies that the patient is allocated to a ward before surgery, and then returns to that same ward after surgery to recover. There is thus no separate recovery room.

**Comment 8**

During the post-discharge phase, there is a step in which a patient must schedule a postoperative follow-up appointment with the surgeon. Pieter emphasised that within the South African context this a compulsory step that the patient must visit the surgeon for a post-operative follow-up.

**Final concluding remark**

Pieter agreed and confirmed that with his improvements and feedback included, the main patient flow pathway as well as the activities of each of the phases are representative of the actual patient flow pathway within a day hospital setting.

# Appendix E

Interviewer:

Interviewee:

Date:

## 1. INTERVIEWEE BACKGROUND CONTEXTUALISATION

- a) What is your occupation and the industry thereof?
- b) What is your current role in the organisation?
- c) Previous exposure to the field of day hospital management? Please elaborate.
- d) Previous exposure to the field of capability maturity models? Please elaborate.

## 2. RESEARCH METHODOLOGY RELATED QUESTIONS

- a) To what extent do you agree or disagree with the research methodology that was followed in the development of the maturity model framework for day hospitals, as visually depicted in Figure 37?
  - i) If you do not agree with the research methodology what improvements do you propose?
  - ii) Considering the research methodology that was followed, what is your opinion of the potential of the framework as guidance to establish the current maturity of a day hospital?
- b) To what degree do you agree with the process followed in identifying all the various dimensions that influences the efficiency of a day hospital?

## 3. FRAMEWORK RELATED QUESTIONS

- a) Do you believe that the dimensions identified in the maturity model comprise a comprehensive framework for the assessment of day hospital maturity?
  - i) Are there any additional dimensions that you feel must be included in the maturity model?
- b) Please comment on the following structural aspects of the framework?
  - i) How would you rate the easiness of understanding the framework?
  - ii) How well does the framework allow the establishment of the maturity of a day hospital?
- c) In your opinion, what are strong points of the proposed maturity model framework for day hospitals?
- d) In your opinion, what are weak points of the proposed maturity model framework for day hospitals?
- e) In your opinion, how can the framework be improved?
- f) Please comment on the applicability and usability of this framework, from your professional viewpoint, to establish the maturity of a day hospital.

#### **4. FURTHER COMMENTS**

Please provide any further comments should you deem it necessary

**Thank you very much for your time and effort in the validation of this research study. It is greatly appreciated.**

# Appendix F

## Interview Questionnaire

Interviewer: Lizan Henning

Interviewee: Pieter Lotz

Date: 31/10/2016

### 1. INTERVIEWEE BACKGROUND CONTEXTUALISATION

- a) **What is your occupation and the industry thereof?**  
An operations manager for Mediclinic Southern Africa, a private hospital group in South Africa.
- b) **What is your current role in the organisation?**  
Operations Manager: Day Clinics – Responsible for the role out of a Day Clinic (hospital) strategy.
- c) **Previous exposure to the field of day hospital management? Please elaborate.**  
Was hospital manager of the Mediclinic Strand facility for 6 years. The facility was operated as a day clinic.
- d) **Previous exposure to the field of capability maturity models? Please elaborate.**  
Limited. Only in theory as part of training.

### 2. RESEARCH METHODOLOGY RELATED QUESTIONS

- a) **To what extent do you agree or disagree with the research methodology that was followed in the development of the maturity model framework for day hospitals, as visually depicted in Figure 37?**  
100% in agreement.
  - i) **If you do not agree with the research methodology what improvements do you propose?**  
In agreement
  - ii) **Considering the research methodology that was followed, what is your opinion of the potential of the framework as guidance to establish the current maturity of a day hospital?**  
Very good. The various dimensions that affects the efficiency, performance and/or profitability were identified and are listed in the framework.
- b) **To what degree do you agree with the process followed in identifying all the various dimensions that influences the efficiency of a day hospital?**  
100%. The success of a day hospital is fully dependent on the number of admissions that it can efficiently take through the system in the shortest possible time. Measuring the maturity of the patient flow pathway will be an ideal indication of the maturity of the day hospital.

### 3. FRAMEWORK RELATED QUESTIONS

- a) Do you believe that the dimensions identified in the maturity model comprise a comprehensive framework for the assessment of day hospital maturity?**

Yes, on a high level.

- i) Are there any additional dimensions that you feel must be included in the maturity model?**

Nothing to add.

- b) Please comment on the following structural aspects of the framework?**

- i) How would you rate the easiness of understanding the framework?**

Very easy.

- ii) How well does the framework allow the establishment of the maturity of a day hospital?**

Very good.

- c) In your opinion, what are strong points of the proposed maturity model framework for day hospitals?**

A day hospital can identify opportunities for improvement and focus on those areas. It can also be used to determine the maturity level of a group of hospitals.

- d) In your opinion, what are weak points of the proposed maturity model framework for day hospitals?**

Need to take it one level lower (task level) to make the model more comprehensive.

- e) In your opinion, how can the framework be improved?**

Measure the maturity at task level.

- f) Please comment on the applicability and usability of this framework, from your professional viewpoint, to establish the maturity of a day hospital.**

The framework can be used to identify opportunities for improvement and focus areas.

### 4. FURTHER COMMENTS

**Please provide any further comments should you deem it necessary**

None.

*Thank you very much for your time and effort in the validation of this research study. It is greatly appreciated.*

**Interview Questionnaire**

Interviewer: Lizan Henning

Interviewee: Dirk Kotzé

Date: 1/11/2016

**1. INTERVIEWEE BACKGROUND CONTEXTUALISATION**

- a) What is your occupation and the industry thereof?**  
Industrial engineer in the private hospital (i.e. healthcare) industry
- b) What is your current role in the organisation?**  
Process Improvement Engineer, concerned with improving of business performance through business process engineering, enterprise engineering, and operations research interventions
- c) Previous exposure to the field of day hospital management? Please elaborate.**  
Very little. Most of the exposure was through high-level theoretical discussions with representatives of our organisation working in this field.
- d) Previous exposure to the field of capability maturity models? Please elaborate.**  
Very little. I did some reading on some maturity models, but have never utilised or been involved in the utilisation of a maturity model.

**2. RESEARCH METHODOLOGY RELATED QUESTIONS**

- a) To what extent do you agree or disagree with the research methodology that was followed in the development of the maturity model framework for day hospitals, as visually depicted in Figure 37?**  
The research methodology seems well suited for the purpose of developing a maturity model for day hospitals.
- i) If you do not agree with the research methodology what improvements do you propose?**  
None
- ii) Considering the research methodology that was followed, what is your opinion of the potential of the framework as guidance to establish the current maturity of a day hospital?**  
It seems that the process followed to develop the framework is well suited to deliver a usable and applicable maturity model.
- b) To what degree do you agree with the process followed in identifying all the various dimensions that influences the efficiency of a day hospital?**  
It is understood that the dimensions were identified through literature study. The relevance of the dimensions discussed in the various literary sources should depend on the context and scope in which it was developed. Care should therefore be taken to ensure that the sources refer more to practical, actual and general experiences as opposed to purely theoretical or very focused research. On the other hand, the more sources corroborate a certain dimension, the more applicable it ought to be. I would agree that the process would be applicable if this was the case. The fact that the framework is also validated by actual operators of day hospitals strengthens it further, so I am comfortable with the process that was followed.

### 3. FRAMEWORK RELATED QUESTIONS

- a) Do you believe that the dimensions identified in the maturity model comprise a comprehensive framework for the assessment of day hospital maturity?**

Yes

- i) Are there any additional dimensions that you feel must be included in the maturity model?**

No

- b) Please comment on the following structural aspects of the framework**

- i) How would you rate the easiness of understanding the framework?**

The framework is easy to understand

- ii) How well does the framework allow the establishment of the maturity of a day hospital?**

It provides a practical and actionable view of the important factors that is applicable with regards to determining the maturity of a day hospital. The actual value is however more in the cell text than in the framework, and in some cases this text may have to be refined/made more specific to make the framework more practical.

- c) In your opinion, what are strong points of the proposed maturity model framework for day hospitals?**

It provides a very clear view on the important factors to focus on then attempting to improve the maturity of a day hospital's operations.

- d) In your opinion, what are weak points of the proposed maturity model framework for day hospitals?**

Some of the terms used to describe a specific maturity level for a specific dimension are vague, making the actual determining of the maturity level quite subjective, e.g. "A well-developed protocol is in place..." What does a well-developed protocol look like?

- e) In your opinion, how can the framework be improved?**

More specific/detailed ways to accurately determine the maturity level for a specific dimension (see above).

- f) Please comment on the applicability and usability of this framework, from your professional viewpoint, to establish the maturity of a day hospital.**

The framework definitely seems very applicable, provided that the cell text in some cases are made more specific to assist in accurately and objectively identifying the most relevant maturity level for a specific dimension.

### 4. FURTHER COMMENTS

**Please provide any further comments should you deem it necessary**

None

*Thank you very much for your time and effort in the validation of this research study. It is greatly appreciated.*

**Interview Questionnaire**

Interviewer: Lizan Henning

Interviewee: Johan Stadler

Date: 1/11/2016

**1. INTERVIEWEE BACKGROUND CONTEXTUALISATION****a) What is your occupation and the industry thereof?**

Industrial Engineer in the private healthcare industry.

**b) What is your current role in the organisation?**

Work as Process Improvement Engineer (PIE) within the Business Performance department of Mediclinic Southern Africa (MCSA). Together with the other PIE in MCSA, we work on various process and system related improvement projects. Our main focus areas are in the fields of Management Information, Business Improvement [including the application of specialised Industrial Engineering skills and techniques (top-down problem solving) as well as driving the phasing in of a Continuous Improvement programme in MCSA whereby all staff will be involved in operational problem solving and improvement activities (bottom-up problem solving)]. We are also functioning in a governance role regarding the mapping of business processes in MCSA (which are done for various purposes) and we are responsible to implement a Benefits Management methodology in MCSA to ensure structured and thorough identification of the benefits of improvement projects and to ensure the realisation of those benefits can be and are eventually tracked.

**c) Previous exposure to the field of day hospital management? Please elaborate.**

I started with Mediclinic in May 2013 in my current role. No hospital experience prior.

**d) Previous exposure to the field of capability maturity models? Please elaborate.**

None.

**2. RESEARCH METHODOLOGY RELATED QUESTIONS****a) To what extent do you agree or disagree with the research methodology that was followed in the development of the maturity model framework for day hospitals, as visually depicted in Figure 37?**

I have no reservations around the research methodology as depicted by Figure 1 in the research document. It appears that the selected methodology is based on proven approaches such as those by Srari et al (2013) and Jabareen (2011). Judging from what is depicted in Figure 1 and from the explanations in the section 1.3.2 in the research document appears logical and sufficient for the purposes of the research undertaken.

**i) If you do not agree with the research methodology what improvements do you propose?**

No disagreement.

**ii) Considering the research methodology that was followed, what is your opinion of the potential of the framework as guidance to establish the current maturity of a day hospital?**

I am not sure what the need exactly is for such a maturity assessment framework at real day hospitals in South Africa, but if I look at the clustering of



the key dimensions against which maturity is proposed to be assessed (as per Figure 12) I agree that those dimensions are indeed key dimensions of a day hospital and that having an understanding of the maturity of a day hospital in terms of each of those key dimensions should be helpful, especially to prioritise focus areas for improvement. In my mind the value to be gained from the framework will be dependent on how well the framework can be translated into a practical assessment tool and how well the assessment tool can be complemented by a tool that can aid a day hospital to take practical steps to improve on the level of maturity per key dimension as measured by the assessment tool.

**b) To what degree do you agree with the process followed in identifying all the various dimensions that influences the efficiency of a day hospital?**

I agree strongly with the “patient flow approach” (as introduced in section 1.3.2.2 as Phase III, and as discussed in chapter 2) which was taken to, in turn, identify dimensions affecting efficiency, performance and profitability. It makes for logical reasoning and it is increasingly critical in healthcare to design processes and metrics around the patient flow and patient experience rather than around the hospital’s processes.

### 3. FRAMEWORK RELATED QUESTIONS

**a) Do you believe that the dimensions identified in the maturity model comprise a comprehensive framework for the assessment of day hospital maturity?**

Yes

**i) Are there any additional dimensions that you feel must be included in the maturity model?**

I will not add an additional dimension, but I propose that the “People Management and Culture” dimension is expanded to add a sub-dimension for “Workforce Management System and Practices”. There should then be different indicators of the degree of maturity with which this sub-dimension is place. Unless I have missed it in the other dimensions, I could not see a clear reference to it. In any hospital environment the management of staff hours worked, hours absent and the accompanying costs are typically one of the biggest focus areas. Staff cost, particularly nursing staff cost, is typically one of the biggest cost drivers. (Workforce Management System and Practices would refer to the process of annual budgeting, advanced and JIT planning and then scheduling of nursing staff, time and attendance management and monitoring of actuals vs. plans, schedules, budgets and other benchmarks.)

In South Africa, in private healthcare, the management of doctors’ hours will typically not fall within the hospital’s jurisdiction, but optimal planning and scheduling of doctors (together with the supporting nursing teams) in order to optimise patient flow and efficient theatre and bed utilisation could be made part of the broader workforce management efforts in a day hospital.

**b) Please comment on the following structural aspects of the framework**

**i) How would you rate the easiness of understanding the framework?**

I would say that the framework is rather easy to understand, provided that the reader is familiar with the design process and detail dimensions explained in Chapter 5.

**ii) How well does the framework allow the establishment of the maturity of a day hospital?**

As mentioned above, I think the effectiveness of the framework will be dependent on how well it can be used in a real-life setting as a practical tool for assessment. That might require some further work to make it easier for an assessor to be able to identify practical things which should be in place, as well as to gauge the degree to which those things are in place. Having a questionnaire with a list of tick boxes (potentially weighted) to mark whether certain things are in place or not could serve as a practical tool. Such a tool could potentially be electronically available such as in an “app” format. For example, when rating the maturity level in terms of sub-dimension “Development of performance metrics” it could help an assessor to be able to “tick off” and/or provide a rating to indicate the degree to which a facility does have all the elements in place which are described on p.77 as required to be place in a mature environment. However, I reckon using the framework as is, would already be a pretty useful aid to consider most key dimensions (aspects) of a day hospital and to assess qualitatively or through a basic interrogation process how well those dimensions are actually in place.

**c) In your opinion, what are strong points of the proposed maturity model framework for day hospitals?**

I think it covers most if not all of the key dimensions of a day hospital and I think the framework is quite clear and understandable. The logic behind its development is also sound and based on thorough research.

**d) In your opinion, what are weak points of the proposed maturity model framework for day hospitals?**

**e) In your opinion, how can the framework be improved?**

For d) and e), please refer to my comment in question 3.a.i above under Framework related questions.

**f) Please comment on the applicability and usability of this framework, from your professional viewpoint, to establish the maturity of a day hospital.**

Please refer to my comment in question 3.b.ii above under Framework related questions.

#### 4. FURTHER COMMENTS

***Please provide any further comments should you deem it necessary***

None

*Thank you very much for your time and effort in the validation of this research study. It is greatly appreciated.*

Interviewer: Lizan Henning

Interviewee: Yvette Jordaan

Date: 28/10/2016

### 1. INTERVIEWEE BACKGROUND CONTEXTUALISATION

**a) *What is your occupation and the industry thereof?***

I'm a Registered Nurse and have been working in the medical field through my whole career.

**b) *What is your current role in the organisation?***

Day Clinic Manager

**c) *Previous exposure to the field of day hospital management? Please elaborate.***

I use to live in Holland and had the opportunity to work in two Day Clinics. The one was a general Day Clinic where we did mostly, Gynaecology, General Surgery, Orthopaedics, Paediatric, Urology, ENT and Plastic Surgery. The other was a clinic where we only did Eye Surgery. I wasn't the manager but had the opportunity to see how a Day Clinic is managed.

**d) *Previous exposure to the field of capability maturity models? Please elaborate.***

I don't have any experience in this.

### 2. RESEARCH METHODOLOGY RELATED QUESTIONS

**a) *To what extent do you agree or disagree with the research methodology that was followed in the development of the maturity model framework for day hospitals, as visually depicted in Figure 37?***

I wasn't involved with the whole development of the Day Clinics. When I came the unit was already opened

**i) *If you do not agree with the research methodology what improvements do you propose?***

**ii) *Considering the research methodology that was followed, what is your opinion of the potential of the framework as guidance to establish the current maturity of a day hospital?***

**b) *To what degree do you agree with the process followed in identifying all the various dimensions that influences the efficiency of a day hospital?***

### 3. FRAMEWORK RELATED QUESTIONS

**a) *Do you believe that the dimensions identified in the maturity model comprise a comprehensive framework for the assessment of day hospital maturity?***

**i) *Are there any additional dimensions that you feel must be included in the maturity model?***

At the moment, and from the information you gave me it looks right to me, there is nothing that I could think of to add.

**b) *Please comment on the following structural aspects of the framework?***

**i) *How would you rate the easiness of understanding the framework?***

From what I can read – it is a model that predicts what will happen with a Day Clinic from the moment it is planned to the moment it is up and running. There

are also certain criteria that should be met before the unit is considered to be mature

**ii) How well does the framework allow the establishment of the maturity of a day hospital?**

To me it is a very thought thru and complete framework. At the moment, there isn't a thing that I can think of to add.

**c) In your opinion, what are strong points of the proposed maturity model framework for day hospitals?**

I like the fact that it doesn't just look at normal management tasks but for instance the structure and the effect it might have on the department is also included. It has a very holistic approach.

**d) In your opinion, what are weak points of the proposed maturity model framework for day hospitals?**

I think that once I have used and "lived" this model it will be easier for me to add to this point. At the moment, it looks very complete and well thought through.

**e) In your opinion, how can the framework be improved?**

Same argument as with the previous question.

**f) Please comment on the applicability and usability of this framework, from your professional viewpoint, to establish the maturity of a day hospital.**

I definitely plan to make use of this model. It will help me in developing goals and objectives for my department. Thru this model I already got the idea to contact the patients after surgery to find out how they are doing. At the moment, I might not be able to use all the points. However, I'm very interested in the Lean Methodology and would like to implement those principles, to help us be more sufficient and productive.

#### 4. FURTHER COMMENTS

*Please provide any further comments should you deem it necessary*

None.

*Thank you very much for your time and effort in the validation of this research study. It is greatly appreciated.*