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Informing BPM practice in Emergency Units of South African hospitals for improved patient flow.

A dissertation by

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Master of Commerce in Information Systems

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Abstract

Globally, higher healthcare demand strains existing systems, already overburdened by a lack of resources and funding while longer life expectancy and increased disease burden force higher patient loads. A majority of the South African population is medically uninsured and therefore depend on emergency care; consequently, the healthcare service demand easily exceeds available acute care to prevent life threat. When this happens, emergency centres suffer from overcrowding and long patient waiting times, which increases morbidity and mortality, associated patient risk. Moreover, critical resources such as staff and hospital beds are required for an even flow of patients through hospitals, but are distributed inefficiently. The South African healthcare system configuration therefore delays access to and compromises the delivery of equitable, unbiased life-saving healthcare in an environment moreover challenged by economic pressures. This calls for sustainable, cost-effective reform. Therefore, more efficient healthcare can save more lives by improving access to life-saving care.

Research on current Healthcare Information Systems (HIS) shows an incoherent knowledge body with conceptual gaps in theories on healthcare, which disengages transformation potential. Comprehensive reform tactics thus require *a priori* concept discovery and diagnostics to make research practically useful. The systematic use of BPM theories allowed for the qualitative assessment of as-is process activity at patient touch-points at three hospitals – two public and one private – in the Western Cape of South Africa. Because a strategic Information Systems (IS) methodology, Business Process Management (BPM) poses business process activity improvement, this research draws from successful BPM activity as a means to improve patient flow processes in Emergency Centres (ECs). Success is evaluated by drawing from empirically supported enabler categories and prescriptive guidelines because BPM practice is not yet fully understood.

The results show a clear correlation between the improvement areas at the three hospitals; improvements on aspects of actions and decisions taken during patient-flow process activity, therefore support a pragmatic approach to reform. The data confirms disparity between public and private healthcare. Healthcare appears to be a “doctor driven” service, which, based on qualitative decision-making, navigates patients along defined flows, enabled by supporting human capital and hospital assets. Optimal patient flow is a product of symbiotic working relationships and depends on efficient integration with wider hospital functions. Shorter waiting times and hospital stays reduce process burden. This leads to more efficient resource usage and regulated access to healthcare. However, integrated healthcare reform must consider the time demands and rigidity of clinical processes. The challenge lies in finding the space to invite parallel business agility to drive the reform of the stricken healthcare industry in South Africa.

Keywords

Healthcare reform; health systems strengthening; triage process; healthcare BPM; healthcare framework; BPM implementation support; Healthcare Information Systems (HIS).

Preface

This Master's dissertation is original work by the author, I.P. Loriston. The topic was conceptualised independently and with supervisory academic guidance from Professors Edda and Peter Weimann during the coursework toward a Master of Commerce degree from the University of Cape Town (UCT).

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I dedicate this work to my baby Zaiah: May you have the best life Daddy can provide. Dear Good Lord, Thank You. The challenging journey brought the grace of blessed growth. I am grateful. Lost to suicide, "*Lights will guide you home*", dear brother and baby sis; I commit my learning toward a world more beautiful, unwaveringly.

List of abbreviations

BPM	Business Process Management
BSM	BPM success model
EC	Emergency Centre
ED	Emergency Department
EM	Emergency Medicine
GSH	Groote Schuur Hospital
HIS	Healthcare Information Systems
HIT	Healthcare Information Technology
IGOE	Inputs Outputs Guides Enablers model
IS	Information Systems
IT	Information Technology
PCSF	Process-specific critical success factors
PCC	Patient-centred care
SA	South Africa
SATS	South African Triage Scale
TSEF	Theory of Swift and Even Flow
UCT	University of Cape Town
VSM	Value Stream Mapping
WC	Western Cape
WHO	World Health Organization

Chapter 1: Introduction

Healthcare in South Africa (SA) desperately requires reform (Mayosi, Lawn, Niekerk, et al., 2012). A distinct division between private and public healthcare in SA emanates from funding (Perrott, 2003; Weimann & Stuttford, 2014). Medical insurance schemes and patients who can afford the pay-for-service model primarily endow private healthcare, which serves 20% of the population within comfortable settings (Wallis, Garach, & Kropman, 2008). Resource-constrained public healthcare in SA serves 70% of the population without all the supporting systems to offer basic pre-hospital life support or the outlook to implement such relief (Sun, Shing, Twomey, & Wallis, 2014; Wallis et al., 2008).

Dysfunctional healthcare has severe consequences (Chopra, Daviaud, Pattinson, Fonn, & Lawn, 2009). Since 1990, SA has become one of 12 countries in which child mortality rates have increased as a result of rising poverty-related disease and a turbulent disparity-fuelling past which favours macroeconomic growth instead of service redistribution (Chopra, Daviaud, et al., 2009). For acute health problems, private patients access general practitioners at a cost (Perrott, 2003). Poorer citizens depend on government facilities and are encouraged to visit clinics for medical management. However, they present to Emergency Centres (ECs) with acute medical needs, which suggests that they may require admission and a hospital bed (Perrott, 2003). Beyond that, access to acute healthcare among the indigent is restricted by unavailable transportation to dispersed medical facilities (Sun et al., 2014). Inherently, ECs are plagued by large and fluctuating volumes, in variable conditions (Shen & Wang, 2015).

Healthcare quality improvement is a complex endeavour (Elizabeth, Sharon, Sandeep, Lynne, & Matthew, 2012). Hospitals that operate efficiently execute more procedures while moving more patients through their systems, subsequently improving financial performance (Devaraj, Ow, & Kohli, 2013). Therefore, well-motivated healthcare improvement requires processes, staff, organisational structure and culture to be patient-focused. In addition, healthcare improvement requires technology-enabled systems to improve the quality of care and service delivery (Bardhan & Thouin, 2013; Lenz & Reichert, 2007). However, mediocre implementations diminish the effects of existing interventions, which could otherwise deliver greater practical impact (Chopra, Lawn, et al., 2009). Although comprehensive organisational improvement missions and strategies have not yet transpired, holistic reform is imperative because it will determine how hospital resources support care delivery and quality improvement (Bardhan & Thouin, 2013; Ruelas, Gómez-dantés, Leatherman, Fortune, & Gay-molina, 2012).

This thesis supports the strategic intent of Groote Schuur Hospital (GSH) to improve service delivery, given South Africa's struggling public healthcare (Mayosi, Lawn, Van Niekerk, et al., 2012). ECs are singled out because they provide a front-line 24-hour service, seven days a week (24/7) to the majority of the population (Sun et al., 2014).

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This research studied EC business practice in order to inform improved patient flow. Consequently, some of the major concerns raised by the literature are addressed. These concerns include the lack of patient-centric studies, the lack of quality healthcare, and the inequality and disparity contributing to troubled healthcare in South Africa (Chopra, Lawn, et al., 2009; Patel, 2014; Weimann & Stuttford, 2014). In addition, the literature does not provide a rigorous and comprehensive framework to drive the actionable reform of complex and vast healthcare environments (Reichert, 2011).

This study recruited Information Systems (IS) theories to investigate EC business process activity for informed patient flow optimisation. One of the key objectives of this thesis was to provide practically useful research results that could be used to improve the flow of patients through clinical EC processes to broader hospital destinations. Comparative case studies of one private and two public hospitals in the Western Cape provided practical results to conceptualise the integration of methodical Business Process Management (BPM) with healthcare and EC business practice. The outset achievement tactic was to investigate EC operational efficiency in order to determine how patient-flow processes can be improved. The investigation also explored the data with enablers for theoretically grounded BPM success. Therefore, in order to encourage sustainable long-term interventions, the inductive approach of this study aimed for empirically informed streamlining of patient-flow processes (Shabani et al., 2015).

The next section will contextualise and clarify the topic and outline the research objectives.

1.1 The research topic explained

In order to inform guided IS practice for healthcare service improvement, this research adopts an operational efficiency and IS management focus for useful results. The topic innovation originated at GSH. The hospital embarked on operations audits to drive reform as organisational and process inefficiencies had a negative impact on the delivery of efficient patient care, yielding undesirable outcomes with frustrated patients and an unfavourable working environment (PwC, 2014). This research therefore informs healthcare service improvement by advocating prescribed BPM practices, localised to the Western Cape but required in a broader South African healthcare context (Mayosi, Lawn, Van Niekerk, et al., 2012). ECs deliver primary healthcare services to the majority of South Africa's medically uninsured population (Weimann & Stuttford, 2014). Therefore, due to the complexity associated healthcare settings, the research only focused on Emergency Centres (ECs).

The complexity associated with healthcare settings makes it challenging to identify a well-constructed, comprehensive and rigorous inquiry framework (Reichert, 2011). Moreover, IS healthcare literature is heterogeneous (Sylvester, Tate, & Johnstone, 2013). Therefore, systematic inquiry proved an initial challenge. Narrowing the research topic to Emergency Medicine (EM) helped to bridge knowledge domains. Thereafter, it was easier to detect research patterns and themes pertaining to Healthcare Information Systems (HIS). In

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addition, the initial topic was broken down into attainable research objectives to satisfy a pragmatic research agenda and to narrow down the vast body of literature in this field.

An ageing population and uninsured patients entering the healthcare system faster than trained medical staff do are among the reasons why healthcare in South Africa is under increasing pressure (Patel, 2014; Stender & Christensen, 2013). The majority of the population and low-priority medical cases use ECs for primary care needs, which is not the purpose of ECs and which increases the load of these centres (Engelbrecht, Toit, & Geysler, 2015). This leads to the overcrowding of EC systems, consequently diminishing capabilities to deliver care, which reduces quality (Di Somma et al., 2015; Paul & Lin, 2012). However, despite the perception that load and inappropriate EC use are the main threats to adequate healthcare, some argue that “access block” is the most significant challenge at ECs, referring to the rate at which admitted EC patients can access in-patient beds for ward stay and extended care (Affleck, Parks, Drummond, Rowe, & Ovens, 2013).

Overcrowding leads to resource constraints such as bed shortage and trouble retaining qualified and experienced specialist staff, especially in ECs (Higginson, 2012). When this happens, hospitals and patients suffer severely (Weimann & Stuttford, 2014). The aftermath manifests as underfunded and universally overburdened clinical settings, which evidently necessitates change (Chopra, Lawn, et al., 2009; Mirzaei et al., 2013). To reduce costs, hospitals should operate at optimal levels of efficiency, which means processing more patients with current system configurations in order to improve financial performance (Devaraj et al., 2013; Di Somma et al., 2015; Lenz & Reichert, 2007). However, given the resource constrained state of healthcare in South Africa, is it fair to expect cost reform through operational efficiency? Hence, this thesis will look at methods to improve the set-up at Emergency Centres.

There is little empirical support to show how technology impacts healthcare quality improvement (Antony & Kumar, 2012; Lenz & Reichert, 2007; Reichert, 2011). Rapidly expanding research on healthcare IT and patient-flow improvement does not translate into practically useful solutions (Jones, Rudin, Perry, & Shekelle, 2014; Oredsson et al., 2011). Despite evidence that “patient centeredness” increases patient response and thus better outcomes and, ultimately, quality of life, scant research persists (Bardhan & Thouin, 2013; Lorig, 2012; Mirzaei et al., 2013). Reinforcing arguments state that health policy custodians do not fully understand what “patient-centred care” means and why it matters, which is largely supported by the lack of empirical inquiry (Epstein, Fiscella, Lesser, & Stange, 2010; Higginson, 2012).

Furthermore, the literature shows that the current disparity between South Africa’s private and public healthcare is worse than what it was in the country’s turbulent past (Epstein et al., 2010; Weimann & Stuttford, 2014). It reveals that healthcare organisations demand more focused effort regarding efficient hospital management and operations (Spaulding, Furukawa, Raghu, & Vinze, 2013). Past studies have neglected to enquire in this context,

which complicates reform and compromises the consequential impact of operational reform at South African public ECs such as GSH (PwC, 2014). (Chopra, Lawn, et al., 2009). Hence, the objective of this research is to develop an IS-informed management strategy to guide improved patient flow, optimal resource usage and change implementation in a complex organisational setting for better patient response.

The following sections will focus on the problem statement in order to position Information Systems (IS) support as a strategy to enhance operational efficiency at Emergency Centres.

1.1.1 The problem area and research context

This research is addressing the need to inform the business efficiency of EC operations at GSH for improved patient flow. Thus, from the outset, various stakeholder perspectives were considered in developing an actionable and implementable solution for the challenges experienced by overburdened Emergency Centres (Glasgow & Riley, 2013).

Problem area: Healthcare Emergency Centres

Improving the quality of overburdened public healthcare systems is globally supported by the World Health Organization's (WHO) agenda to strengthen health systems (Wallis et al., 2008; Weimann & Stuttford, 2014; WHO, 2007). Operational audits at GSH have revealed unnecessary patient-flow process bottlenecks – a challenge that public hospitals in general have to deal with (PwC, 2014; Sun et al., 2014). Activities that support patients are therefore value adding. However, the complexity of healthcare organisations makes it difficult to agree on which activities actually add value (Epstein & Street, 2011). This research will therefore also look at activities that add value. Moreover, how these activities impact patients and which measures would more accurately reflect patient participation and response in order to enhance healthcare outcomes pivotal to reform through the use of HIS (Boudreaux & O'Hea, 2004; Epstein & Street, 2011).

In SA and globally, EC overcrowding significantly hinders the timely delivery of quality healthcare (Di Somma et al., 2015; Wallis et al., 2008). Overcrowding is a phenomenon where the demand for Emergency Medicine (EM) exceeds the EC's capability to deliver such services (Affleck et al., 2013). Some are sceptic about this growing field of research and question whether it is motivated by relevant concepts to effectively mitigate this phenomenon (Higginson, 2012). Consequently, overcrowding is oversimplified and expressed in terms of "waiting time", which begs the question whether this metric is an accurate reflection of the challenges at hand (Aaronson, Marsh, Guha, Schuur, & Rouhani, 2016; Higginson, 2012; PwC, 2014) and whether current EC service-quality measures are accurate indicators of existing practices (Higginson, 2012). Hence, this study is conducted within the organisational context pertaining to Emergency Medicine (EM).

In South Africa, EM is a young field (Man Lo et al., 2014; Wallis et al., 2008). Overburdened healthcare systems, a shortage of available beds and unavailable trained medical staff aggravate overcrowding (Crawford et al., 2014). ECs gear for patients that require acute

medical care. However, medical cases intended for primary healthcare often present at ECs, which increases the patient loads at these centres (Engelbrecht et al., 2015). Consequently, this research investigates whether improved patient management through HIS can deliver more effective and efficient clinical services because long waiting times, specifically in ECs, cause patient deterioration, which weakens the quality of and access to care (Di Somma et al., 2015; Man Lo et al., 2014). Therefore, an ever-increasing patient load can force technology adoption which, in principle, can lead to faster and improved processing cycles as a result of decision support and access to information (Agarwal & Sebastian, 2014; Patel, 2014). This means that an investment in systems and technologies can improve the quality of healthcare (Agarwal & Sebastian, 2014), which underlines the need for clear improvement strategies underpinned by Business Process Management (BPM) (Thompson, Seymour, & O'Donovan, 2009).

Research context: IS methodologies for improved healthcare practice

It is difficult to comprehensively express complex techno- and socio-centric phenomena in a quantitative IS format (Goldkuhl, 2012). According to literature, qualitative IS research similarly fails because it is viewed as limited when compared to quantitative methods (Myers & Newman, 2007). Instead, qualitative and quantitative IS should rather be valued for the strength that comes from the inherent methodological differences and consequent value that this may hold (Thomas & Magilvy, 2011). In support, the literature indicates mixed views regarding the methods to evaluate qualitative rigour (Conboy & Fitzgerald, 2012; Petty, Thomson, & Stew, 2012). Nevertheless, literature agrees that healthcare is a complex field which needs reform, and that the challenge is compounded by a lack of practically useful research results (Ammenwerth, Gräber, Herrmann, Bürkle, & König, 2003; Bardhan & Thouin, 2013; Jones et al., 2014; Mayosi, Lawn, Van Niekerk, et al., 2012). In addition, if inquiry is launched based on unclear concepts – for example patient-centricity – it may produce inconclusive and unconvincing results (Epstein & Street, 2011). Regardless, there is an intensified need for pragmatic research given the current challenges imposed on public health and healthcare, especially in SA (Glasgow, 2013; Sun et al, 2014). Hence, there is an urgent need for research that translates into policy changes and healthcare practice reform (Glasgow, 2013).

The following section will look at the requirements of suitable IS theories for this research.

1.1.2 Seeking an appropriate theory

The increasing demand for better and more extensive services strains healthcare, especially in resource-limited areas such as the Western Cape (Man Lo et al., 2014; Sun et al., 2014). The pressure on health systems is exacerbated by public, economic and healthcare service concerns such as population ageing and growth, longer hospitalisation, uninsured patients, and ultimately bed shortage (Man Lo et al., 2014; Patel, 2014; Stender & Christensen, 2013). Consequently, health systems, trained medical staff and infrastructure cannot cope as demand and load continue to grow in an environment where

public healthcare competes for funding from a central, limited pool (Patel, 2014; Weimann & Stuttaford, 2014).

Globally, the World Health Organization (WHO) is a formal authority that coordinates healthcare and concerns with international public health and standards in the United Nations (WHO, 2007). The WHO has developed frameworks and support to strengthen healthcare systems and the management thereof, aiming to set a global precedent for primary healthcare. The frameworks specifically support the delivery of equal and un-biased health service of good quality to all people, regardless of status, whenever and wherever it is needed (WHO, 2007). In all cases, the service constructs of such a system require certain fundamental building blocks and management actions, as shown in Appendix E.1.¹

The WHO's frameworks provide valuable insight into IS literature. However, the existing WHO frameworks merely offer high-level construct guidelines, which are not detailed enough to support rigorous healthcare research (Weimann & Stuttaford, 2014; WHO, 2015). Moreover, global initiatives set international priorities and imply subsequent compliance, which puts additional pressure on local healthcare systems and which can potentially divert attention away from more pressing local health challenges and health system needs (Stender & Christensen, 2013). Interdisciplinary research conducted in healthcare with an IS view imposed the need to understand the balance between appropriate IS methodologies for the envisioned healthcare reformative practice of improved patient flow. Consequently, BPM was found most appropriate and the following section will clarify the tactics applied.

1.2 Research objectives and questions

Populations grow faster than clinicians become operationally effective (Patel, 2014). Cost constraints hinder the delivery of equitable and comprehensive measures which could mitigate patient surge; unfortunately, restricting constructive intervention (Patel, 2014; Weimann & Stuttaford, 2014). It exacerbates bureaucracy, corruption and nationwide resource shortages, which translates to increased neonatal and maternal mortality in healthcare (Weimann & Stuttaford, 2014).

Healthcare is a specialised clinical system with disparate activities, in contrast to routine "business as usual" operational processes (Lenz & Reichert, 2007). The following sections will provide an overview of the approach taken to understand how IS can help patient flow in Emergency Centres.

The research objectives

EC business practice and management formed a key component of this research study because the main purpose is to reduce mortality. The main purpose is to inform business and management practice for improved patient flow in ECs, thus relieving overburdened

¹ Appendices are indexed and referencing occurs as follows: E.1 refers to Appendix number E.1.

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clinical settings. The proposed IS theory, BPM, advocates streamlined business processes increases the control for operational results, if articulated well. This enables efficient and effective service delivery, a suggested WHO building block to strengthen health systems (WHO, 2007). The main research output encourage patient-flow optimisation by presenting prescriptive methods for EC business practice and therefore healthcare service improvement.

The literature agrees that healthcare requires transformation which is hampered by a lack of practically useful research results (Ammenwerth et al., 2003; Bardhan & Thouin, 2013; Jones et al., 2014; Mayosi, Lawn, Van Niekerk, et al., 2012). The need for reform therefore validated the need for useful research. In addition, the lack of practical results in the literature initially motivated a pragmatic approach to the research. The WHO framework of building blocks offers crucial global support to strengthen healthcare. It has been conceptualised over time, suggesting academic maturity and practical relevance (WHO, 2007). Consequently, the building blocks arranged the initial heterogeneous literature body on IS sensibly for healthcare IS inquiry. This was a simplification tactic to narrow down IS inquiry for a complex healthcare setting. Therefore, understanding how the WHO building blocks link, integrate and impact each other will lead to more usable research outputs (Weimann & Stuttford, 2014).

The literature study showed that an outcome of reduced mortality and morbidity rates can be achieved by more agile and flexible healthcare systems (Aaronson et al., 2016). The reason for this is because ECs are complex integrated systems that depend on the larger organisation (hospital) to function well and optimally (Oredsson et al., 2011). This motivated the need to understand how healthcare systems can become more agile in an EC context and how IS can facilitate integration across departments. After further reviewing the literature, evidence emerged of healthcare optimisation using techniques with manufacturing underpinnings to reduce business process waste and improve flow (D'Andreamatteo, Ianni, Lega, & Sargiacomo, 2015; Lenz & Reichert, 2007). This led to an investigation of how Business Process Management (BPM), an IS methodology that encompasses optimisation techniques, fits healthcare improvement. However, despite operational and strategic complexities, there seems to be an expectation of sequential or linear patient flow according to manufacturing theories, thus, a correlating sequential arrangement of resources (Devaraj et al., 2013; Greenhalgh & Stones, 2010; Lenz & Reichert, 2007). This generated the need to understand the dynamics behind EC patient flow in order to determine whether sequential flow is a feasible expectation or misleading practice; thereby, contextualising useful research results.

Complex healthcare challenges EC practices, which made it difficult to find a suitable theoretical fit for rigorous inquiry (Reichert, 2011; WHO, 2007). Moreover, due to the historic technical bias of IS research, a suitable theory had to consider social and technical inquiry within the heterogeneous healthcare setting (Bardhan & Thouin, 2013). Consequently, this thesis aims to explore theoretically motivated EC practices for stronger healthcare systems.

Ultimately, the findings of this study should lead to the cost-effective improvement of patient flow in developing countries like South Africa.

The following section will look at the title of the proposed research and the research questions.

The proposed title and research questions

This research is titled as follows: *Informing BPM practice in Emergency Units of South African hospitals for improved patient flow*. **Table 1.1** shows how concepts from the objectives and title link, which ensures that the title, objectives and research questions thread tightly.

Table 1.1: Links between the title and outset objectives

Title	Objective
(Hospital EU) BPM practice	Practical and useful healthcare research results
Improved flow	Reduce patient wait time; process waste reduction
Informing	Useful to EC business, adds value
(Improved) Patient flow	Understand patient flow dynamic
Emergency Centers, SA hospitals	Context and problem area

These links provided the basis for the selection of the IS theories and frameworks which are explained in Chapters 4 and 5. The research questions that could most appropriately lead to reaching the above-mentioned objectives are listed below.

The main research question has been formulated as follows: *How can BPM practice in Emergency Centres generate improved healthcare outcomes?*

Four sub-questions (SQ) were formulated as follows:

- SQ01: Why do patients wait long in the ECs of SA hospitals?
- SQ02: How can ECs encourage better patient flow?
- SQ03: What hinders the efficiency of EC operations?
- SQ04: How can BPM help ECs to become more patient-centred?

The research title was developed to cover all the outset objectives. Therefore, the research questions support the title. **Table 1.2** shows how the research title and research questions link. The section thereafter provides an overview on how the remainder of this document is structured.

Table 1.2: A comparative view on how the research questions and thesis title link

Question	Question grounding	Title construct
SQ1	Patient flow bottlenecks	(EC) BPM practice
SQ2	EC systems improvement	Inform (improved patient flow)
SQ3	Patient flow process dynamic	Improve patient flow
SQ4	Business strategy and management	EU's of SA Hospitals

1.3 Document overview

Chapter 1 clarified the topic, research problem and context, and provided insight into the application of Information Systems in a complex healthcare setting. The link between the research topic, research questions and outset objectives were also explained.

A review of the relevant literature follows in Chapter 2 to provide a theoretical position for research results that would satisfy the stated objectives. In Chapter 3, the objectives will be explored in more detail, taking into account the appropriate theories and relevant instruments to achieve the desired outcomes.

Chapter 4 will describe the research methodology used for this qualitative study. This includes the collection of data and the analysis of the data to produce practical results based on the research questions. Chapter 5 will explore the data inductively. Finally, Chapter 6 will conclude with a discussion of the research findings and suggestions for future research.

Chapter 2: Literature survey

2.1 Methodology of the literature review

A past and present snapshot of healthcare research, which also provides links between theory and practice, offered a supportive argumentation layer for this qualitative research (Conboy & Fitzgerald, 2012). Pre-research meetings with relevant healthcare professionals provided practical insights into EC anomalies that could benefit reform. The notes taken during the sessions were re-read to confirm relevant themes to be investigated through the literature review. This approach enabled a “concept-centric” literature review as against a chronological or author-centric literature review (Levy & Ellis, 2006), leading to better synthesis of the body of literature on IS for healthcare (Sylvester et al., 2013). Moreover, it enforced neutral inquiry, which substantiates the research problem (Levy & Ellis, 2006; Sylvester et al., 2013).

IS and healthcare research are fundamentally different research domains. Effective research results therefore demands the use of good-quality literature (Levy & Ellis, 2006). Relevant papers, which were of good quality and which married these two domains, were obtained by searching top-ranked IS journals and databases using Google Scholar and specific keywords for key themes, for example, “Lean in Healthcare”. Key themes emerged through congruent background reading. This included articles that advocated action toward stronger health systems, in line with the WHO frameworks supporting global healthcare improvement.

2.2 Examining the healthcare landscape

The literature revealed key issues from which the arguments for this thesis derives. Healthcare is a crucial service involving intricate human activity and specialist knowledge that drives erratic and routine, real-time decision support in order to save and improve lives (Debono et al., 2013; Shen & Wang, 2015; WHO, 2007). However, the literature shows that it is riddled with inefficiencies (Rathert, Wyrwich, & Boren, 2013).

Quality healthcare systems may result in increased life expectancy (Mayosi et al, 2012). Quality improvement suggests that healthcare participants learn new ways, making them more prone to adopt changes for better results (Elizabeth et al., 2012). Although learning occurs at individual level, the management of patient lifecycle activities suggests that healthcare providers can control better patient response and thus outcomes (Basole, Bodner, & Rouse, 2013; Elizabeth et al., 2012; WHO, 2007). According to the literature, quality healthcare implies that healthcare provider effort translates into better quality of life for patients, for longer, through interventions that compel patients to participate in available clinical procedures. Therefore, as a complex and adaptive system, better healthcare outcomes depend on heterogeneous actors and their interactions, as opposed to sequential or intentionally linear flow processes (Basole et al., 2013; Greenhalgh & Stones, 2010). Thus, when targeting specific process results, one would need to consider developing corresponding process activity. However, there is a struggle to develop sustainable

interventions, a consequence of strained healthcare systems globally (Klopper, Coetzee, Pretorius, & Bester, 2012; Shabani et al., 2015).

Effective care reduces mortality and morbidity associated with acute injury or illness and requires system agility and flexibility (Aaronson et al., 2016; Reichert, 2011). However, healthcare providers are struggling to deliver personalised, cost-effective patient service efficiently amid increased demand and severe resource stresses (Reichert, 2011; Weimann & Stuttford, 2014). Globally, a large portion of trauma deaths in resource-limited countries occur before patients reach hospitals (Sun et al., 2014). This urgently calls for localised basic life support and transportation, hopefully answered by governments and policymakers, especially those of developing countries (Sud, Ohuabunwa, Sun, Jean, & Wallis, 2015). Shorter service response times hold the potential for more effective care and reduced mortality in urgent cases, which means relief for strained Emergency Medicine (Augustyn, Hattingh, & Ehlers, 2007; Calvello et al., 2013; Sun et al., 2014; Wolf et al., 2012). However, few healthcare facilities in developing countries are able to adopt this required approach, because “developing” implies resource shortage (Calvello et al., 2013). Labelled “acute care”, it suggests pre-hospital patient support and stabilisation, which means integrating basic life support and emergency care systems with hospital ECs to lessen the load (Calvello et al., 2013; Sun et al., 2014).

The paper next presents the main issues according to the review methodology, as explained in section 2.1.

2.2.1 Key healthcare issues

Overcrowding is a common healthcare issue that has gained significant global attention over the past decade, where emergency service demand exceeds an EC’s ability to deliver the right care of good quality, within appropriate time (Affleck et al., 2013; Crawford et al., 2014; Di Somma et al., 2015; Man Lo et al., 2014). This leads to situations where long waiting periods block immediate access to care (Crawford et al., 2014; Paul & Lin, 2012). A popular perception is that inappropriate EC use causes overcrowding. However, access to in-patient beds is cited a more likely contributor (Affleck et al., 2013).

Access block occurs in conjunction with overcrowding, where patients wait long for available beds (Man Lo et al., 2014). Regardless of the various interventions to reduce resource stress, this means that patients cannot access an appropriate hospital bed when required (Crawford et al., 2014). Some argue that inappropriate EC use causes higher patient traffic, which appears to be a main cause of access block. However, there is a higher correlation between access block and the release of EC-admitted patients gaining access to in-patient beds (Affleck et al., 2013), which points to failed internal routing and process support (Zeising, Schcinig, & Jablonski, 2014). Regardless, public healthcare is the primary and only provider of easily accessible healthcare in many local communities (Peltzer & Phaswana-Mafuya, 2009) and Emergency Medicine largely caters for a poor and uninsured

portion of SA population (Di Somma et al., 2015). Consequently, these facilities are burdened beyond their resource capacity (Weimann & Stuttaford, 2014).

Resource constraint is commonly observed in healthcare settings worldwide (Aaronson et al., 2016; Klopper et al., 2012; Weimann & Stuttaford, 2014). Current strategies to ease the resource burden cannot function in under-developed and inherently resource-limited areas of developing countries and therefore begs new solution strategies (Sun et al., 2014). The pressure on healthcare systems, especially on ECs in SA, increase due to population ageing. Moreover, increasing numbers of immigrants extend the uninsured patient pool (Aaronson et al., 2016; Patel, 2014). It therefore becomes imperative to deliver high-quality care that is resource-efficient (Aaronson et al., 2016) and also equitable and sufficient (Aaronson et al., 2016; Weimann & Stuttaford, 2014).

Equitable healthcare brings safe, accessible and unbiased life-saving healthcare to citizens, regardless of political divisions, thereby reducing mortality and morbidity (Stender & Christensen, 2013; Sun et al., 2014; WHO, 2007). Equitable care is imperative in reform and fundamental to healthcare quality and system strengthening (Aaronson et al., 2016; Weimann & Stuttaford, 2014; WHO, 2007). Although global high-level improvement strategies exist, it is the duty of local governments to connect tangible outcomes with consistent care (Gevers, 2009; WHO, 2007). However, global healthcare systems are challenged by cost-efficiency and equitable access, which complicate service distribution (Patel, 2014). Moreover, SA's healthcare targets are threatened by socio-economic decline (Chopra, Lawn, et al., 2009). This leads to an unsustainable balancing act to provide advanced healthcare admit crippling conditions (Patel, 2014).

Long waiting times and overcrowding imply a delay of patient treatment, which compromises healthcare quality (Man Lo et al., 2014). Waiting times may or may not directly impact morbidity and mortality if for example, a patient bleeds uncontrollably internally, but it is not detected and appropriated timeously with accurate treatment (Augustyn et al., 2007). Reducing waiting time is therefore pivotal to efficient healthcare service delivery. However, waiting times, although a common metric, it is not meticulous enough to highlight the actual process pitfalls and bottlenecks (Higginson, 2012; Reichert, 2011). It is also important to note that there is a difference between "length of stay", "waiting time" and "congestion"; waiting time and congestion are wasted time where value is not added to a patient (Higginson, 2012; Konrad et al., 2013). Patient flow processes should therefore be measured contextual to relevant metrics, in order to test performance and thus improvement (Affleck et al., 2013; Reichert, 2011).

Bed availability is a key operational hindrance (Alder, Silvester, & Walley, 2010). However, the lack of actual beds is only a symptom which does not explain the entire situation and is therefore not a thorough indicator of underlying problems (Alder et al., 2010). Consequently, hospital capacity and the ability handle patient load are expressed by number of available beds (Shen & Wang, 2015). Bed management concerns the efficient

use of bed resources and forms a significant part of operational capacity planning as well as control (Article, 2003). However, it is not always optimised because bed managers rely on walkthroughs and telephones, which means manual activity, for bed occupancy status (Article, 2003). Other factors that complicate bed management include the lack of interdepartmental admissions and discharge synchronisations, be it per hour, day or week. Moreover, irregular patient flow and weekends create a significant amount of wasted time and down-time, thus process waste periods (Alder et al., 2010).

The literature therefore presents no single root cause for the multitude of issues that cause bed shortages (Affleck et al., 2013; Crawford et al., 2014; Wallis et al., 2008). ECs in isolation cannot solve a bed shortage problem (Wallis et al., 2008), which suggests that research should focus on EC boarding and discharge process bottlenecks, which represent portions of bed management, other than just the front-end of the process; subsequently inviting an integrated care approach (Alder et al., 2010; Di Somma et al., 2015). Also, to support better flow, ECs should rely on *ad hoc* swift access to and integration with supporting departments in the broader hospital context (Crawford et al., 2014). The following section explores the research context in more detail.

2.2.2 Emergency Medicine in South Africa

Emergency Medicine (EM) in SA is young, as indicated by first registration in 2003 (Man Lo et al., 2014; Perrott, 2003; Wallis et al., 2008). Resource constrained EM largely caters for a growing portion of poor and uninsured citizens (Di Somma et al., 2015) which turns it into the primary and only providers of available and easily accessible healthcare facilities to many locals (Peltzer & Phaswana-Mafuya, 2009; Sun et al., 2014). Moreover, ECs are considered in-patient “gatekeepers” as these centres may or may not admit patients, depending on whether the specific centre was designed on a “fee-for-service” model, thereby suggesting financial and value-maximising business drivers (Wiler et al., 2012). Although ECs are intended for critical patients, low-priority, underprivileged patients, who should be managed by primary care, increase the load as a result of unavailable pre-hospital support (Engelbrecht et al., 2015; Murphy & Neven, 2014; Sun et al., 2014). This intensifies service demand (Crawford et al., 2014; Wallis et al., 2008). These facilities are overburdened beyond capacity, which complicates a secondary agenda of strategic improvement (Sun et al., 2014; Weimann & Stuttford, 2014). Consequently, the quality of care suffers because EC patient health deteriorates as a result of long waiting times (Di Somma et al., 2015; Man Lo et al., 2014).

While healthcare in SA urgently needs government support for consistent protocols and policy frameworks to develop specialist skills, resource management complexities and limitations also require attention (Crawford et al., 2014; Perrott, 2003; Wallis et al., 2008; Weimann & Stuttford, 2014). The increasing demand for EC staff is consistently higher than the rate at which newly skilled and capable EM practitioners become available (Agarwal & Sebastian, 2014; Wallis et al., 2008). Moreover, the invariable demand for beds created by increased patient load and cost constraints requires trained staff, which highlights human

capital shortages and directly contributes to the current overburdened state of the country's EM (Crawford et al., 2014; Di Somma et al., 2015; Man Lo et al., 2014). This severely debilitates the transformation of SA's healthcare (Agarwal & Sebastian, 2014). Effective EM can evidently and substantially temper mortality and morbidity brought by acute health threats and subsequently improve healthcare outcomes. For this reason, it is a top global priority (Higginson, 2012; WHO, 2007). However, strategies to alleviate the burden on EM appear beyond resource-constrained developing countries such as SA (Sun et al., 2014). Hence, the lack of practically useful and comprehensive improvement strategies and governmental support at various levels hinders healthcare reform (Patel, 2014; Weimann & Stuttford, 2014).

2.2.3 Promoting healthcare transformation

Patient-centred care (PCC) has been featuring in health policies since 2001 and is cited a pivotal means to achieve a higher quality of care (Epstein et al., 2010). Since then, patient-centred care has become fundamental in global discussions on the quality of healthcare because it has the potential to increase patient response, satisfaction and improve quality of life. Consequently encouraging patients to comply with treatment processes, subsequently generating better healthcare outcomes. PCC therefore suggests improved healthcare outcomes, despite varying views (Epstein et al., 2010; Epstein & Street, 2011; Lorig, 2012; Mirzaei et al., 2013). The WHO and various studies support this view that patients prefer such care because it brings better health outcomes (Mirzaei et al., 2013; Weimann & Stuttford, 2014). A systematic literature analysis also confirms positive results between PCC and patient satisfaction (Epstein et al., 2010), which suggests improved self-management through the adoption of health management for general well-being (Rathert et al., 2013). However, improved service delivery does not necessarily mean that improved patient-centricity and better results can be achieved by viewing the patient as a client (Stender & Christensen, 2013).

Another literature survey found irregular results between clinical outcomes and PCC, specifically over the long term. Shorter term results provided a more positive correlation (Rathert et al., 2013). Some researchers link specific PCC elements with outcomes, while others point to the absence of a relationship between PCC elements and outcomes and the lack of empirical evidence to support better health outcomes (McMillan et al., 2013; Rathert et al., 2013). Some suggest that PCC definitions are not clear, and that there are missing correlations between PCC process constructs and clinical outcomes (Epstein & Street, 2011; McMillan et al., 2013; Rathert et al., 2013). This notion is supported by a lack of pragmatism regarding the delivery of PCC (McMillan et al., 2013).

2.3 Information systems for healthcare transformation

Healthcare processes rely strongly on information and knowledge to support decision making during clinical activities (Lenz & Reichert, 2007), whereas quality healthcare and service depend on technological innovation and advancement (Spaulding et al., 2013).

Initially, healthcare IT lacked flexibility in multidimensional and complex healthcare settings, thus offering less value which complicated transformation (Reichert, 2011). Making medical decisions cannot be automated although predefined treatment processes can be navigated by using relevant and established knowledge. However, flexible IT is required to make this possible (Lenz & Reichert, 2007). As a result, Healthcare Information Systems (HIS) can provide essential support to medical infrastructure and communication channels (Khodambashi, 2013). Often, access to information is delayed by paper-intensive processes, which can cause communication breakdowns (Agarwal & Sebastian, 2014; Bechtel & Ness, 2010). Electronic data centralisation toward more mature BPM and knowledge management support more accessible patient information, thereby reducing costs and process throughput time while upholding process quality (Bardhan & Thouin, 2013; Bechtel & Ness, 2010; Stender & Christensen, 2013). However, while IS processes and IT investment suggest better healthcare outcomes, it inflates costs, thus adversely impacting care delivery (Bardhan & Thouin, 2013; Devaraj et al., 2013).

The literature links technology adoption to decreased mortality (Devaraj et al., 2013). Any computerised system should benefit clinicians and nurses by offering unhindered resourcefulness whenever required (Reichert, 2011) in order to support the strategic intent to improve IS and optimal adaptability, termed agility, in daily work (Johnston, Munge, & Mwalemba, 2012; Reichert, 2011; Thompson et al., 2009). However, well-understood clinical processes should motivate the redesign of IS and align these systems with medical processes (Khodambashi, 2013). Moreover, an increasing number of medical disciplines and specialised departments require optimal process support in healthcare, both clinical and administrative (Doolin, 2004; Lenz & Reichert, 2007). On the other hand, specialised IT applications can complicate application integration (Lenz & Reichert, 2007). Therefore, unsystematic process automation may not optimally exploit the benefits offered by new IT (Devaraj et al., 2013). Regardless, inherent to IT investment is the ability to redesign processes, subsequently transforming it according to organisational needs which brings business agility (Devaraj et al., 2013; Reichert, 2011).

Few have studied how IT affects service delivery, specifically in healthcare, even though inconsistent data supports the realisation of Healthcare Information Technology (HIT) benefits (Devaraj et al., 2013). Rapidly expanding research on HIT is not translating into proportionate amounts of useful knowledge (Jones et al., 2014) and empirical evidence in support of pragmatic approaches to improve patient flow is limited (Oredsson et al., 2011). It could be because scientific research focuses on explaining models and proving their competence, rather than bridging the gap between theory and practice (Glasgow, 2013).

2.3.1 The role of triage

Although EDs are supposed to handle urgent cases, in SA they are often used for primary care, community-based healthcare and other hospital resources (Konrad et al., 2013; Shen & Wang, 2015). Globally, growing demand for EM attributed to high patient volumes has increasingly led to the application of manufacturing strategies to hospital operations (Konrad

et al., 2013; Wang, Shen, & Liu, 2011). ED patient flows have thus been conceptualised upon a three-phased, sequential manufacturing model: input, throughput and output (Naik et al., 2011). It therefore opens up healthcare to standardised management practice (Business Process Management) and streamlines flow processes in support of optimal financial viability (Devaraj et al., 2013). BPM subsequently allows for the recruitment of improvement methodologies such as Lean theory, leading to more efficient ED operations (Naik et al., 2011). The application of lean principles can therefore reduce patient activity times and improve efficiency and process quality (Devaraj et al., 2013) to deliver the benefits that healthcare transformation require.

Overcrowding and bed shortage lead to deteriorating patients in waiting rooms, and thus to poor patient outcomes (Crawford et al., 2014). Therefore, structuring ED stay according to injury severity suggests improved patient flow and better patient management (Crawford et al., 2014; Di Somma et al., 2015). The main objective of any improvement strategy should therefore be the optimised use of existing beds and resources in order to add optimal value to patients, thereby decreasing waiting times (Crawford et al., 2014; Di Somma et al., 2015).

Input

Triage is a pre-admission utility system used to regulate ED patient entry. Triage allows swift classification of critical patients requiring emergency medical attention (Buys et al., 2013; Engelbrecht et al., 2015). It originated in wars when doctors had to manage the injured to balance functional soldiers while keeping casualties low (Augustyn et al., 2007). The design of Triage therefore favours trauma care, although it can also handle non-trauma cases (Gottschalk, Warner, Burch, & Wallis, 2012) which occupy trauma-gearred resources, thereby intensifying overcrowding (Crawford et al., 2014).

Triage has matured since its inception. According to the Cape Triage Group, Triage requires the following: an accessible safe and private area, equipment such as a clock and basic medical aids to measure vital signs, and specialised additional medical equipment (Augustyn et al., 2007). Today, it compensates for staff shortage and helps to balance demand with patient load by supporting swift medical decision making with a simplified classification system (Augustyn et al., 2007; Dalwai et al., 2014; Pardey et al., 2006). This facilitates regular patient flow through the ED. Patients are paired with a colour chart, which has predefined medical knowledge and times grouped per category (The South African Triage Scale Training manual 2012, 2012). **Figure 2.1** shows the South African Triage Scale (SATS).

Figure 2.1: The SATS triage scale, priority levels and target times

Priority COLOUR	Target time	Management
RED	IMMEDIATE	Take to the resuscitation room for emergency management
ORANGE	< 10 mins	Refer to majors for very urgent management
YELLOW	< 1 hour	Refer to majors for urgent management
GREEN	< 4 hours	Refer to designated area for non-urgent cases
BLUE	< 2 hours	Refer to doctor for certification

Throughput

Despite the intent to improve patient care, triage scoring adds additional load to an already stressed system and limited resources (Augustyn et al., 2007; Connelly, Ford, Turel, Gallupe, & Zweig, 2014). A systematic literature review of triage systems suggests limited scientific data to substantiate the effectiveness of pre-hospital triage systems (Lidal, Holte, & Vist, 2013) while widespread reluctance to adopt this scoring system has also been reported (Naidoo, Ranghia, & Naidoo, 2014). However, based on its design and if properly implemented, triage scoring can lead to improved patient flow in hospitals (Article, 2003; Augustyn et al., 2007; Crawford et al., 2014).

Output

Care transition after ED stay is termed outpatient care and concerns patient “follow-ups” (Wiler et al., 2012). Public healthcare encourages elective outpatient care. However, patients often only visit when in a critical medical state, which reroutes them to EDs for possible admission (Perrott, 2003). More mature and inclusive outpatient care promotes earlier discharge and relieves the load on EDs (Affleck et al., 2013; Mirzaei et al., 2013). Location is also an important factor contributing towards better outpatient care strategies (Rathert et al., 2013). However, waiting times for outpatients in South Africa are long (Peltzer & Phaswana-Mafuya, 2009), which further discourages compliance and patient responsiveness, and therefore hinders appropriate care (Mirzaei et al., 2013).

2.3.2 Transformation participation

Humans are a key aspect of improving business processes in organisations and in healthcare. Also, people form an important construct of the BPTrends pyramid (E.4) (Bandara, Indulska, Chong, & Sadiq, 2007; Khodambashi, 2013; Long, 2012a). The following section will clarify human implications for healthcare reform.

Good patient response and satisfaction lead to better clinical outcomes (Rathert et al., 2013). However, when patients perceive health information as irrelevant and useless, they disobey treatment regimes, which is counterproductive to improving care (Mirzaei et al., 2013). Patient-centred systems therefore offer ready access and consider features that matter to patients. These features include comprehensive and relevant communication, which supports patient empowerment (Bechtel & Ness, 2010; Mirzaei et al., 2013). The ultimate goal is patient satisfaction (Bardhan & Thouin, 2013). However, policymakers do not fully understand how to realise “patient improving” service benefits with policy changes, despite evidence that shows patient satisfaction follows PCC processes (Epstein et al., 2010; Rathert et al., 2013; Weimann & Stuttford, 2014).

Patient participation

Patient-centred care (PCC) and an improved patient experience are required to encourage patients to actively participate in the delivery of higher-quality healthcare (Ammenwerth et al., 2003; Epstein et al., 2010; McMillan et al., 2013), and also to close the gap between patient participation and satisfaction (Epstein & Street, 2011). The literature survey showed a positive correlation between PCC processes and self-management, which results in patient satisfaction (Rathert et al., 2013). Earlier research supports this notion, suggesting that patient satisfaction may be a catalyst for healthcare reform and a mobilisation tactic toward positive healthcare regimes (Boudreaux & O’Hea, 2004), thus leading to more successful and unrestricted reform (Bechtel & Ness, 2010).

In essence, patient-centeredness depends on encouraging relationships that promote healing and are built upon effective communication and trust (Epstein et al., 2010). Failure to consider relationships that foster PCC when redesigning systems and practices for improved outcomes may therefore hinder the adoption of patient-centred healthcare practices and also negatively impact results (Bechtel & Ness, 2010).

Impact on hospital staff

To achieve patient-centred objectives, the workforce should be well coordinated with a common goal (Epstein & Street, 2011), which is enhanced by increased empathy, and the development of interpersonal skills to improve the daily practices of healthcare professionals (Fitzgerald, Heywood, Bikker, & Mercer, 2014). However, commitment toward organisational goals is lacking (Elizabeth et al., 2012). Moreover, EDs struggle to retain trained and experienced staff, which has crucial consequences (Affleck et al., 2013; Denis, Bob, Jørn, & Anthony, 2015).

While not extensively researched, organisational systems underpin staff behaviour (Elizabeth et al., 2012). Greater resource availability supports higher-quality care and conformance to processes, while resistance among staff (collectively or at individual level) presents a challenge in terms of quality improvement (Bardhan & Thouin, 2013; Elizabeth et al., 2012). Therefore, an important strategy to support quality improvement is to free

resources from activities that do not add value to patients, subsequently reallocating them to service improvement initiatives (Elizabeth et al., 2012). This corresponds with the research objectives of this study, which investigates how BPM activities can be integrated with clinical duties to contribute to EC business and patients.

2.4 Bridging the gap

Global healthcare is forced to provide more with less and therefore depends on operational streamlining or optimisation (Aaronson et al., 2016). Today's leaders will have to adapt healthcare strategies and support to prevent the collapse of healthcare systems (Patel, 2014). Better patient results are possible if healthcare participants adopt changes more readily, which will teach them new health practices through more effective participation (Elizabeth et al., 2012). Healthcare processes and procedures aimed at a better quality of life for patients encourage better participation (Greenhalgh & Stones, 2010). However, rigid and inflexible healthcare processes can discourage patients and lead to follow-up failure (Mirzaei et al., 2013). Hence, better patient response at individual level translates into better outcomes (Basole et al., 2013). Public and governmental support is necessary (Weimann & Stuttford, 2014).

The literature shows that an outcome of reduced mortality and morbidity can be achieved by healthcare system agility and flexibility (Aaronson et al., 2016). Moreover, the additional provision of basic pre-hospital life support can reduce ED strain, especially in underdeveloped areas of developing countries (Sun et al., 2014). Resource and cost constraints amidst increased public healthcare demand can stifle the delivery of personalised, cost-effective and efficient patient services (Reichert, 2011). Consequently, relevant organisational strategies and government support can lead to better healthcare systems (Calvello et al., 2013). However, the severe shortage of skilled medical personnel exacerbates the pressure on healthcare (Stender & Christensen, 2013). Managerial roles and responsibilities have an impact on professionalism and organisational efficiency in healthcare, directly hindering cost reductions and service delivery (Ferlie, Crilly, Jashapara, & Peckham, 2012). Regardless, improved healthcare quality call for flexible employees who respond favourably to organisational goals and the working environment (Elizabeth et al., 2012). Although an ED business model requires a fee for service, financial drivers are not holistic indicators for this complex area of healthcare (Wiler et al., 2012).

Information systems underpin and enable clinical infrastructure and processes (Bardhan & Thouin, 2013). However, healthcare is complex and it is difficult to evaluate IS solutions for this sector, as shown in the literature (Ammenwerth et al., 2003). The WHO's frameworks for stronger health systems list favourable outcomes as improved health, better patient responsiveness and improved efficiency (WHO, 2007). These frameworks are too generic and need empirical support to be more rigorous and practically useful. Hence, there is a need to understand how the independent WHO building integrate and impact each other (Weimann & Stuttford, 2014). This includes the need to understand how IS, which hold the

Literature survey

potential to link business improvement with clinical processes, can promote building-block integration; thus leading to more usable research outputs (Reichert, 2011).

Stressed EM is a global concern. Gainful education trends and operational practices from other countries should therefore form part of transformation suggestions (Perrott, 2003). However, higher demand in all healthcare areas, in a resource-scarce climate, further threatened by declining funding, complicates reform (Naik et al., 2011; Weimann & Stuttford, 2014). A quick fix does not exist (Patel, 2014). Embedding transformative processes will take time, effective governmental policy and financial aid in order to develop a climate conducive to making improved healthcare a reality (Weimann & Stuttford, 2014).

Chapter 3: Scrutinizing the Research objectives

The Chapter clarifies the research methods chosen to arrive at the envisioned outcomes. The research context is also explored to explain which theories and methods suited the research objectives for the envisioned outcomes.

3.1 Change in the research context

A rapid increase of patients places higher demand on healthcare, which requires more efficient management during all stages of patient flow: input, throughput and output (Devaraj et al., 2013; Naik et al., 2011). This requires efficient resource utilisation for optimal care delivery (Nordlander, Berghe, & Schittekat, 2013). As inefficient patient flow consumes more resources and causes delays, the technology effort in hospitals must improve the quality of service in order to be effective (Devaraj et al., 2013).

3.2 The research purpose

Healthcare processes are complex and often linked across organisational boundaries and levels, while requiring the same limited clinical resources (Nordlander et al., 2013). Therefore, adopting complementary methods to increase processing ability is crucial within an organisational and operational context (Agarwal & Sebastian, 2014; Nordlander et al., 2013; Spaulding et al., 2013). Moreover, hospital systems should be able to accommodate exceptions and unpredictability, thereby supporting agility to handle evolving processes (Reichert, 2011). Others have indicated that successful change in complex healthcare seems best suited to incremental delivery (Lenz & Reichert, 2007). This calls for research to support generating pragmatic outputs (Crawford et al., 2014; Reichert, 2011).

Healthcare technology strategies usually have two main agendas, namely efficiency and effectiveness (D'Andreamatteo et al., 2015). In the context of hospital performance and operations, efficiency calls for more outputs per any given set of inputs, and therefore better processing (Devaraj et al., 2013; Spaulding et al., 2013). This is in contrast with effectiveness, which ensures desired and expected results, and is synonymous with organisational influence (Devaraj et al., 2013; Spaulding et al., 2013). Both efficiency and effectiveness are required to improve healthcare quality. However, scepticism surrounds the impact and application of healthcare technology, regardless of all the research in this field. Current research has not yet delivered pragmatic solutions or mitigated healthcare development going forward (Jones et al., 2014).

3.2.1 Theoretical requirements

The literature shows that healthcare complexity is a recurring theme, which calls for the need to simplify the research context in this study. It was important to identify specific areas within a healthcare organisation to scope the research problem more clearly, and to separate interlinked clinical and flow processes, which subdivided problem areas, for simplified investigation (Khodambashi, 2013; Nordlander et al., 2013). Motivations for the lack of coherent conceptual and practically relevant theories to support healthcare transformation are unclear (Epstein & Street, 2011; Reichert, 2011). The following sections

list the selected theories that proposed a systematic investigation for rigorous results. It will be shown how they suit the objectives and research context. A detailed explanation of each will be given in sections 4.1 and 5.1.

Environment simplification

BPM offers a holistic approach to organisational management to overcome the lack of process control and deliver business improvements which are pivotal for healthcare transformation (Johnston et al., 2012; Reichert, 2011). This suggests that operational performance can be increased through process improvements, which effectively increases business agility and response (Reichert, 2011; Thompson et al., 2009). BPM is underpinned by the Lean improvement theory and the Theory of Swift and Even Flow (TSEF) (Thompson et al., 2009). Therefore, BPM in this context specifically draws on holistic management and includes process flow for complex healthcare change (Johnston et al., 2012; Lenz & Reichert, 2007). Moreover, the BPTrends pyramid, an organisational tool in the BPM domain, appropriately subdivides business process activity into one of three levels within an organisation for simplified process understanding (Dziubich, 2015; Harmon, 2010). Understanding the implications of BPM practice on EC business was an important objective of this thesis. Therefore, this schematic representation illustrates the practical relevance and application of practices resulting from this research. Thus, the BPTrends pyramid forms a suitable basis for methodological investigation.

Process decomposition

The Theory of Swift and Even Flow (TSEF) comes from manufacturing and advocates process productivity through the swift and even flow of materials or information. Therefore, the swifter and more even the flow, the more productive the process (Schmenner, 2004; Schmenner & Swink, 1998). The theory mainly distinguishes between two types of process activity, namely “value-adding” which transforms the product (patient) and “non-value-adding” which is considered wasteful effort (Schmenner, 2012). Thus, TSEF supports the overarching optimised patient flow theme. Lean theory is an improvement methodology used in the BPM context to increase productivity through reduced process bottlenecks and process waste, thereby contributing to operational optimisation (D’Andreamatteo et al., 2015). The combination of TSEF and Lean theories under the BPM banner promotes process decomposition for better understanding of flow problem areas.

Activity isolation

The IGOE template (E.3) combines the strengths of the above-mentioned theories to form the data collection instrument (theoretical lens). It is used to scope, capture and document process information (Long, 2012b). The instrument allows scoping and decomposition by evaluating basic process components of any business process according to the IGOE acronym: Input, Guides, Enablers and Outputs (Long, 2012b). Applying this theory during data collection allowed the researcher to capture process-related activity. This instrument

met the requirements of the research environment and satisfied the research objectives. It also supports practical results that are more manageable or achievable by grouping the subsets of process activity in each of the four IGOE components. This provided a consistent manner to collect data across three varying environments, subsequently linking the data collection and analysis theories. It is clarified in section 4.4.

3.2.2 Envisioned research outcomes and target contributions

Positive healthcare systems lead to patients who are more willing to participate and to better outcomes (Mirzaei et al., 2013). To investigate this, patients, and specifically patient flows, formed the focus of this research on healthcare information systems. It is envisaged that the research findings will help Emergency Centres in SA to improve their patient flows in order to reduce waiting time for patients and to achieve operational efficiency (Thompson et al., 2009). For brevity and clarity, the research tactics are summarised in Appendix D.

Chapter 4: Research methodology

The research conceptually integrates information systems and healthcare knowledge domains. It therefore supports theory building and it is consequently inductive (Reichert, 2011; Saunders, Lewis, & Thornhill, 2009).

New healthcare knowledge lacks practicality in an environment characterised by predominantly quantitative research (Boudreaux & O'Hea, 2004; Ferlie et al., 2012; Jones et al., 2014; Oredsson et al., 2011). Some researchers have argued that it is a consequence of techno-centric enquiry, suggesting reprieve by grounding research in social science literature (Ammenwerth et al., 2003; Ferlie et al., 2012; Reichert, 2011). This calls for a balance between theory and practice (Conboy & Fitzgerald, 2012) and for selecting the appropriate research methodologies to deliver research findings that are practically useful (Conboy & Fitzgerald, 2012; Saunders et al., 2009).

4.1 Research philosophy

The research philosophy underpins the research strategy and research methods (Saunders et al., 2009). Pragmatism and interpretivism are important paradigms in qualitative IS research. However, the associated practical constitutions are not well recognised and are therefore difficult to apply in practice (Conboy & Fitzgerald, 2012; Goldkuhl, 2012).

The engagement space in which healthcare providers interact with patients forms an important part of primary healthcare (Stender & Christensen, 2013). A pragmatic approach is used to inspect patient flow, with a focus on patient-clinician touch-points (interactions and relations). Pragmatic methods invite information that could be used to design and develop IS for streamlined healthcare flows and strategic optimisation with actionable results. Thus, pragmatism as a research philosophy suited the purpose of this study (Bardhan & Thouin, 2013).

Pragmatism invites change by focusing on facts that elicit real-world action and frameworks or models associated with this focus on relationships and contexts (Glasgow, 2013). Many authors agree, stating that well-functioning healing relationships between patients and clinicians hold redress of current and core healthcare issues (Debono et al., 2013; Epstein et al., 2010; Starfield, 2011). Such relationships can also serve as catalysts for behavioural change, thus inviting reform (Debono et al., 2013). Pragmatism therefore drives quality improvement by inviting change, facilitating increased implementation and addressing stakeholder concerns (Glasgow, 2013; Glasgow & Riley, 2013).

Ontology considers the nature of reality, or how the researcher views or makes sense of how the world works, which is either subjective or objective (Saunders et al., 2009). With an objectivist ontological view, reality contains social constructs external to social actors in its natural setting (Cohen & Crabtree, 2006; Saunders et al., 2009), thus aligning with a pragmatic philosophy. Moreover, ontology and epistemology overlap in interpretivism because knowledge (meanings or understanding) is supported by ontological assumptions

(Goldkuhl, 2012). Therefore, given the research topic, interpretivism serves to understand EC nuances. Moreover, prescriptive research outputs that consider practical implications require evidence, which warrants interpretivism (Saunders et al., 2009).

Another benefit of pragmatism is that it uses action and intervention to construct knowledge through the use of mixed methods (Goldkuhl, 2012; Saunders et al., 2009). Furthermore, showing the practical relevance of concepts can justify the increased use of pragmatic IS studies (Goldkuhl, 2004). In the IS context, qualitative interpretivism appreciates interesting phenomena and aims to understand it, while qualitative pragmatism constructs knowledge that is useful for practice (Goldkuhl, 2012). Ultimately, the research question determines which approach to apply (Goldkuhl, 2004). Pragmatism and interpretivism can be applied to gain understanding and generate practical outcomes, to challenge the assumptions presented in the literature review, and to support the lack of practical foundations (Bardhan & Thouin, 2013; Goldkuhl, 2012; Saunders et al., 2009).

4.2 Research approach

Although qualitative purists prescribe constructivist and interpretivist research paradigms, some argue pragmatism a third, especially in IS research (Goldkuhl, 2012). Regardless, qualitative research contends that the subjective, contextual “known” cannot be separated from the “knower”, the holder of reality (Terrell, 2012). Described as an artistic endeavour, it requires imagination (Houghton, Casey, Shaw, & Murphy, 2013); a strength in the creative agility it offers to develop new means of inquiry (Saunders et al., 2009). Moreover, it probes a variety of IS-related phenomena from multiple sources, including interviews, observation, interventions, design efforts and archives (Conboy & Fitzgerald, 2012). This translates into significantly more data per topic and toward holistic investigation, which facilitates deeper understanding (Thomas & Magilvy, 2011) which is especially relevant in an environment saturated with quantitative studies but needs practically useful research feedback (Boudreaux & O’Hea, 2004; Jones et al., 2014). However, it is difficult to transfer implied skills toward rigorous and objective qualitative results (Conboy & Fitzgerald, 2012; Saunders et al., 2009), which provides more reasons for the proportionally low number of qualitative research articles in top IS journals (Conboy & Fitzgerald, 2012).

Historically, quantitative analysis underpins social science research (Terrell, 2012). Healthcare research has strong social constructs. Yet, to date, research has not translated into effective and comprehensive solutions and improvement efforts (Bardhan & Thouin, 2013). Although quantitative studies provide good insight into defining existing problems (PwC, 2014), there is still a lack of practical implications regarding the delivery of transformation efforts (Devaraj et al., 2013). Consequently, qualitative research is increasingly recognised for its valuable contribution potential because it explains the “how” or “why” as opposed to the quantitative “if” (Houghton et al., 2013; Terrell, 2012). Therefore, despite the perceived methodological shortcomings of qualitative research, some argue that the value lies in how it differs from quantitative research. The quality of results between the two is incomparable, which proposes qualitative validity and reliability (Houghton et al.,

2013). Moreover, there is a symbiotic relationship between quantitative and qualitative inquiry, which develops knowledge. The one that occurs first supports the other, thus substantiating the need for both (Terrell, 2012). Nevertheless, the recruited methods should support and best serve the theoretical underpinning and research question(s) to facilitate diverse perspectives and provide an accurate voice for respondents (Conboy & Fitzgerald, 2012; Terrell, 2012).

In this study, a qualitative underpinning is adopted to investigate patient flow and resource usage optimisation in healthcare settings (Harling, 2002; Terrell, 2012). The research instruments and theories were selected to support qualitative rigour, which will be covered under section 4.4 of this chapter.

4.3 Research strategy

This research output targets public hospitals in the Western Cape of SA. Accordingly, the research design employed methods detached from a specific level of healthcare facility and rather chose the holistic integration of BPM into EC healthcare practice through theoretically derived advice for successful implementations. However, the complexity involved with finding suitable IS theories to apply in a complex healthcare setting was explained earlier in this thesis. Agility for creative manoeuvrability regarding the research methods was therefore a requirement for research practices. This study empirically investigated multiple-evidence sources within a real-life setting to comprehend what is peculiar about each of three complex cases through deepened understanding (Petty et al., 2012). Because no particular techniques apply to case research, the methods fit this research requirement because of the inherent flexibility to adapt what best suits the research environment, focus and question (Petty et al., 2012). It was therefore relevant to mitigate the lack of a comprehensive framework for integrated healthcare and IS inquiry.

Qualitative inquiry supports an interpretivist stance within the social sciences as opposed to grounded theory, and it offers another inductive means of theory building. As qualitative inquiry is more akin to a positivistic approach it is well suited to this research (Harling, 2002; Saunders et al, 2009; Thomas, 2011). Therefore, qualitative inquiry and multiple case studies were chosen as the best way to conduct this particular research (Conboy & Fitzgerald, 2012).

Research purpose

The fact that case studies can be exploratory, descriptive or explanatory favoured this research (Yin, 1981). Referring to the purpose of this research (see section 3.2), a methodological explanation will now be given on how case studies are relevant. Descriptive studies accurately profile people, events or situations. Moreover, human knowledge as learned in existing operations context and daily activities suggest that humans are experts at the roles and functions they fulfil. Case studies therefore allow the ability to derive from intimate expert knowledge based on a multitude of business cases over time (Flyvbjerg,

2006). Furthermore, case studies can extend or precede exploratory or explanatory research because it is important to have a clear picture of the research landscape (Saunders et al., 2009) and therefore suited the data collection and analysis techniques of this thesis which seeks to understand how current process activities contribute to or hinder patient flow in ECs.

Descriptive inquiry was necessary to understand patient flow processes at each site. The data was analysed by using exploratory inquiry to seek insight into and to clarify understanding of the problem (Saunders et al., 2009). Exploratory inquiry lays the foundation for the development of more structured conceptualisations (Rowley, 2012), which was necessary given the diverse knowledge domains involved in this research. Hence, this research study, exploratory during analysis, allowed for the comparison of collected data using the analytical models from both healthcare and IS. The inquiry process, which translated to prescriptive results, is clarified in Chapter 5.

Case study

Case studies allow detailed and in-depth examinations of single examples in order to understand associated system complexities (Flyvbjerg, 2006; Petty et al., 2012). Therefore, case studies yielding comparable data were developed at three hospitals (one private and two public), of which the drainage area appear similar. Drainage area refers to the geographical dispersion of patients to which the EC is closest. Due to anonymity requests and thereby adhering to the agreed ethical conduct, no further information of each case is disclosed as it could lead to identification of the hospital. However, case defining criteria that adhere to the agreed ethical conduct appear in section 5.2, where relevant. Triangulation as a strength of case studies draws from evidence at multiple sources (Rowley, 2012). Moreover, the three cases provided triangulation context for the data and appropriate research methods that could corroborate the findings and answer the research questions accurately. The case studies also provided a comparison between better funded private hospitals and underfunded, overburdened public hospitals (Weimann & Stuttford, 2014) to support generalisability and representation.

Case studies have often been criticised in the past (Flyvbjerg, 2006). However, the criticism was grounded in proving the theory, validity and reliability of the study as scientific inquiry (Flyvbjerg, 2006). Nevertheless, this method captures knowledge residing with practitioners which informs theory development (Benbasat, David, & Mead, 1987). Experience and knowledge acquired through contextual learning allows an intimate bond between the knower and the known (Flyvbjerg, 2006; Terrell, 2012). This bond, based on deep understanding gained through thousands of concrete cases, makes a specialist and serves as the knowledge base from which they act (Flyvbjerg, 2006; Terrell, 2012). Therefore, although no patient interviews were conducted (interviews were only conducted with clinicians and other EC staff members), case studies were regarded as a suitable strategy to understand the interactions between patients and clinicians, assuming patients as clients

of the healthcare service delivery (Stender & Christensen, 2013). This strategy also fits the research objectives which seek to scope activities related to patient flow processes in order to derive improvement practices (Saunders et al., 2009).

Some scholars argue that the subject and the object of a case study investigation should be separated, because this distinction marks all social inquiry due to the fact that a case or characteristic unit does not have meaning in itself but only through the interconnectedness between the knower and the known (Terrell, 2012; Thomas, 2011). Skills and knowledge come to the fore through the practitioner's personal account and application of relevant practices, which makes case study research important to develop variations of reality or to understand the "as is" (Flyvbjerg, 2006). Moreover, multiple case studies mitigate access and time restrictions by offering rich information and comparison of smaller groups or organisations, especially in diverse settings (Houghton et al., 2013; Rowley, 2012). Case studies therefore pertain to specialist information harboured in expert occupations which provide an information-rich learning environment (Flyvbjerg, 2006).

The following section will describe how the chosen research methods translated into theoretically supported and systematic data collection to generate rigorous and consistent data.

4.4 Data collection techniques and procedures

This study aimed to derive a holistic, in-depth understanding of how ECs operate based on the collection of rich data from multiple sources of information in a natural setting. Case studies allow freedom regarding the selection of the data collection instrument and they do not imply qualitative or quantitative proof (Yin, 1981). Therefore, multiple data gathering techniques are relevant (Harling, 2002). The main technique was qualitative interviews which allow for corroboration through triangulation and, despite being undervalued, can be applied to collect data in qualitative research regardless of the philosophical underpinning (Myers & Newman, 2007; Saunders et al., 2009).

4.4.1 The relevant theories

Holistic and integrated management, BPM

Improving the quality of healthcare is a global concern. However, comprehensive strategies to deliver reform are not well documented (Ruelas et al., 2012; Weimann & Stuttaford, 2014; Wiler et al., 2012). Motivations for the lack of conceptual and practically relevant theories are unclear (Epstein & Street, 2011; Reichert, 2011). The delivery of quality care is also hampered by the on-going debate about what patient-centred care (PCC) actually entails (Singer et al., 2011). It is not clear how organisations can deliver more cost-effective and personalised service to patients in efficient and innovative ways (Epstein et al., 2010; Lorig, 2012; Rathert et al., 2013). Sustainable transformation in health care is especially crucial for SA because the majority citizens rely on public healthcare, which faces various socio-

economic and funding challenges (Mayosi, Lawn, Niekerk, et al., 2012; Patel, 2014; Weimann & Stuttford, 2014).

BPM is a management methodology with an enterprise-wide reach aimed at more effective organisational operation (Armistead, Pritchard, & Machin, 1999; Johnston et al., 2012; Reichert, 2011). It supports improved service delivery targets by reducing business process (BP) waste and cost through coordinating and grouping related efforts (Reichert, 2011; Thompson et al., 2009; Wiler et al., 2012). BPM is therefore a mechanism to deliver process improvements which can increase operational performance and business agility, which are pivotal for healthcare transformation (Reichert, 2011; Thompson et al., 2009). However, hospital IS infrastructure can smother agility because it is conventionally inflexible, which highlights the need for process-aware IS in reformative efforts (Reichert, 2011). Therefore, this research study drew from BPM practices and envisioned research results to inform cost-effective improvement of EC patient flow through increased process control, subsequently contributing to healthcare reform (Lenz & Reichert, 2007; vom Brocke & Sinnl, 2011). This research is based on the expanded BPM success model (BSM) as a holistic management approach for improved business process productivity and adopts a view which separates BPM from technological components (Johnston et al., 2012; Thompson et al., 2009).

However, is healthcare, specifically emergency medicine, ready to embrace reform (Weimann & Stuttford, 2014; Wiler et al., 2012)? Due to uncertainty about the practical implications of advancing healthcare and despite increased research, potential rewards are rendered inaccessible (Bechtel & Ness, 2010; Wiler et al., 2012). BPM creates the expectation of benefits for complex healthcare settings, even though organisations struggle to operationalise and integrate many associated proponents (Armistead et al., 1999; Reichert, 2011). In the context of this research, the holistic management consideration of BPM is an ideal because healthcare settings are intrinsically complex and even chaotic. Also, BPM can accommodate the application of theories such as Lean theory to improve processes, allowing the flexibility to recruit additional theoretical support to satisfy the outset objectives (Thompson et al., 2009). Theoretical inclusion was crucial for three reasons: firstly, because this research involves IS in complex healthcare with rigid clinical processes; secondly, because healthcare research is often not practically useful and therefore requires both strategic and operational insights; and, thirdly, because practical insights into healthcare challenges are required to fill the literature gaps (Epstein & Street, 2011).

TSEF, the patient flow strategy

Efficiently operating hospitals execute more procedures while moving more patients through their systems, which improves financial performance in an environment characterised by rising healthcare costs (Devaraj et al., 2013). The Theory of Swift and Even Flow (TSEF) is based on the manufacturing industry and suggests that process productivity depends on the swift and even flow of materials or information through the system. Therefore, the swifter and more even the flow, the more productive the process (Schmenner, 2004; Schmenner &

Swink, 1998). An increase in process productivity therefore advocates growth potential and also financial gains (Devaraj et al, 2013; Schmenner, 2004). This research looks at both productive processes and the handling of an increasing patient load using TSEF.

TSEF distinguishes between value-adding work, which adds to material (patient) reform, and non-value-adding effort, which navigates, classifies, reworks or inspects materials (patients). TSEF considers non-value-adding effort as waste by proposing that materials move more swiftly through processes due to reduced or eliminated waste (Schmenner & Swink, 1998). Swift flow is achieved through the elimination of bottlenecks and process blockages. Measured as throughput time, the flow speed (waiting time in healthcare) expresses patient stay from process entry, when value-add starts, and up to process end, when the work unit (patient) is complete. Longer throughput times indicate more waste (Schmenner, 2004; Schmenner & Swink, 1998). Some scholars argue that such theories, with manufacturing underpinnings, are rudimentary and not suited for activities that impact the time taken to treat patients (Henrique, Rentes, Godinho Filho, & Esposto, 2016). Regardless, TSEF aligns with Lean theory and contributes to the operational and flow optimisation of patients in emergency settings, which is what this research investigates.

TSEF suggests that even flow requires narrowed variability regarding the operational steps within the process. To narrow variability, the demand placed on processes should be regular and even. This can be achieved if “like” things are grouped and processed together without slowing down the process, subsequently increasing productivity (Schmenner & Swink, 1998). Part of this is already achieved at the EC process entry point by triage, where patients are classified or colour-coded based on their care needs (Engelbrecht et al., 2015), which sets the context for more regular flow through the rest of the EC processes. TSEF allows, at individual and group level, for the observation of activities that contribute to patient flow and related strategies, process waste and bottlenecks, as well as the isolation of related management and operational activities – as investigated in this study.

However, theories with manufacturing roots are linear and not ideal for complex healthcare settings (D’Andreamatteo et al., 2015; Greenhalgh & Stones, 2010). Lean theory does not explicitly imply manufacturing and is instead open to multiple interpretations, which mitigates the linearity and rigidity of manufacturing and brings an agile perspective (D’Andreamatteo et al., 2015). Moreover, although clinical processes are rigid, actual patient treatment time is impacted by supporting activities and therefore does not exist in isolation (Henrique et al., 2016). This suggested a need to understand which activities add value to patients and how these activities serve ECs. However, despite the value that Lean principles contribute to EC business, it can also negatively affect patient outcomes and staff directly or indirectly. Hence, cautious change leadership and management is crucial and advised (D’Andreamatteo et al., 2015).

Past studies have presented multiple accounts of measured throughput or waiting times (PwC, 2014), consequently rendering TSEF appropriate. The data showed that decreasing

patient stay and treatment duration is a key driver of ED patient flow (see section 5.2). This makes the use of TSEF relevant in the research context. The theories that guided the research strategy are summarised in Appendix 0.

Data collection protocol and instruments

This research investigates patient flow through ECs by analysing, among others, operational activities. The following section explains the data collection process.

Data collection instruments

The main data collection method used in this study was semi-structured open-ended interviews (B.2). Each respondent received a one-page questionnaire (B.1). The sole purpose thereof was to profile each respondent in order to determine the credibility of the respondent, thus validating the collected data. This method served as a pre-interview tactic to frame the mind of the respondent, thereby mitigating a limitation associated with qualitative interviews in intimate social settings. The result was more contextual responses during the interview that followed. The questionnaire responses were captured in Microsoft Excel to create pivot tables and charts (Appendix C). Appendix C.1 summarises the data sources and related abbreviations. The profiling questionnaires produced the summarised view shown in **Figure 4.1**. The distribution of average EC experience and respondent ages compared closely between sites, which supports generalisation credibility. Appendix C shows more detail of the full respondent profile analysis per site.

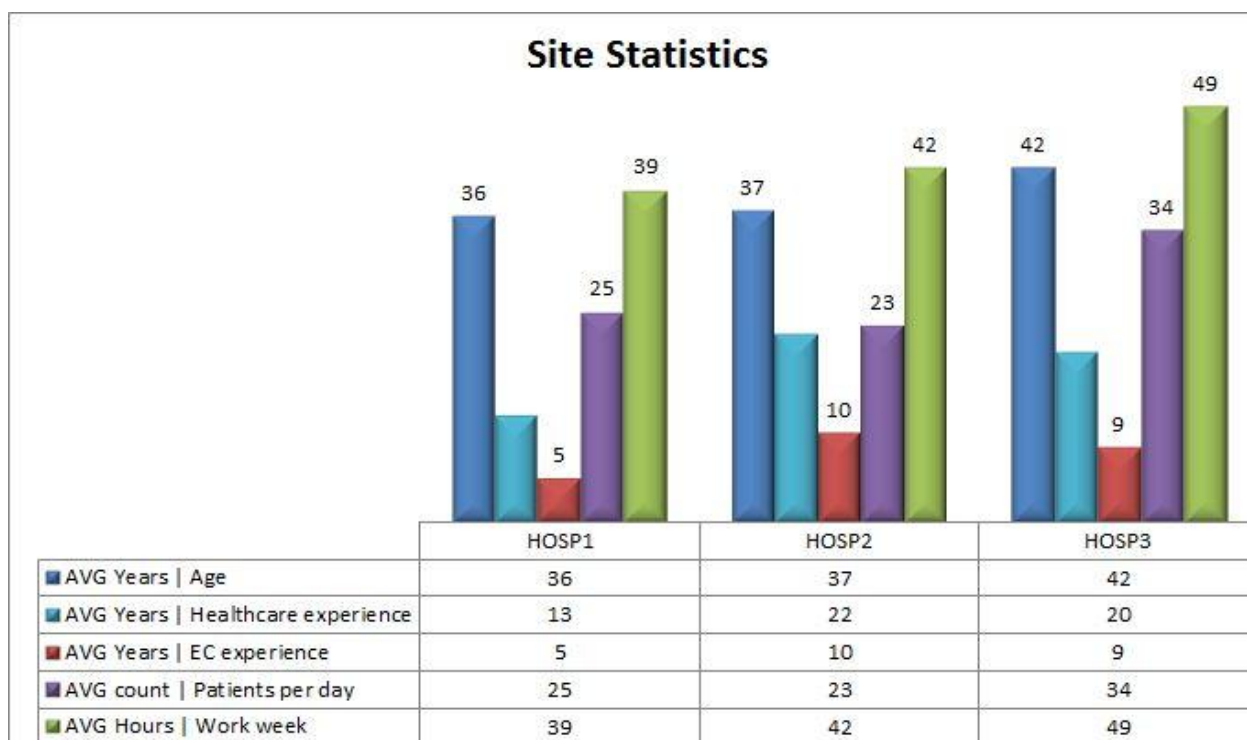


Figure 4.1: Average respondent and environment indicators per site

Figure 4.2 below shows the overall distribution of all respondent roles across all sites. The balance between doctors and nurses reduces qualitative bias. Deductions based on the questionnaire responses, which support some of the findings, are qualified in the conclusion, section 6.2.

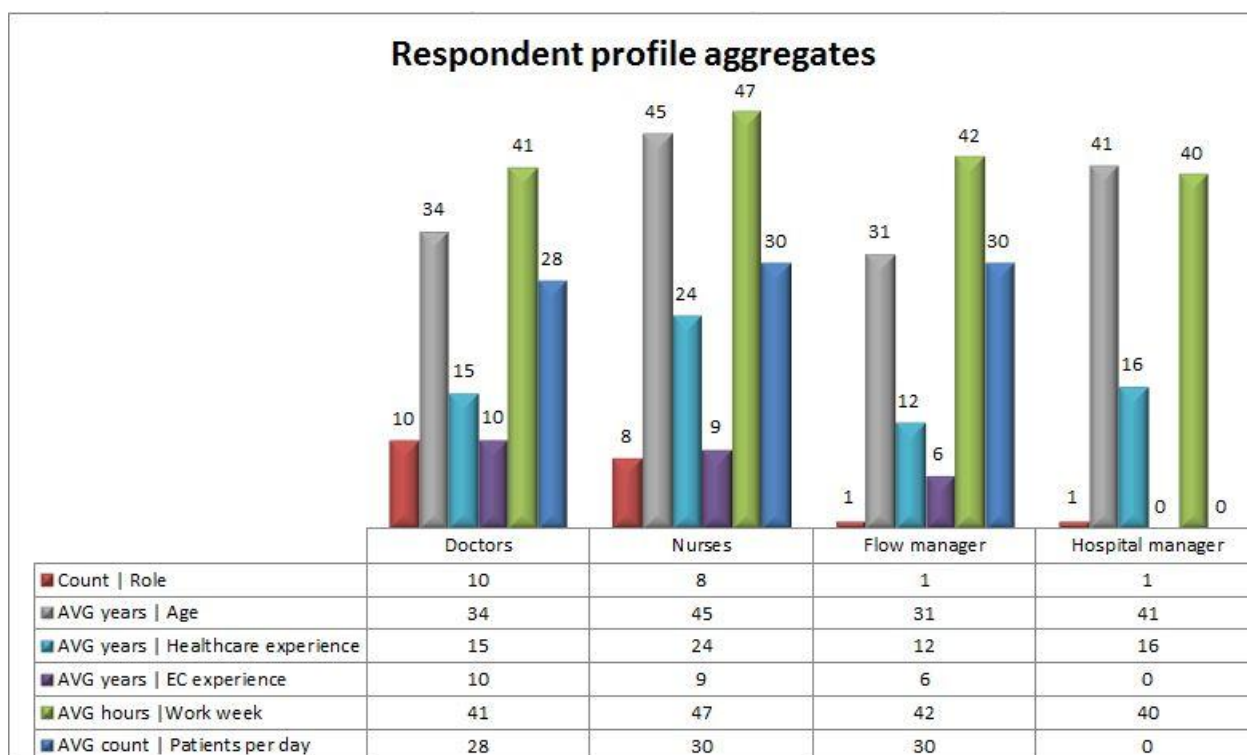


Figure 4.2: Distribution of roles across all sites

The IGOE acronym stands for Input, Guides, Outputs and Enablers (Harmon, 2010). This scoping template is applied to capture and understand service-oriented process information or how any grouped set of work is done within a business process (Long, 2012b; Mahal, 2010). The tool was used to understand how the activities of each respondent role are linked to patient flow. Akin to material flow, input entails the object to be transformed by the process activity (Long, 2012b). The Guides aspect answers “how” decisions are made for the “when”, “why” or “how” process activities to happen (Long, 2012b). The outputs entail the results (Long, 2012a).

Because the Guides aspect of the IGOE template provides a link with decision criteria, it is applied to assess how work gets done and to determine patient flow based on the remaining three components – input, enablers (of flow) and outputs – to ultimately deliver operational insight (Harmon, 2012; Long, 2012a). The definitions of the IGOE interfaces were strictly adhered to during inquiry and design practices (Long, 2012b). Given the diverse roles and complex healthcare settings, this model aided rigorous and systematic inquiry because the

semi-structured interview questions were derived from the base definitions of the four categories. Appendix E.3 shows the IGOE template in detail. The next section clarifies how the interview questions were methodically developed.

Data capture and preparation

Semi-structured interviews are ideal when the researcher only has one chance to interview respondents. Therefore, semi-structured interviews suited this study’s cross-sectional timeframe (Cohen & Crabtree, 2006). The questionnaire was based on the IGOE template (E.3.). Consequently, questions and data from the analysis were grouped neatly into the four components: Input, Guides, Outputs and Enablers. **Table 4.1** shows the question categories that were mapped to each interface of the IGOE template, and the strategic inquiry purpose behind each category.

Table 4.1: A view on how the questionnaire design linked with the instrument (IGOE)

Question category	IGOE interface	Inquiry purpose
QC1	Inputs	What they need to do their role (Swift Even Flow)
QC2	Enablers	Where they do it and who they do it with
QC3	Guides	Why, When and How they do what they do
QC4	Outputs	What they produce or deliver

Linking the IGOE template with the analysis theories (explained in section 4.4.1) provides an understanding of where bottlenecks and waste occur within the four categories. Responses within each of the four question categories are grouped per environment, which supports generalisation. This helped to pinpoint which components or aspects within each role (and process) are critical in terms of patient transformation or flow, and how process activity differs between environments.

Timeframe and field impacts

Investigating a particular phenomenon at a particular time is referenced a “snapshot” or cross-sectional perspective (cross-sectional perspective) while a series of snapshots over an extended period is referenced a “diary perspective” (longitudinal perspective) (Saunders et al., 2009). This study shapes to a cross-sectional horizon. Moreover, South African healthcare is overburdened and stressed by staff shortages (Stender & Christensen, 2013), which risks the study and data gathering timeline. Therefore, free and even access to the data gathering was paramount, resulting in the selection of hospitals that could accommodate the research timeline.

Sampling and target population

This comparative study targeted roles or functions in ECs that directly affect patient flow. A fair spread of such roles or functions were interviewed to assess interaction with patients and contribution to flow. The pie chart in **Figure 4.3** shows the sample balance of respondents and roles for this research across all sites. The balance mitigates bias associated with any particular view or authority.

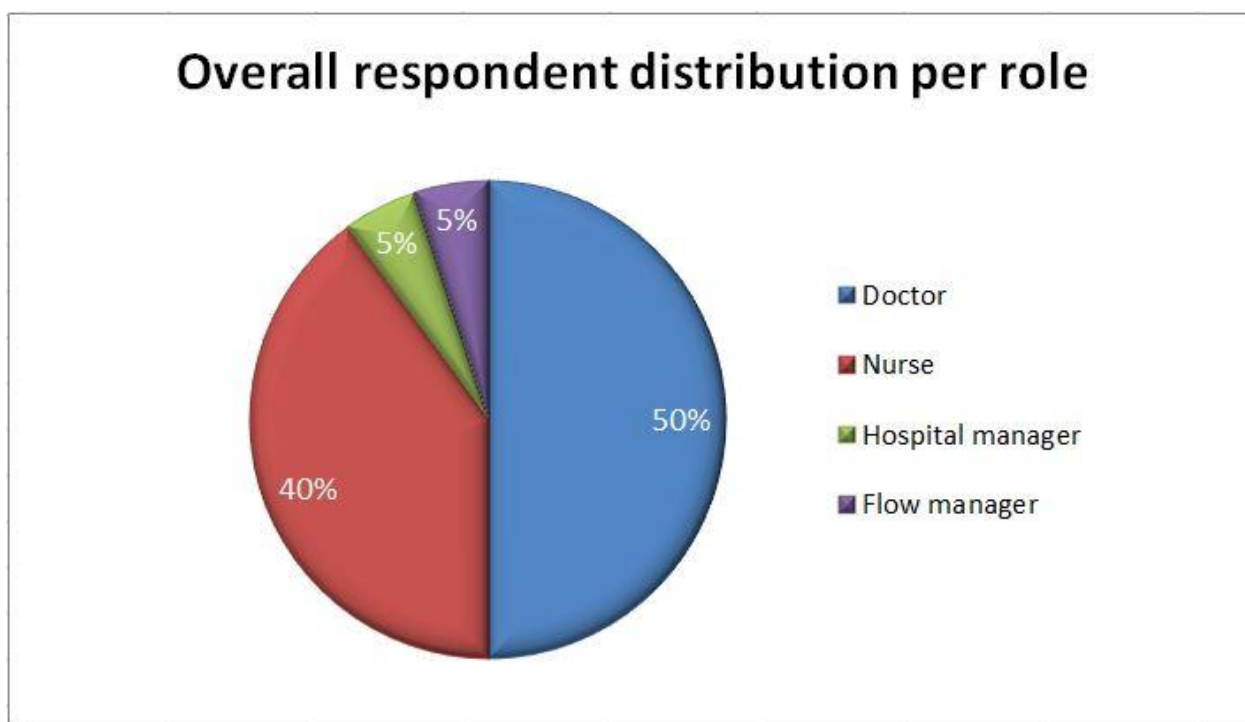


Figure 4.3: Distribution of respondent roles across all sites

The research studied EC business and management practices related to patient flows in the Western Cape of South Africa. The aim was to understand enablers for improved EC patient flows and subsequent contributions to the reform of the greater EC business management practice. Consequently, there is a generalisation requirement. However, due to the qualitative nature of this study, non-probability sampling was more suited (Saunders et al., 2009). The close balance of doctors and nurses mitigates bias to support a generalisation.

Time and access restrictions suggested the need for a sampling technique that contains the range and amount of data collected by focusing on a designated sub-group (Saunders et al., 2009). Therefore, three hospitals suggested a representative qualitative sample: two public and one private. The researcher liaised with the management of the Innovation Hub at Groote Schuur Hospital, which aided the selection of hospitals through existing contacts. A private hospital was included as a result of the disparity in SA (Weimann & Stuttaford,

2014). Moreover, it is better funded and was assessed for any differences and competing or comparable influences (Saunders et al., 2009).

4.4.2 Research conduct and ethics management

Strict adherence to the prescribed ethical research conduct guidelines of the University of Cape Town (UCT) was practiced at all times during interviews, and also in terms of the conditions accompanying site authorisation. ED management generally served as the touch-point with each site in order to contact respondents and arrange interviews.

Ethical considerations and procedures

All conduct was transparent and within UCT ethical guidelines, assuring respondents of anonymity. Consequently, there were no intentional requests for personal information or any data, which may lead to the identification of respondents or organisations. The private institution explicitly requested anonymity. The gathering of personal data was avoided. Transcripts were checked for any personal data (gathered unintentionally) and purged if found.

Access to hospital employees

This research design passed GSH's Health Research Ethics Committee (HREC) requirements, which ensures anonymity through masking techniques and pseudonyms. Subsequently, according to the research design, each hospital at initial engagement received a research consent form (A.1), which requested authorisation to participate. The private hospital had a defined research application process that lasted an additional five weeks and delayed the finalisation of this dissertation. No data collection occurred without permission. When boarding a site to collect data, the researcher adhered to all the conditions prescribed and accompanying the relevant approval. Each respondent was required to confirm voluntary participation by signing the interview permission slip, (A.2).

Interviews

Strict adherence to the prescribed UCT ethical conduct prevailed during interviews. Interviews were transcribed using Microsoft Word soon after completion, while the experience was fresh. The transcripts were re-read for familiarisation, bearing in mind the BPM and TSEF theories. Secondary sources of information included notes taken during interviews.

Interview scheduling took into account the convenience of each respondent; only one was rescheduled due to a meeting that was moved. One respondent did not want to participate because of time pressure. All the other respondents participated unreservedly. The interviewed respondents were experts based on their qualifications, the scope of their daily duties, and their period of exposure to the healthcare industry.

4.4.3 Data analysis and presentation procedures

Qualitative research analysis is typically challenged by large data sets with little or no structure (Conboy & Fitzgerald, 2012). Thematic analysis aids recognition of patterns within data, which ensures rigorous inductive theme coding, subsequently resulting in the direct extraction of themes that can become categories for analysis (Fereday & Muir-Cochrane, 2006). This delivers structure directly rooted in the gathered data (Conboy & Fitzgerald, 2012). Other options for analysis include grounded theory. However, thematic analysis is more suited in this case because it allows for agility during data coding schemes and theory building (Bardhan & Thouin, 2013; Conboy & Fitzgerald, 2012). The next section will present the rationale behind the analysis and explain the pilot test.

Data analysis strategy

The methodical analysis strategy followed Porter's three-phased approach to define a strategy (Harmon, 2010):

- Phase 1: Determine what the company is currently doing; develop an as-is view per hospital ED and patient flow that shows assumptions and current strategic handling of patients.
- Phase 2: Determine the current operation of the environment (in strategic and operational context); the as-is model will show enabling and disabling environmental factors as well as capabilities and limitations while comparative analysis will show strengths and weaknesses between hospital ECs.
- Phase 3: Develop new strategic handling for the organisation: current patient flow management was compared with the environment to confirm feasibility; and alternative approaches are suggested based on the data and findings (Harmon, 2010).

Phase 1 suited the exploratory nature of this research. Phase 2 shapes to the descriptive nature while Phase 3 simulates the prescriptive nature of the results. Strategic and operational concerns were evaluated across the three organisational levels of Appendix E.4. Further recommendations for practice were derived from analysing the data according to the Expanded BPM success enablers model (E.2) which has relevant empirical support (Thompson et al., 2009).

Because of time limitations, not all aspects of holistic and enterprise-wide BPM success were assessed in similar detail. Two frameworks, E.1 (for healthcare) and E.2 (for BPM), were chosen to guide data collection and analysis. A comparison between the constructs of the WHO framework (E.1) and the Expanded BPM Success Model (E.2) confirmed similarities between BPM practice success and healthcare. This eliminated irrelevant enquiry by containing the desired BPM attributes for this research, which was successful BPM for optimised patient flow. The result is presented in section 5.2: an actionable and

therefore practically useful research output informed by an IS methodology (BPM). Consequently, hospitals can prioritise improvement and develop associated practices based on methodologically informed and empirically supported BPM practices. This can increase the control that hospitals have over each of the relevant processes perspective described in section 5.2. This empirically supports complex healthcare transformation and satisfies the pragmatic outset objectives.

Presentation of the findings

Despite increased research on BPM for healthcare, associated process solutions fail because the related implementation processes and activities, the vehicle to deliver operational results, are not well understood (Bechtel & Ness, 2010; Reichert, 2011; Thompson et al., 2009). Consequently, the BPTrends pyramid was recruited for analysis because it depicts three distinct process levels within an organisation aspiring to mature BPM improvement practices, thus providing a simplified implementation context (Harmon, 2010). This inclusion contributes to more practically useful results. Moreover, the model defused a complex healthcare organisational setting for transformative strategy to support a practical implementation context for the findings. The use of the BPTrends pyramid (E.4) is clarified in section 5.1.

Data coding techniques

The interview questions used in this qualitative research were open-ended. Questions strategically derived from TSEF and subsequently, answers categorised according to the four interfaces of the IGOE template (E.3). Consequently, each response was iteratively coded to the corresponding question category and therefore IGOE template interface it pertained. This was done using a “drag and drop” technique within the Nvivo software program interface. Responses were thereafter read and compared for BPM success with the Expanded BSM (Appendix E.5) and CSFs (Appendix F).

This approach allowed flexibility to explore topics in more detail as and when required (Rowley, 2012a). Each interview audio was listened to before actual data coding. Thus, familiarisation with the transcripts of the interviews during the analysis preparation processes allowed for better understanding of the collected data in the context of the relevant frameworks (analysis and design). Thematic coding was done using NVivo version 11. According to the application of the theories, explained in the research tactics (see section D.1), related text extracts were grouped and classified according to the IGOE template (E.3). In conjunction with the main analysis framework (E.2), this provided the key themes into which data extracts were iteratively coded and grouped per interview. Recommendations for healthcare improvement practices in ECs were derived from the final list of themes for BPM success (Thompson et al, 2009). Practical usefulness is additionally supported by Appendix F, which covers factors for BPM success.

4.5 Pilot strategy

Pilot study purpose

A pilot study was undertaken with one recipient to test the validity and rigour of the data collection instrument and the rationale behind the theoretical lenses. The intent was to highlight any shortcomings in the design and execution of the initial theoretically derived semi-structured questions. The pilot study also served as a preparation and test for interview conduct. The negative test strategy was to identify questionnaire design shortcomings, gauged by the degree of interactive interview response: whether the pilot user struggled to respond to specific questions, or responded only with a “yes” or “no”. As qualitative inquiry should render rich data, such responses were not well suited, which triggered updates of the specific question to elicit a more detailed response (Saunders et al, 2009; Thomas & Magilvy, 2011).

Pilot results

Initially, the questions were too structured and there were too many questions per theme. This created time pressure, pushing the pilot interview to just over an hour, out of the target duration of 45 to 60 minutes. This hindered the exploration of themes, which detracted from richer data gathering, thereby justifying a pilot test. The question categories (**Table 4.1**) proved an efficient guide to contain questions under time pressure. This was especially relevant because some interview responses were richer in certain areas due to the role distribution. For example, if the respondent was a senior, the responses generally elevated managerial insights. Sometimes, the respondents answered questions in other categories during exploration. It was not necessary to explore a relevant category if time was limited because the question was already answered due to the semi-structured explorative nature of data collection.

The insights gained from the pilot study allowed the interview questions to be adapted during this stage of the research, and only once. The pilot interview was transcribed to test data preparation and format procedures. However, due to the limitations imposed by UCT for this thesis and time pressure, the pilot data was not analysed. Additionally, the risk of losing analysis rigour was mitigated because the data collection instrument was by design also included in the analysis strategy, which kept the data structures consistent across all research phases (see section 5.1).

4.6 Limitations

Qualitative inquiry

Because qualitative research produces more data across various features, the main aim is to develop a deeper understanding of a specific phenomenon in holistic context; subsequently, generalisation is not the main purpose (Thomas & Magilvy, 2011). In qualitative research, quality (validity and reliability or rigour) is governed and assessed by

“credibility, dependability, confirmability and transferability” (Houghton et al., 2013). However, it is difficult to transfer the associated skills to conduct this type of research (Conboy & Fitzgerald, 2012). Therefore, the effective application of methods that translate into rigorous results can elude novice researchers (Conboy & Fitzgerald, 2012).

Qualitative interviews, despite being taken for granted, are an excellent means to collect data despite bearing pitfalls (Myers & Newman, 2007). However, complexities bring risk and include talking to strangers under time pressure, within intruding personal social settings. It interferes with behaviour and have not been discussed in detail (Myers & Newman, 2007).

Generalisation, adoption and change resistance

More flexible standards are required in healthcare, which are difficult to enforce in complex technological environments (Braa et al., 2013; Lenz & Reichert, 2007). System adaptability affects implementation. Healthcare organisations are complex and adoption success and standards vary in different contexts. Additionally, individual standards easily reach a “locked-in” state causing inadaptability. This renders organisations unable to accommodate generic changes, which compromises generalisation potential. However, the data collection framework, analysis strategy and chosen theories explicitly support comparison. The research design served generic recursive application across the research terrain. EC sites were consequently evaluated in a generic yet systematic manner. To mitigate this limitation, the methods were chosen and designed specifically to increase the generalisation potential and adaptability of the outcome (Braa et al., 2013).

Linear flow inquest

TSEF is critiqued for being synchronous and sequential or linear, likened to a production line that handles one product type at a time while not considering multi-tiered environment variants (Klug, 2013). Healthcare settings are inherently complex and consist of diverse processes and variations (Reichert, 2011). Although patient flow at a high level sporadically appears sequential, it structurally simulates a network (Klug, 2013). TSEF fundamentally supports the strategy of optimised flow, which is a key challenge in healthcare practice, as shown in the literature review (Bardhan & Thouin, 2013). Despite this limitation, TSEF works as the main examination strategy in this study because it supports operational performance gain and enhanced process responsiveness, which leads to process productivity (Klug, 2013; Schmenner & Swink, 1998). Linear flow is moreover mitigated by using the WHO framework together with the conceptual IS framework for BPM success (E.2). Even though the IS framework was developed for the financial services industry, it overlaps with the WHO building blocks framework to strengthen health systems (E.1). Moreover, the IGOE template (E.3) and data collection instrument objectively evaluate business process activity irrespective of industry (Long, 2012b).

Chapter 5: Analysis and interpretation

BPM forms part of business language, particularly in larger organisations (Armistead et al., 1999) and is therefore strategically prioritised to encourage business process improvements. However, BPM depends on organisation-wide enabling factors, termed enablers, to succeed (Thompson et al., 2009). Deploying BPM for business gain and therefore operationally is difficult (Armistead et al., 1999). Research shows that many BPM implementations in healthcare have been unsuccessful, which motivates the need to understand the requirements for successful BPM practice (D'Andreamatteo et al., 2015; Khodambashi, 2013; Thompson et al., 2009; Trkman, 2010). The following section explains how the relevant theories, that formulated the research design, were combined for analysis leading toward empirically supported findings that are practically useful.

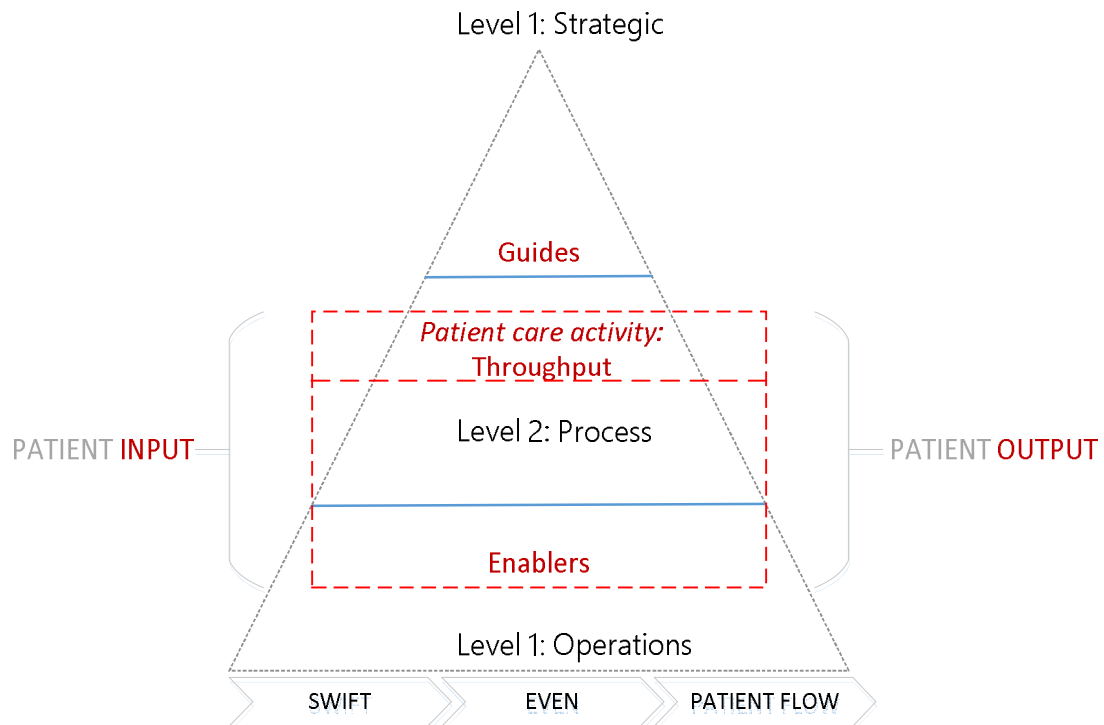
5.1 Overview of the methods and models applied

The main data collection instrument, IGOE template (E.3), was explained section 4.4. The semi-structured questionnaire, derived from the model, was used to collect secondary profiling data for all four IGOE interfaces to assess key activities within roles at patient touch-points, spanning different levels of EC operation. This template essentially separates process activities in categories that enables BPM success, in order to allow exploration based on the selected analysis theories (Khodambashi, 2013). Understanding the context of the four components is important because it addresses different aspects of patient flow. Consequently, it was possible to form a corroborated view per site of how patients move through the EC, which provided an as-is perspective on flows. Adopting this instrument and approach enabled methodical data collection per role, to understand how process participants (human resources) execute process activities or tasks within existing patient flow processes. As per the research design, the overarching strategy was to determine how EC business management can draw from BPM to improve patient flow.

5.1.1 Explaining theoretical fit for analysis

The IGOE template and TSEF were integrated to collect data to provide a view of how patients flow through ECs. Both models were clarified in section 4.4. TSEF focuses on waste reduction by distinguishing between value-adding effort, which transforms a product (patient), and non-value-adding effort, which is considered waste (Schmenner & Swink, 1998). Grouping similar process activities together speeds up the process flow and decreases the variability of the demand to increase productivity (Schmenner, 2012). According to the research design, TSEF was the main data collection strategy that supports the swift and even flow of patients through the EC. The IGOE template provided a structured way to conduct data collection while accommodating TSEF objectives and allowing flexibility to explore concepts identified from literature and industry reports (PwC, 2014; Trkman, 2010). Figure 5.1 illustrates how the theories are combined.

Figure 5.1: Visual of TSEF and IGOE combined



The WHO building blocks framework for stronger healthcare systems is shown in Appendix E.1. The framework clearly shows which health business facets, termed building blocks, to develop for stronger health systems (WHO, 2007). This framework adheres to a healthcare agenda, which is crucial for this IS research. Four of the six building blocks overlapped neatly with the data collection instrument as shown in **Figure 5.2**.

Table 5.1: How the IGOE template and WHO framework overlaps

IGOE template	WHO framework
Input	Information, Finance, Workforce
Guides	Governance, Information
Enablers	Workforce, Technologies (Information)
Output	Service delivery, Information

The “Service delivery” building block is a main outlier while “Information” is an independent construct of the WHO framework which forms a pivotal part of decision-making in clinical healthcare processes (Harmon, 2012). Therefore, patient information drives the delivery of EC process activities. Consequently, the dependency on patient information to drive activities associated with flow processes, which, at times, are supplied by other departments

or clinical tests, is investigated within all four the components of the collection instrument (IGOE). Both the main outliers are clarified later in this chapter.

5.1.2 Clarifying the models that support the findings

The three levels of the BPTrends pyramid (E.4) provide a simplified understanding of BPM activity in an organisation, which lends more structure to qualitative inquiry by defining and contextualising each process level. This provides a simplified, structured organisational representation of process practices per level, leading to the ability to classify any process activity. The three levels of the model provide a rationale hierarchy and process-type classification mechanism for organisational processes. Subsequently, it strengthens the practicality of the findings and supports the pragmatic outset agenda.

BPM is not theoretically well established despite its popularity and widespread adoption which started in manufacturing (Armistead et al., 1999; Trkman, 2010). Therefore, the structured organisational levels of BPM activity exhibited by the model provide a presentation and implementation context for the prescriptive findings of this thesis by segregating business levels and the associated process activities at each level. In support of the pragmatic research agenda, the pyramid structure directs the logical argumentation flow, from strategic to the operational level of business.

The following figures show only the relevant parts of the theoretical model that form the presentation context of the prescriptive findings (see section 5.2). **Figure 5.2** shows the six enabler categories extracted from the full Expanded BPM Success Model (Thompson et al., 2009). The full model, (E.2), will now be referred to as BSM. BPM effort in these categories promotes BPM success and underpins the findings.

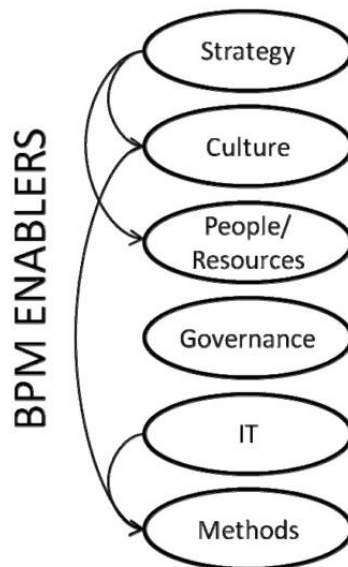


Figure 5.2: The six BPM enabler categories of the expanded success model

Managed BPM practice within the six enabler categories leads to “Process Success”. This is illustrated in Figure 5.3 (Thompson et al., 2009). The three aspects – efficiency, quality and agility – indicate the degree of process success and dynamics associated with the results of BPM effort. The process level BPM benefits pose more consistent process action and reduced errors due to process quality (Thompson et al., 2009). Process efficiency leads to time saving through either the application of improvement (Lean) methods, or process automation through technological support (Thompson et al., 2009). Process agility considers how easy it is to implement process changes within the organisation, which includes the implementation speed (Thompson et al., 2009).

Figure 5.3: Process success competencies of the BPM success model



Appendix F provides a summary of process-specific critical success factors for BPM implementation, abbreviated as PCSF (Trkman, 2010). A case study grouped relevant BPM activity and considerations to derive requirements for process success (Trkman, 2010). Both BSM and PCSF promote BPM competencies for process success and overlap somewhat. However, while BSM prescribe BPM actions across the enabler categories and the three organisational levels sufficiently, the PCSF subsequently groups the considerations to achieve associated process competency. Both are important for holistic BPM practice, and are therefore included to contextualise BPM results per research site. Section 5.3 elaborates on the rationale that PSCF supports BSM.

5.1.3 Formulating the chapter structure

Five theories and models have been integrated to underpin the analysis and interpretation of the research data. To prevent potential complexity, the explanation below describes this integration to support argumentation at the relevant junctions of this thesis. The BPTrends pyramid offers three organisational levels of BPM practice. Within the three levels, process activity differs.

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The following section describes how the relevant theoretical components correlate with each particular level and where in the chapter it is covered. This section also clarifies the three prescribed levels of BPM activity in an organisation, categorising BPM activity into three levels for practical implementation support.

At Level 1, strategy-level BPM activity in an organisation includes process architecture, performance measurement, strategic alignment, BPM priorities and planning (Harmon, 2010). The BSM enabler categories that correspond with this level are “Strategy”, “Culture”, “People / Resources” and “Governance”. Section 5.2.1 formulates the data in this context.

At Level 2, process-level BPM activity requires the prioritisation of process redesign and improvement projects. This offers a formal improvement agenda and assigned methodology to enable consistent process actions (Harmon, 2010). The BPM activity required here matches with the “Methods” enabler, while other process-level competencies also distribute across the remaining enabler categories. To remain consistent in the application of the theories, level 2 only covers actions in the “Methods” enabler. This approach allows for the evaluation of an additional component (process success) of the BSM. Consequently, the findings are easier to apply practically because it is triangulated with two another models. Therefore, PCSF strengthens the process competencies because of effort in the BSM “Methods” when explaining the findings for Level 2 in section 5.2.2.

At Level 3, the implementation level of BPM activity, strategic and tactical BPM activity becomes operational to generate results for which processes are designed (Harmon, 2010). The BSM enablers “People / Resources” and “IT” match this level because these business assets directly or indirectly execute process activity, as explained in Section 5.2.3 (D’Andreamatteo et al., 2015).

The next section (5.2) discusses the prescriptive findings according to BSM and PCSF. The prescriptive argumentation is expressed as follows: Firstly, list the prescribed theoretical BPM competency or activity according to the models: BSM (Thompson et al., 2009) and PCSF (Trkman, 2010). Secondly, do an empirical observation by comparing the data with what the BSM (E.2) prescribes. Section 5.3 synthesises prescriptions for BPM implementation at each level of the BPTrends organisational pyramid (E.4). Chapter 6 summarises the outcomes. This chosen approach supports triangulated findings.²

² The terms EU, ED and EC are used interchangeably by the respondents. There is no standard. It means Emergency Department or Centre or Unit.

5.2 Research interpretation: Advancing BPM at Emergency Centres

Improving organisational performance requires an increased awareness of both business processes and the management proficiency thereof (Harmon, 2015; Reichert, 2011). Process management maturity improves as process management capability increases (Harmon, 2015). Process mastery and agility translate into quicker organisational response, leading to better management of the business value proposition to clients (Harmon, 2015; Thompson et al., 2009). This accelerates organisational efficiency and optimises the use of resources, which cumulatively translates into business success (D'Andreamatteo et al., 2015; Harmon, 2015; Thompson et al., 2009). Methodical BPM practice therefore enables organisations to achieve more business value with the same or less resources. In this context, the findings are presented according to the simplified organisational view and related theoretical components explained in section 5.1.2. This section considers and evaluates BPM effort at the three sites according to the enabler categories of the BSM, E.2. The discussion (5.3) and conclusion (6.2) sections will expand on this.

5.2.1 Organisational Level 1: Strategic

Strategy

Enabler. Define a value stream and consciously link it with core processes to support top-down change. This enabler therefore prescribes a top-down methodological improvement approach (Thompson et al., 2009). ECs are a critical, front-line, life-saving medical speciality. *"In primary care of Emergency Medicine, we want to save your life. If you need initial support, we must be able to do it. If you are not able to breathe on your own, we should be able to put a tube down your throat, put you on a ventilator, but not keep you there"* (INT2B). Therefore, EC operations differ from other hospital services. *"Critical life-saving resuscitations happen in ECs but it doesn't happen anywhere else. It also runs in-patients and outpatients. The other [hospital] facilities just run in-patients"* (INT3A). The core strategy of an EC demands immediate generation of clinical results, which are defined by clinical processes (Harmon, 2010). The main competency, on which all sites are unanimous, is the initial elimination of life threat. All the sites aim to reduce patient waiting times, which poses an operational resolve. It could be argued that the rigidity of clinical processes and subsequent results limit the type of BPM methodology (top-down or bottom-up) suited to healthcare. Regardless, the way BPM principles manifest at the research sites rather suggest a bottom-up process approach (Harmon, 2015). The data gathered does not show a definitive link between core strategic EC business and related processes (Thompson et al., 2009). Even the private hospital, with greater financial drivers and support, subscribed foremost to a well-defined clinical directive or value stream, and no explicit BPM strategy.

Enabler. Define a clear BPM strategy linked with strategic intent, therefore an improvement methodology (Thompson et al., 2009). *"I should have gone for to more management courses, more inter-personal relationship courses, more lean courses, so just a better understanding of the methods because we learn (Lean) on the job"* (INT2D). Following the argument of the previous

enabler, the data confirms that BPM activity takes the form of operational efficiency initiatives as opposed to clear and conscious improvement activities linked with strategic BPM practice. The main empirical observation under this enabler confirms a bottom-up process methodology. HOSP1 discusses operational optimisations weekly, which cloaks strategic BPM intent. *“We have two weekly meetings with the Medical Superintendents, Heads of Departments and deputies. Everyone is there and it is a meeting with a fixed agenda. Improvements are one of the main [discussion] points”* (INT1A). Methodical discovery of improvement opportunities form a crucial part of any BPM agenda (D’Andreamatteo et al., 2015). However, it is unclear whether focused strategic BPM intent motivates improvement opportunities.

In all cases, triage³ undergoes regular improvement cycles. This is evident in a pre-triage role at all the sites. The function, occupied by a human actor, puts patients at ease and uses EC process expertise to make basic quantitative medical decisions to route patients. If the initial patient touch-point is not equipped to direct a patient to a medical process, it delays and compromises care. *“Considering the whole patient journey, when the patient enters the EC you get stopped by a security. We rather prefer access to a queue marshal first. If a security guard is the first contact point that could already be a bottleneck. Because, if someone does not realise the patient has chest pain, it is a potential serious problem. They might instruct the patient to go and wait in the queue which delays treatment time by not detecting the clinical problem at that point”* (INT2D). Further research could explore why triage processes receive more focus compared to other process domains. It could be argued that triage use reduces clinical risk or because the triage system is already established and continuously developed. This enables facilitated implementations of a clinical classification system, whereas BPM implementations require IS competencies. Here, the data supports an earlier finding, which prefers an environment where bottom-up improvement triggers are favoured over a committed top-down strategic BPM approach. *“We have been through endless projects to improve bed status. The last project happened because it took me an hour and half to get the [bed status] information from the wards”* (INT1A).

Enabler. Foster a process dimension across the organisation (Thompson et al., 2009). *“[Lean training] certainly made me aware that one can streamline processes and that there are quicker, more efficient ways of doing things and sometimes being able to actually bypass certain steps or helping us to recognise what each person’s role is. And by not doing your own role you may be creating inefficiencies in the system, so I did gain a lot of principles”* (INT1F). Pockets of process understanding exist at varying organisational levels. HOSP1 has an explicit role for

³ Triage is a standard procedure and first contact in EC, which categorises patients. Correct triage categorisation can save lives by reducing morbidity and mortality threat. Colour codes start with the highest medical priority: red, orange, yellow, and then green (Naidoo et al., 2014).

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a bed manager, which is active, while HOSP2 had bed manager but no more, and HOSP3 has a central bed-bookings function, which they do not use due to inefficiency gripes. ECs send patients to wards to clear load. If the wards have no beds, it hinders patient flow. This is therefore another confirmed observation that major operational pains drive process improvement. Generally, the bed management competency receives an increased operational efficiency focus, while other process competencies lack entirely. *“We desperately need the patient folders and that’s a huge issue. I do not think the clerks actually realise the urgency of getting the folders upstairs. They sit [and accumulate requests while they play computer games]. It literally takes them 20 seconds to pull the folder off the shelf...”* (INT1C). This quote highlights a symptom of lacking process perspective. The clerks do not grasp the urgency of folder retrieval in a chain of events, connected to deliver patient care. Doctors depend on information in folders to support the qualitative decision-making of patient treatment. The treatment is a core clinical directive. However, it depends on efficient folder retrieval. Retrievals that are more efficient would enable more decisions through quicker information access. Doctors can thus treat more patients for better patient flow, which is a core EC competency. This is a typical display of how better process understanding among clerks can serve a core strategy while showing the value of BPM for optimised processes. Moreover, junctures such as these are perfect for automation or electronic process support, leading to faster access to patient records. Despite the importance of this enabler, a lacking process understanding across the organisation hinders improvement in this area. Process improvements cannot be linked to an unambiguous strategy nor be executed unanimously (Thompson et al., 2009).

Enabler. A credible business case for BPM attracts funding which should be budgeted for and supported by specific project management (Thompson et al., 2009). Organisations view BPM as a *de facto* competency. The data does not show BPM as a part of the value stream because improvement is driven bottom-up. Consequently, BPM does not attract sufficient attention to deliver realistic results (Thompson et al., 2009). Under these conditions, this enabler is invalidated at the sites researched. This is evident from a scenario where EC management motivates for a role to enable process optimisation principles. However, the optimisation is rejected, citing fund shortage. The problem is described as follows: *“I actually timed it. In an 8-hour shift, a doctor spends 30% of his time seeing a patient. So 30% of 8 hour shifts is the core function of the doctor [the most expensive resource]”* (INT2B). A potential solution would be if cheaper labour performs the routine tasks that are not clinical; however, there is no organisational support. *“Everyone we employ has a job description. I need general labourers to answer the phone, fetch stock, call the next patient, and get the patient to and from the bed; to perform simple tasks.”* (INT2B). The petition is rejected, irrespective of motivation, due to funding shortage. The finding confirms a lacking top-down BPM strategy in the ECs, which cause a lack of enterprise support to attract funding for projects, specifically for BPM and process improvement as a secondary and parallel strategy above main clinical directives. *“Funding, funding, funding. I had to push very hard to get Medical Officers (MOs) [junior doctors]. We are still pushing. We decided to have two MOs per shift, later on three. We do not currently have*

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three after midnight, still two. We want at least three dedicated MOs on the floor at all times, even weekends" (INT2F). Obtaining funding for BPM is secondary to obtaining more doctors to handle more patients, which does not necessarily suggest efficient process improvement. However, BPM depends on symbiotic relationships, using available resources in an efficient, managed way (Johnston et al., 2012).

Enabler. Results must be visible (Thompson et al., 2009). Two senior respondents clearly expressed the lack of results despite the perception of various on-going improvements. *"I feel, how many more things are you actually going to do to improve, but nothing is actually improving?"* (INT1B). Given the pockets of process understanding explained earlier, the results may be visible to some, yet not commonly perceived among staff. This detracts from organisation-wide BPM adoption, which hinders consistent process activity and support.

Culture

Enabler. Adapt to smaller, incremental changes which are the least disruptive (Thompson et al., 2009). The most appropriate empirical support here comes from HOSP2. Although triage processes are manual, and no electronic support or automation is provided, there are signs of triage process maturity. The efficient audits suggest elevated process control for consistent actions and results. HOSP1 appears to be the least triage process mature due to a recent re-structure of triage roles. *"...that is why we had to give names for a triage champion. A couple of senior doctors will go on a refresher course so that they can teach all the staff..."* (INT1B), while HOSP3 has electronic triage support, suggesting process automation. The management of triage education at HOSP2 supports this finding. *"We have got formal triage training for which I am responsible. The informal training is when you see someone is doing something wrong. I correct them and ensure that they [do it properly]"* (INT2D). *"People don't want to change. When they are overworked, they revert to their old ways instead of implementing the new triage [correctly]. Then you get [their own interpretations of triage scoring] that is not the South African Triage. If you trust the triage system then you are backed. [If triaged incorrectly] I summon them and say 'Listen, you have done wrong here. Revert back to the way we do'. I do it there and then. I correct on-site"* (INT2A). This verbatim shows pitfalls associated with this enabler category. EC business mainly reduce mortality risk associated medical trauma cases. Inaccurate triage scoring therefore brings escalated EC business risk by delaying care from patients that should have received a critical triage score and might die while waiting to be treated. Findings here support the importance of formal and informal training to mitigate business risk and pro-process adoption for accurate results and process trust. It underlines how crucial timing is for ongoing and incremental behavioural change to support process quality and uphold process behaviour standards.

As a result of triage maturity at HOSP2, process control allowed for the foresight to update standardised document layouts to enforce behavioural change, which is key to BPM success or failure (vom Brocke & Sinnl, 2011). The triage capture document was redesigned to enable role players to capture triage-scoring data more accurately and to support triage

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audits, thereby implying a process agenda. *“So it’s not just a triage audit, but a triage and waiting time audit. Our paper [is updated]. Arrival time must be documented. Then, who did the Triage and then the patient complaint. We added ‘Is there an emergency sign? If urgent, is there an urgent sign? This confirms we are using the [triage] algorithm...So we changed the paperwork to help incorporate the new added triage. If your paperwork makes it easy for the nursing staff to document everything, it makes fewer gaps”* (INT2D). Resistance to change in organisational culture is a main cause of BPM failure (Bandara et al., 2007; vom Brocke & Sinnl, 2011). Under this enabler, small incremental changes lead to behavioural change, which is crucial for organisational culture and BPM success. Moreover, process control is important to expose failing actions and it cannot be done without accurate measures, which are the triage audits in this case.

Enabler. Cultivate a culture of support and process encouragement with defined channels to allow continuous improvement for process development (Thompson et al., 2009). Change resistance occurs when there is a lack of widespread support (vom Brocke & Sinnl, 2011). *“There is a lot of friction in the communication channels. People are very... [stubborn to change] or they work in silos or their departments. However, the hospital is actually supposed to function as one but they [reject improvement] proposals. They do not embrace the change very quickly”* (INT1A). There is one account of varying change culture and adoption behaviour between geographical areas. *“In KZN [province] you don’t get resistance to change. They do it. As soon as you go [do not govern behaviour], they stop doing it. Cape Town [Western Cape] you are going to get resistance to change, because they just don’t want to do it”* (INT3C). The data and sample cannot confirm geographical location as an indicator of change adoption and behaviour. For this research, leadership appears to have a greater impact on change acceptance among staff, but the research design does not cover leadership explicitly. Further research could validate leadership impact as a change advocate to extend healthcare inquiry frameworks. However, this falls outside the scope of this project.

Enabler. Staff must be held accountable for non-compliance to process, likewise incentivised for good performance and promoting process (Thompson et al., 2009). *“When they triage incorrectly I correct it immediately. Otherwise, they end up getting the idea that it [incorrect triage] is okay. I don’t know what my colleagues do...and when we do quarterly triage auditing we look at every specific person’s triage accuracy and we do directed [corrective] intervention with each person”* (INT2A).

Enabler (Caution): Staff reduction due to cost saving (doing more with less) must not be misappropriated as an explicit BPM objective (Thompson et al., 2009). Culture is a key driver of BPM effort. Therefore, a weary culture will deter adoption by creating the perception among staff that BPM causes job losses (Vom Brocke & Schmiedel, 2011). Instead, optimised processes generate higher efficiency and enable a resource to accomplish more (Thompson et al., 2009). A BPM cost saving benefit emerges from accurate decisions that are executed efficiently, thus saving money by not wasting resources or time (Harmon, 2012). *“They opened new posts for me. I do not have the correct amount of staff based on the amount of patients we see, but that needs to be approved for the new positions. Therefore, every six months*

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we get a backdated report for the prior six months. It shows how many patients we saw. At the last count, I was supposed to have 39 staff. I have 22. It is much less than I should have, but because it is a business, they don't want to appoint more staff" (INT3B). The pay-for-service model at HOSP3 (private), demands stricter financial controls. More staff means more cost. The EC infrastructure is expanding, thus another EC generated expense. The infrastructure-to-human-resource ratio therefore increases which will demand more staff. However, the optimisation view (BPM) at HOSP3 promotes the opposite in a fiscally stringent climate with a shortage of skilled personnel. *"We will now [after construction] have 9 to 10 cubicles. This almost doubles the amount of patients that doctors can see at any given moment. Considering the redesign, we should not need more staff. Currently one nurse is allocated to each cubicle. Whereas now we can have two or three nurses just stand and observe what is currently happening"* (INT3A). This quote suggests that overworked staff members face pressure to do more under an optimisation banner. By misappropriating (BPM) improvement, optimisation is negative correlated with cost saving through more work. This defies prescribed enabler behaviour. This tactic detracts from BPM implementation by damaging culture and morale. It is therefore counterproductive for the adoption of a healthy improvement strategy (vom Brocke & Sinnl, 2011).

Enabler. A good change culture favours adoption and smaller improvement changes absorbs easier (Thompson et al., 2009). The data confirms failure of strategic improvement tactics. One respondent confirms process bottlenecks in one instance. However, on the other hand, the same respondent resists adoption of a process improvement initiative. *"[Respondent lists patient flow bottlenecks as follows] ...availability of beds and cooperation between us and the other ward. That is how this whole telephone thing came about, this 'so-called' telephone. They have this telephone now, and then I have to find the nursing staff to call and make sure that the phone does not disappear. That is another thing. As I said, I will give the telephone a chance but I am very against it"* (INT1B). This verbatim confirms a communication bottleneck between wards. A strategic improvement decision motivated the use of a dedicated and fixed phone-to-person combination between wards for more efficient and consistent communication. However, such a small change to improve patient flow faces resistance. Herewith, posing how a smaller change is cheaper and easier to execute and potentially holds great flow improvement value. This shows the transition between strategic intent and adjusted operational activities. However, if staff resists change it fails the embrace of strategic improvements, which hinders process development and transformation.

Governance

Enabler. This aspect of BPM success prescribes transparent process accountability and incentivised decision-making to guide action (Thompson et al., 2009). In a managed triage context, the quality audits urge adjusted management activities in small increments. This is an important display of the results of process control and it shows how human cognitive decision-making supports process action. *"If there is a problem with the triage audits, my role is to investigate it. The triage task team consist of myself, the Medical Officer that does the audits, our*

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nursing manager, of the sisters that can do the triage and finance and admin [representatives] as well" (INT2D). This shows how formal process roles at HOSP2 support better process control. However, not all processes display similar maturity levels. The improvement focus of the triage domain does not match the other flow cycles: "*[Respondent confirms inefficient folder retrieval]...the next day you have discharged patients, but nobody knows about the folder because the folder is missing now. The patients just leave with the folder because they do not want to [walk all the way to return it]*" (INT2G). Folders are a crucial to patient treatment and efficient flow. A holistic BPM strategy would mitigate information loss.

Enabler. Clear process ownership is necessary and crucial for inter-departmental process integration (Thompson et al., 2009). "*If you work here, you phone the bed bookings lady. She puts your name on the list. We had a bed bookings sister as well, whom you could phone to look for a bed. But the best process to follow would be to go to the ward and look for a bed yourself*" (INT3E). This verbatim illustrates a critical healthcare process across departmental boundaries. If patients cannot efficiently transition to an available bed, the delays show in the EC (Shen & Wang, 2015). Bed access is therefore crucial to healthcare service, due to how it affects the management of patients along functioning processes. More mature flow processes optimally recruit available bed resources. This enables efficient access and results in consistent patient flow from the EC to the hospital (Higginson, 2012). The previous HOSP3 (private) quote shows that there have been various attempts to improve bed-access management processes. This argument is strengthened by the many roles, specifically implemented for better bed management. However, the improvement initiative failed due to process distrust caused by haphazard results. Moreover, unclear ownership fails the current process. Hence, no standard operating bed management procedure and process accountability between departments govern this crucial engagement. Consequently, a resource on which the EC depends, bypass the bed management process as seeks a bed as the need arises; thereby, rejecting an existing process for a counterproductive, manual intervention. The quote exemplifies how inefficient improvement directly affects staff (D'Andreamatteo et al., 2015). The manual intervention replaces what a defined, efficient process should otherwise handle by occupying a nurse, therefore detracting from patient care. This result opposes what BPM governance proposes for a routine task.

Enabler. Processes that cross departmental boundaries require a cross-functional management capability (Thompson et al., 2009). In order to work efficiently, complex EC operations demand integration with the broader hospital (Lenz & Reichert, 2007). The previous bed management example qualifies this enabler also. A lacking real-time view of available beds encourage process distrust. Consequently, resources reject existing procedures. Herewith, a key dependency and theme that surfaced during the analysis. "*Unfortunately our hospital drains a large area. We always struggle for beds. Once a matron told me to refer a patient [to another hospital] because there was absolutely no bed and this was a very sick*

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patient. At 01h00⁴ I phoned another hospital for a bed. Luckily, there was a very nice physician and they obliged. It was an ICU bed and I could send the patient. At 05h00 or 06h00 that morning somebody said there were actually 2 beds available. I phoned the matron and said 'this was the last time ever I am referring a patient. Stabilising and transfer does not work for me. You caused a big problem for me [as a doctor]. In future, if I want a bed, even if you have to fetch a bed from home, you will find one' (INT3G). This shows critical impact of an available bed on EC service processes, specifically destination processes of medical emergencies. Moreover, how a process navigates healthcare departments and cross organisational boundaries (Thompson et al., 2009). Cooperative colleagues and organisational integration is a crucial EC service enabler (Reichert, 2011). All sites have core cross-functional patient process that requires beds to function. Beds are an unmanaged resource that lacks regulatory and strategic management. Despite the critical nature of bed currency for patient flow, all the hospitals encounter the same challenge. As a result, bed management occurs in silos causing a significant patient flow bottlenecks that, if addressed, can greatly improve flow. Therefore, a clear need exists to mature a strategic bed management competency with sufficient authority to develop and enforce regulatory and standardised operating procedures. Optimal flow derives from the governance of bed usage. Even the clinical competencies seemingly operate in business silos. However, the data does not conclude this observation, which would support bed current management inefficiencies. Although a formal bed manager is appointed, the competency receives informal and unstructured organisational support with insufficient authority. Unsuitable results force manual intervention that detracts from BPM. Resources use their own initiative to override existing engagements, which leads to inefficient resource usage and wasted time.

⁴ 24-hour time format applies. 01h00 suggests 01:00 (AM); similarly, 18h00 suggests 06:00 (PM).

5.2.2 Organisational Level 2: Process

After understanding the high-level vision and need for BPM, a top-down approach enables a channel from the strategic level, traversing the process levels down to operations. Specific problems, that hinder optimal business performance and results can then be identified (Harmon, 2015). At this level, processes that add value to clinical activities are defined for expected results and specified in the value stream (Henrique et al., 2016; Khodambashi, 2013). BPM activity in this case and at this level can be considered tactical; which is closer to operations where the standards, competencies and requirements to promote successful BPM and related process activity is established (Bandara et al., 2007). Understanding the enablers of process activity will support organisational BPM, which poses more even EC process demand (Allder et al., 2010).

Methods

The triage process at HOSP2 covered under the “Culture” enabler demonstrates a top-down improvement approach. Assigned triage champions reinforce the two enablers explained below. To re-iterate, accurate triage is vital to the clinical and core EC strategy and patients because it eliminates life threat. The predefined quantitative scoring system depends on training for qualitative decision-making. Triage training of staff members must always remain current and consistent. Triage scoring requires a command of the quantitative knowledge for accurate execution. Else, EC business risk escalates as miss-scores increase. Patients who have already been triaged have to be rechecked which causes an operational inefficiency. The pivotal role of triage in regulating patient flow requires a significant amount of effort to maintain consistent process actions to deliver quality process outputs. At HOSP2, the triage mechanism received updates to ensure accuracy. The layout of the document used to capture triage scores was changed. Data capturing accuracy was enforced by rearranging the fields on the page that are used to capture critical information during triage. Revisiting the documentation simplified triage audits and improved scoring accuracy. Both these outputs strengthen triage, which upholds process quality. Missing or inaccurate information per defined document field indicates deviation from standardised scoring process activity. Triage audits hold each staff member accountable for the document used. Process deviations are fixed with training, as soon as possible. Better process outcomes derive from updated management activities, which encourage consistent behaviour and accurate triage results. Consequently, confidence in the process and process result holds.

Enabler. Support and enable consistent process actions (Thompson et al., 2009). According to the literature, this enabler involves defined process mapping, with central technological support (Jones et al., 2014; Reichert, 2011; Thompson et al., 2009). In this instance, financial services and healthcare differ significantly. Process mapping is a documentation process that represents the current business processes in the organisation as derived from core business strategy. Therefore, a graphical mechanism that is consulted for organisational (BPM) changes (Armistead et al., 1999; Thompson et al., 2009). BPM prescribes a central repository to keep the process maps (Thompson et al., 2009). At no site

is there an explicitly integrated BPM value stream, as explained in the “Strategy” enabler. Expecting technological support for defined processes is therefore premature. The financial organisations in the BSM paper had not yet fully reached this goal or level of maturity at the time of review (Thompson et al., 2009). In the absence of a defined BPM strategy, expecting technologically supported process-mapping activities is also premature. The following enabler links with this enabler.

Enabler. BPM does not inherently have an improvement methodology (Thompson et al., 2009). Process improvement is hierarchical to promote consistency. Improvement methodology depends on the type of methodology, either top-down or bottom-up (Harmon, 2015; Thompson et al., 2009). It is unclear how ECs discover improvement initiatives due to irregular process maturity and control levels. Although all the sites act for improvement, it is unclear whether a formal improvement methodology guides effort. Instead, it seems driven by operational needs, which the triage management substantiates. Triage is critical and so is the management for consistent behaviour. Budget constraint business forces an environment and training for accurate results in cost-effective ways. Obtaining immediate results from triage improvements is vital because the process risk is high. A recommendation here considers the type of process improvement: redesign, update or process-waste reduction (Harmon, 2015). Implementing this recommendation formalises improvement, which promotes structured BPM practice with theoretically informed support.

Informal applications of unstructured Lean concepts occur at all sites. Only four of the 20 interviewees explicitly referred to “lean”. Despite variation in organisational size, process improvement holds significant benefits for healthcare. Therefore, the selected improvement path should suit the organisational size and fit the business (D’Andreamatteo et al., 2015). More importantly, streamlined processes are prevalent today. Process waste has therefore predominantly been stripped, which is but one way to improve processes (Harmon, 2012). Improvement beyond this trajectory requires organisations to understand what invokes action-driven decision-making for a defined strategy (Harmon, 2012). In the healthcare context, decision-making within processes can be formalised only to a certain extent (Harmon, 2015; Long, 2012a). This notion reveals which aspects of processes cannot be automated with technology. Consequently, more efficient operational resource allocation develops process control. The result is processes that are more effective (Harmon, 2012).

Enabler. Select process improvements that solve immediate business pains, which favour success. This argues the BPM value proposition and quantification, and it also supports adoption (Thompson et al., 2009). “*We’ve been through endless projects to improve bed status. My last one was...it takes me an hour and a half to get the information from the wards. We wanted the wards to submit it within 15 minutes, but they just did not do it. Clinicom is a hospital information system and supposed to be real-time. I can get bed status from there but it is just not filled in, in real-time*” (INT1A). This exemplifies an immediate pain, crucial to EC and patient flow. A quick-win improvement and solution, was the telephone mentioned under the last strategic enabler to support real-time and efficient inter-departmental communication. Resources waste time

walking to other hospital wards to confirm available beds. The value arises from enabling a dedicated resource with a phone and having an agreed recipient per ward. Therefore, a dedicated communication channel tasks both resources to find a bed, which reduces process waste. The EC gains control over the ability to push patients to ward beds quicker and the dedicated ward resource advocates the pull effect – thus a better managed process. Cell-phone adoption poses a business value of efficient bed status reporting and optimal resource usage. Patients benefit from improved patient flow and increased staff presence. However, staff can be sceptic about improvement projects due to historic failures. Therefore, Initiatives like these require strategic priority informed by BPM knowledge and staff education.

Process efficiency, quality and agility

The literature on process-specific critical success factors (PCSF) highlights the need for organisational changes that was covered in the BSM enablers. A change in organisational structure promotes focussed BPM (Trkman, 2010). Moreover, a culture of designing processes around customers, the patients in healthcare, is pivotal (Trkman, 2010). Many of the PCSF suggestions overlap with the BSM enablers. The section below explains the groupings for process efficiency, quality and agility.

All three sites created a human touch-point with clinical process knowledge as first contact for patients, therefore, not security guards. HOSP1 labels this position an “eye ball” nurse. HOSP2 calls it a “queue marshal” and HOSP3 a “meet and greet nurse”. This role functions to regulate patient flow. As explained before, it brings care access closer to the patient. If a clinical specialist does not occupy this position, which is the case at HOSP2, these resources are trained to quantitatively assess base clinical emergency signs. The ability to escalate medical cases triggers the appropriate triage avenue, which brings agility to EC input events and shows how organisational structure affects process flow. Moreover, it shows how process design and therefore service revolves around the customer, or the patient in healthcare. Efficient patient uptake processes directly impact access to EC, which delivers patient-centred value.

The three sites already have a strong client focus. The detractor in healthcare, specifically ECs, is waiting time (Affleck et al., 2013; PwC, 2014). However, given EC strategy and triage rules, by eliminating life threat, the patient is sure to wait. The patients complaining about waiting times are predominantly those who are guaranteed to wait. BPM implementation can address corrective strategies in this regard through adopting a formal approach. Such improvements fall under the triage process domain. The triage ownership at HOSP2 is formal in terms of assigning duties to promote and uphold the clinical competency of the process. However, given that improvements happen bottom-up and that there is a lack of formal improvement methodology, it is unclear whether maturing all the facets of triage falls within the scope of formal daily duties. The PCSF suggests that an appointed process owner brings agility in this context (Trkman, 2010). In healthcare, it seems that a BPM-specific

process owner will promote BPM activity alongside clinical activity, whereas a clinical process owner will promote the quality of clinical process activity first.

"You have to see the red and orange patients before you go to the green. They will normally complain, the green and yellow marked patients, because they have to wait the longest, but at least you know their lives are not in danger" (INT2F). A dedicated process under a BPM initiative would consider the lack of customer centricity of the process for green and yellow, and provide an integrated solution. However, EC business primarily reduces mortality risk of medical trauma cases. Moreover, in conjunction with other responses, supports the argument that reduced waiting times impact patient morbidity and mortality. The triage owner at HOSP2 therefore focuses on triage accuracy and efficiency for a clinical outcome and not on the agility, a BPM outcome. Improving process agility reduces the clinical focus because it requires the same resource. The medical priorities dictate that any available doctor has to save the life when required. An observation is that keeping a doctor on site for lower priority cases is parking empty beds for patients that are not there while critical patients need those beds. More mature BPM competency develops process agility in this case. The following theme emerged from the data: *"Unfortunately, casualty is a backup for a non-functional clinic system"* (INT1C). Clinic function as a relief for EC load was a common empirical observation at all the ECs. *"I would do the satellite clinic. A satellite near the hospital is a good idea because if the patient needs a referral to the hospital it is near to the hospital [does not delay care]. If it is too far, it doesn't make sense"* (INT2F).

5.2.3 Organisational Level 3: Business operations

Many organisations struggle to realise expected benefits due to challenges associated with implementing BPM (Armistead et al., 1999; Johnston et al., 2012). At the process activity level, execution of daily tasks generate process results which is discuss next (Armistead et al., 1999).

People / Resources

Enabler. Consciously manage widespread process understanding. Everyone should grasp the process perspective and continuous improvement. A clear BPM strategy solves many human resource management issues like training and the capacity required for improvements (Thompson et al., 2009). The research findings shows active operational optimisation projects at all the hospitals, although there is no empirical evidence suggesting a formal and guided improvement methodology. As explained with empirical evidence under the "Culture" enabler, widespread process understanding occurs in pockets of knowledge across the organisational hierarchy. Challenges include change resistance and misunderstanding of important process-enabling activities. The comprehension failure of porters and clerks on how folder retrieval activities contribute to patient flow and care, strengthen this argument. *"Porters are a big problem for me; Porters are wonderful people, they are on duty but they are just nowhere. The nurses take patients to the wards, they [porters] seldom do"* (INT2G). There are pockets of BPM knowledge at HOSP2, at various levels. Under

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leadership of the CEO, who also works EC shifts eight hours a week, HOSP2 shows a uniform EC vision, which translates into synchronised improvement efforts. However, because BPM is not driven top-down and according to a prescribed methodology, the same problem presents at all the sites. HOSP3 has a dedicated EC porter that supports process flow, efficiency and efficient resource usage. *“The porter will go to the wards with us. When we are extra busy, we have extra porters at the reception. Previously we did not have a porter dedicated to the EC. Now there is one dedicated porter on each shift and he does everything, from taking the bloods to taking the patients [anywhere]”* (INT3B). The benefit associated with lower-cost resources for routine tasks is evident, which motivates BPM education for enhanced process understanding and united action.

Enabler. BPM awareness training is important for associated implementations and adoption (Thompson et al., 2009). Empirical support for this enabler was previously discussed in the “Culture” section. The triage champion emphasises immediate corrective action when the scoring protocol is broken. HOSP3 has an innovative, cost-effective approach to triage training. *“We all have tasks for the month. You have to audit three people in our own department”* (INT3F). Each triage nurse must do three peer reviews per month. Triage reviews appear as a key performance area (KPA) for nurses and the execution accuracy and knowledge is constantly measured. The inventive training mechanism shows signs of triage maturity. Both HOSP2 and HOSP3 exhibit more process control. Management executes more effort for accurate triage results. A supporting indicator is the drive for triage consistency and the ability to measure it. This creates more process consciousness in terms of effort, which improves process results.

Enabler. Process improvement requires capacity (Thompson et al., 2009). Extending the argument for the previous enabler, this involves human capital and infrastructure. Therefore, perhaps one of the most crucial enablers as it differentiates healthcare business from other industries. The BPM success model (BSM) was developed for financial services organisations. However, not all of the constructs apply to healthcare. A main discrepancy is that this enabler entails human and IT investment in finance organisations. However, according to the IGOE template (E.3), this includes infrastructure or equipment and beds as process enablers. It is important to emphasise awareness about this dependency for healthcare organisations that wish to undertake BPM. The transformation essence lies within the relationship between hospital beds and healthcare service. Specifically, because beds enable healthcare processes. If there is no access to an available bed, there is no relief for EC process, which then becomes overcrowded. Moreover, the amount of available beds dictates, and limits by national policy regulation, the amount of expertise hospitals can recruit. *“You can train 10% of the total amount of beds you that are available. We have 200 beds which means I can only train 20 people”* (INT3A). It is therefore important to manage the interrelated bed and staff compliment. Similarly, the size of the EC determines the quality and efficiency of healthcare services, which available beds dictate. *“Five [EC] cubicles are insufficient to deliver optimal service in a 200-bed hospital”* (INT3A). Therefore, more hospital

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beds require a bigger EC. Thus, advocating the link between the enabling aspects of healthcare service delivery and the crucial role it plays in developing a comprehensive framework (Weimann & Stuttaford, 2014).

A clear BPM strategy considers the above-mentioned enablers crucial to BPM implementation or change (Thompson et al., 2009). The divert process at HOSP3 supports this argument. HOSP3 is an integrated private corporate with centrally managed access to and control over an ambulance network. Consequently, HOSP3 has the option of relief processes by suspending patient influx by ambulance. The process triggers when critical business rules are satisfied, for example when the resuscitation area (with two beds) is full. This reiterates the importance of process control, and shows again the critical role of beds in healthcare destination processes for EC patient load relief. All the hospitals explicitly stated they do not have enough beds. A respondent at HOSP2 noted the following: *“We know that to have a fully functional hospital you will need between 200 to 400 beds. That should be a minimum. Under 200 beds, you have wastage and under 400 beds, you just do not have control anymore. It is too big and you have too many role players”* (INT2A). Hospital beds are critical process-enabling resources. Mindful allocation and management of available beds is therefore a crucial enabler of EC service delivery. However, the verbatim also illuminates the relation between management (control) relative to the amount of beds, which posits additional process dependencies. More beds will therefore not necessarily solve patient flow problems, which is one of the main findings of this research. Another reiterates the importance of bed management and the role it plays in optimal healthcare service delivery. A bed management function is therefore crucial.

Smartphone functionality emerged as a form of informal technology adoption, which positively enables healthcare service delivery. All the sites use a widely adopted smartphone app⁵ for work related staff communication that facilitates operations. Instant messaging enables rapid human resource access, regardless of location. Value therefore derives from the ability to convey information instantly to EC staff as a group. This replaces individual communication, which saves time. The technology moreover offers customisation for specific groups, for instance management and therefore provides a medium to extend BPM education for adjusted process behaviour. *“We use the [communication] technology to set up a communication group. It is very good. It keeps everyone informed and it helps with the processes as well, because communication happens instantly. What is better than anything else is you will not forget [acts as a reminder]. You are less likely to forget to [gives example] implement something. Or to remind people of things if you got the [communication] group because if you say: ‘The ward round is later’, because that’s another time that we spend focusing on telling people how to run things better in the [EC] ward”* (INT1F). It is interesting to note that behavioural change forms part of implementing this free smartphone communication tool. Process improvements therefore do not have to be costly. It also emphasises the importance of ward rounds, an existing clinical

⁵ An application downloaded to a smartphone, which enables instant messaging between shared contacts.

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process in the EC, as a training mechanism. This involves an onsite information exchange between clinicians when doctors rotate after shifts. Behavioural change occurs through smartphone use and plays a crucial role in BPM implementations. Existing mechanisms therefore extends improvement strategies, which through group education, can support BPM implementation and service integration.

A possible downside associated with technology also emerged with regard to patient smartphone usage in EDs, especially at HOSP3 (private). *“I would say that having an open area in the private sector will not work because of the type of patient that you have here and they’re quick to put everything on social media, very quick. The person next door will listen to what others are saying and you will see it on Facebook. ‘I was in the trauma unit and the person next door had this and this...’ so the fact that there is a wall, you don’t have [confidentiality issues]”* (INT3E). In EC settings, technology therefore risks violating patient confidentiality, which influences staff behaviour. The social media phenomenon therefore restricts free and even communication. None of the public hospital respondents mentioned this. The main difference and most likely explanation is the pay-for-service model at HOSP3. *“...the patients do not actually understand [the priorities assigned by triage]; they just feel entitled because they are private paying patients”* (INT3E). The frameworks used for this study cannot explore this argument, which makes it a topic for future research.

Enabler. A clear BPM strategy can solve many human resource management issues, like the training and capacity required for improvements (Thompson et al., 2009). The triage process at HOSP2 shows signs of efficiency and there is no electronic process support as at HOSP3. Triage implementation also involves training associated staff. Although triage at HOSP2 is more efficient than at HOSP1 (both public), there are process anomalies regarding execution. *“I think triage is a well-researched tool. It depends on the user though, the person applying the triage and interpreting the patient, especially the qualitative parts of triage. Some are better at triage than others are. Some people will come and ask you every now and then whilst other people rarely come and ask. When you pick up a patient’s triage document, you can see they know what they are doing. Sometimes it is frustrating [as a doctor] if someone asks you quite a lot when the answer is straightforward according to the [quantitative] triage chart. There is a place for qualitative interpretation. But sometimes people just need to know the triage better”* (INT2C). Increased triage process control makes corrective steps easy and quick to implement, as explained under a previous enabler.

Enabler. More staff increases cost per head (Thompson et al., 2009) and should be appropriately budgeted for. A clear BPM strategy that is well-integrated in the organisation covers most of the people enablers by default (Thompson et al., 2009), which is especially true for the culture category.

Enabler. There is a close link between EC strategy and people (Thompson et al., 2009). This enabler is covered in the “Strategy” category. Doctors are the most expensive resource in the EC. A verbatim showed how the core value extracted from a doctor is only 30% of his

or her time due to routine albeit essential tasks, which an administrative resource can perform. The EC at HOSP2 needs general labourers. However, there is no strategic BPM to appropriate funding in a clinical business setting. The finding here supports the dependency on other enablers that support a committed BPM strategy.

5.3 Discussion

“The reality is people get sick. More people will get sick and the population is bigger than ever before. People are living longer and they can become more burdened with disease” (INT3A). Effective and efficient emergency care can alleviate the burden that increasing patient loads places on healthcare service delivery. However, healthcare needs, resource availability and access differ between geographical areas across South Africa and between the public and private healthcare sectors (Chopra, Lawn, et al., 2009; Weimann & Stuttford, 2014). Healthcare challenges appear insurmountable. However, this research found that BPM can help. The main contribution conceptualises BPM practice for healthcare reform by highlighting the impact of inefficient EC business management practices on patient flow. Consequently, this thesis correlates empirical evidence against prescribed theoretical management tactics or enablers of BPM success. This discourse is extended by considering the management consequences, if the prescriptions in section 5.2 were implemented. Next, prescriptive considerations in each process level of the BPTrends model (E.4) pose practical improvements, in conjunction with section 5.2.

Level 1: Strategic improvement

Strategic intent implies focused effort to achieve operational results (Thompson et al., 2009). Despite the challenge, it is crucial to develop a shared understanding of feasible results to achieve responsive and agile healthcare systems and to improve quality (Ruelas et al., 2012). This requires commitment to an improvement strategy and the selection of an appropriate methodology (Harmon, 2015). The enablers prescribe a defined value stream to support top-down change and subsequent management. This involves a clear BPM strategy that links change and core processes with an improvement methodology for minimal disruption and incremental implementations (Thompson et al., 2009). If there is a way to show an as-is strategic view of the current healthcare system, organisations can methodically identify improvement areas (Henrique et al., 2016). Value Stream Mapping (VSM) can provide a high-level view of what the organisation is trying to achieve (Harmon, 2010) which considers integrated business for a common goal (Henrique et al., 2016). Once adopted, a top-down approach allow downward insights, from the strategic (value stream) level, traversing all organisational process levels, to identify specific problems that hinder operational results (Harmon, 2015). Likewise, an established improvement agenda at the top tier (strategic level) enable the opposite. The reversed process links operational pains to specific value stream maps. The value of this approach lies in elevated process control, therefore command over operational results. Strategic BPM success therefore demands a methodology to improve standards (Thompson et al., 2009). This facilitates theoretically

guided and supported implementation, and enhances operational results and targets, which translates into process control (Harmon, 2015).

Level 2: Process improvement

At the process level of BPM in an organisation, it is pivotal to encourage consistent process action and activity across the organisation (Thompson et al., 2009). Process measures should consolidate efficiency, quality and agility (Trkman, 2010). Appendix F provides the business facets to consider. Design thinking behind any improvement approach would be better served by expertise (professionals) on quality improvement and process development (Ruelas et al., 2012). It is important, given the rigid clinical processes and activities that by definition demand resources crucial to patient flow as well.

Process inquiry can save costs through understanding how decisions are made during process activities because good decisions save money (Harmon, 2012). This learning perspective may apply to clinicians and patients alike, and help to efficiently formalise knowledge. Subsequently, resource expertise gained through experience can be coded into process flows to create uncomplicated and feasible expert systems (process flows) (Harmon, 2012), which are crucial for complex healthcare settings and rigid clinical processes. Thus, in practice and as shown in the literature, there are pockets of useful knowledge, which can assist healthcare transformation.

Level 3: Operational results

Strategic improvement intent has to translate into operational results. This requires environments conducive to change, which implies accountability along defined organisational pathways (Armistead et al., 1999). This calls for efficient, practical stakeholder support for those tasked with realising transformation strategies, while effective result measures ensures quality care (Aaronson et al., 2016). At the operational level of business, bottom-up process improvement methodologies start with a specific problem and assume a specific process is broken, and endeavour to improve process performance (Harmon, 2015). The scope of the improvement methodology depends on the type of problem. For example, Lean mitigates process flow, while Six Sigma addresses quality and consistency problems (Harmon, 2015). Therefore, the selection of an improvement methodology, in conjunction with holistic BPM, is crucial in diverse and complex healthcare settings where available assets, knowledge and expertise need to be taken into account.

None of the sites has formally implemented an improvement methodology, which infers less established BPM. However, all the sites show strategic intent to improve healthcare service delivery and patient flow. Loosely coupled improvement concepts draw on the pockets of improvement knowledge of the interviewees, and staff management resonates with prescribed BPM concepts. Regardless, it is unclear whether these hospitals' BPM agenda is motivated operationally or strategically. As mentioned in section 5.2, HOSP1 has operational meetings. However, the resulting improvement initiatives detract from structured

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improvement. Despite the value contribution of improvement principles to EC business, it can also adversely influence staff and patient outcomes, directly or indirectly. Hence, cautious change management and leadership is advised (D'Andreamatteo et al., 2015).

Chapter 6: Recommendations and conclusion

This research study investigated how more structured BPM practice can contribute to optimised patient flow and lead to improved healthcare. This thesis will now conclude by summarising the research findings.

6.1 Contributions

Conceptual

The conceptual model underpinning this study derives from the financial services industry. Nevertheless, there was sufficient theoretical overlap between aspects of the WHO building blocks framework and the BPM success model (BSM). For example, staff management and culture are crucial to both. The overlap sufficiently motivated the insights discussed in section 5.2. This research also highlighted development areas in Healthcare Information Systems (HIS) to explore comprehensive healthcare solutions. The IGOE template used for data collection encourages BPM, decision making and process scoping without industry bias, which shows how value can be drawn from other knowledge domains (Long, 2012a). The findings therefore satisfy healthcare and BPM requirements, and are unbiased toward either the theoretical domain or industry.

The recruitment of the Theory of Swift and Even Flow (TSEF) as an overarching flow improvement strategy provided valuable operational insights into process optimisation. However, some scholars argue against theories with manufacturing underpinnings, citing these theories as too basic for complex healthcare environments (Henrique et al., 2016). Contrasting arguments focus on the value of activities, for example management tasks that support and impact the time taken to treat patients (D'Andreamatteo et al., 2015; Henrique et al., 2016). This suggests that conceptual designs would benefit from including these relationships.

For practice

By empirically positioning TSEF for healthcare, this research shows why, going forward, hospitals should consider holistic improvement. In this light, process improvement beyond waste reduction is crucial and demands a need to not just optimise, but mature processes for more efficient business operations (Harmon, 2012). The data unveils that, although bed shortage is a major problem, more beds will not solve overcrowding. Therefore, this research has shown what ECs could do at sundry organisational and process levels to relieve operational pain-points. The discussion section clarifies the methodical access of the enabler categories. Thereby, supporting the practical usage of the findings of this thesis.

Future research

Understanding the participation of stakeholders, especially patients, in healthcare reform uncovers potential relationships between the WHO framework of building blocks. The enabler categories covered in the BSM are conceptually rearranged as interdependencies. In this context, it would be valuable to understand what healthcare business-process success means relative to measurable patient outcomes. Structured improvement effort is therefore correlated with measured process cycles (waiting times), leading to quantitative and qualitative views. This suggests that the conceptual development of a comprehensive framework will require empirical observation to close the gap between practice and theory.

Assumptions of organisational learning overlap with the dependencies for BPM in complex healthcare organisations. There are accounts which position organisational and individual learning as a construct central to healthcare improvement through harnessing knowledge for organisational performance gain (Davies & Nutley, 2000). This requires more knowledge of the success factors that underpin BPM. However, although organisational learning can extend the reformative approach of this research, it falls beyond the design scope of this study. Future research can therefore cover organisational and individual learning as a construct in healthcare improvement.

This research confirms that BPM does and can help to develop and transform healthcare, especially public healthcare, by optimising patient flow. The researcher plans to further this research on a PHD level by exploring the concepts that would advance a comprehensive healthcare improvement framework.

6.2 Conclusion

The philosopher St. Thomas Aquinas said the following about causality: *“For it is manifest that any cause is the more powerful inasmuch as it extends itself to more effects. Whence also good, which has the notion of a final cause, is the more powerful inasmuch it extends itself to more things.”* Accordingly, cause becomes greater by extending causality to more effects (Schwindt, 2016). This statement extends the importance of positive reinforcement, specifically when the “cause” implies “good” or “for the better”. The researcher superimposes “BPM for healthcare reform” upon the “cause” aspect of this argument to conclude this thesis. When compared with the BSM enabler categories, the transcribed interview verbatim reveal improvement approaches at each site, which signals healthcare reform as the main “cause” and efficient service as “effect”.

Although not grouped specifically for each sub-question, the section 5.2 discussion informs all sub-questions. As a whole, the analysed verbatim methodically correlated with BPM success enablers, informs improved patient flow as a means to reform healthcare. Therefore, this research evaluated IS and improved patient flow as a means for holistic healthcare quality improvement, thus answering the research question: “How can BPM practice in Emergency Centres generate improved healthcare outcomes?” Next, the

practical relevance of the research findings will be discussed by referring to EC business and the three organisational levels of the BPTrends model. This thesis concludes by positioning holistic healthcare BPM as an action to sustainably improve service efficiency for stronger healthcare systems.

Level 1: Clear BPM cause for a powerful common good

This research has proven that BPM is useful. However, the methodology cannot thrive in isolation. BPM implementation requires a command of existing business so that the place of BPM can become clear. Healthcare is a suited industry due to unmistakable clinical directives. Therefore, if the custodians of EC business strategy are clear on the value BPM posits, they can integrate it with current improvement tactics. However, it is important for all the actors to know the role they have to fulfil for successful healthcare BPM.

This thesis advocates BPM knowledge and education to inform the methodical implementation practices. Here, specialist skills and knowledge can inform the improvement practice. The goal is to train the minds of all employees to respond with default process behaviour that encourage BPM action. It is a management competency to visualise how to derive business value from BPM contributions. However, executing the updated management strategies require staff participation. It is therefore a management duty to check and ensure progress of associated practices beyond adoption of the methodology.

Consequently, the cause behind BPM for healthcare reform in organisations must be clear. It would therefore serve an end-goal of healthcare transformation when BPM becomes a communicable and shared cause without positioning it as superior to clinical care (Schwindt, 2016). Rather, BPM should be a shared healthcare goal and a central purpose, which mobilises all action for enhanced patient lives. This will turn the improvement of healthcare through more efficient service into an organised central purpose. Promotion from the strategic level should encourage role players to work towards the shared business improvement goal aimed at serving reform. The strategic improvement plan should moreover incorporate IS for shared healthcare improvement at each organisational level. Enterprise practice will draw from this foundation to build an organisation-wide desire to participate in BPM action, leading to structured improvement activity at all organisational levels. The overall objective is to inform improved patient flow for more efficient healthcare and therefore improved quality of life of patients.

Level 2: Purposeful BPM as shared action

Organisational BPM practice will benefit from a proper understanding of how the various actors are arranged, where they engage and how resources are allocated to enable improved patient flow. It is important to note that BPM does not jeopardise clinical directives (Schwindt, 2016). Instead, BPM extends the shared goal of patient care with efficiency. It is therefore important to articulate the symbiotic relationship between BPM and clinical action for the shared end-goal, thus valuing the associated activities in the correct context

(Schwindt, 2016). Resistance to change in organisational culture is a main cause of BPM failure (Bandara et al., 2007; vom Brocke & Sinnl, 2011). However, if a shared purpose is well articulated, BPM practice can result in desired outcomes. This will help to ensure EC business growth proportionate to the knowledge associated with the chosen improvement strategy (Schwindt, 2016). Thus, as BPM knowledge grows, so will BPM practice and strategy grow to enhance clinical practice and up-scale service delivery. It is imperative to assign this planning and management duty formally, or else clinical directives will dissipate any improvement agenda. Moreover, allocating formal roles and responsibilities for a shared purpose should encourage the right action in the correct context (Schwindt, 2016), leading to efficiency.

Level 3: Informed and guided BPM action

At operational business level, the effects of BPM reinforce the cause. It therefore stands to reason that BPM value will be unlocked as clinicians begin to understand how action or inaction in roles contribute to the chosen organisational transformation strategy. It has been shown that small incremental changes can lead to behavioural change, which is crucial for BPM success. If employees can realise how their daily tasks contribute to the BPM underpinning EC business, this will lead to improved clinical and patient outcomes. Hence, patient value will be derived from the extent to which role players participate in BPM. However, this requires a business environment and business culture where staff members understand the benefits to be gained from BPM based on guided action and adjusted process behaviour.

In practice

This research argues that reform cannot occur unaided. The data suggests that aid implies interdependency between hospital service functions, system actors and stakeholders. The data also suggests a strong dependency on theoretically informed and guided improvement practices. To leverage the existing transformation potential in a methodical manner calls for standardised healthcare BPM practice.

Improving the quality of healthcare service will inevitably invite higher load. *“As soon as people started to realise that there is actually a doctor on the floor, then they started coming. Pretty soon the doctor couldn’t cope”* (INT2F). This highlights the need for an actionable framework for healthcare transformation, which requires the support of a common understanding, as described above. More rigorous inquiry will lead to useful results and sustainable implementation processes (D’Andreanmatteo et al., 2015; Ruelas et al., 2012; Shabani et al., 2015).

Although there are differences between private and public hospitals, the data confirmed similar business environments at all the sites. **Figure 6.1** shows a comparative view of patient throughput derived from the quantitative data. Private institutions are better funded, which promotes disparity because of more rapid access to hospital services. However, more

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rapid access to information can lead to reduced waiting times to deliver healthcare that reduces patient risk. Therefore, quicker delivery of patient care and more efficient processes to advocate patient flow and therefore improve healthcare. Service delivery disparity is most prominent at the integrated process level of EC business. Figure 6.1 shows inconsistent service efficiency in that HOSP3 reports similar patient processing ability with one doctor on site at all times where the public sites deploy more doctors.

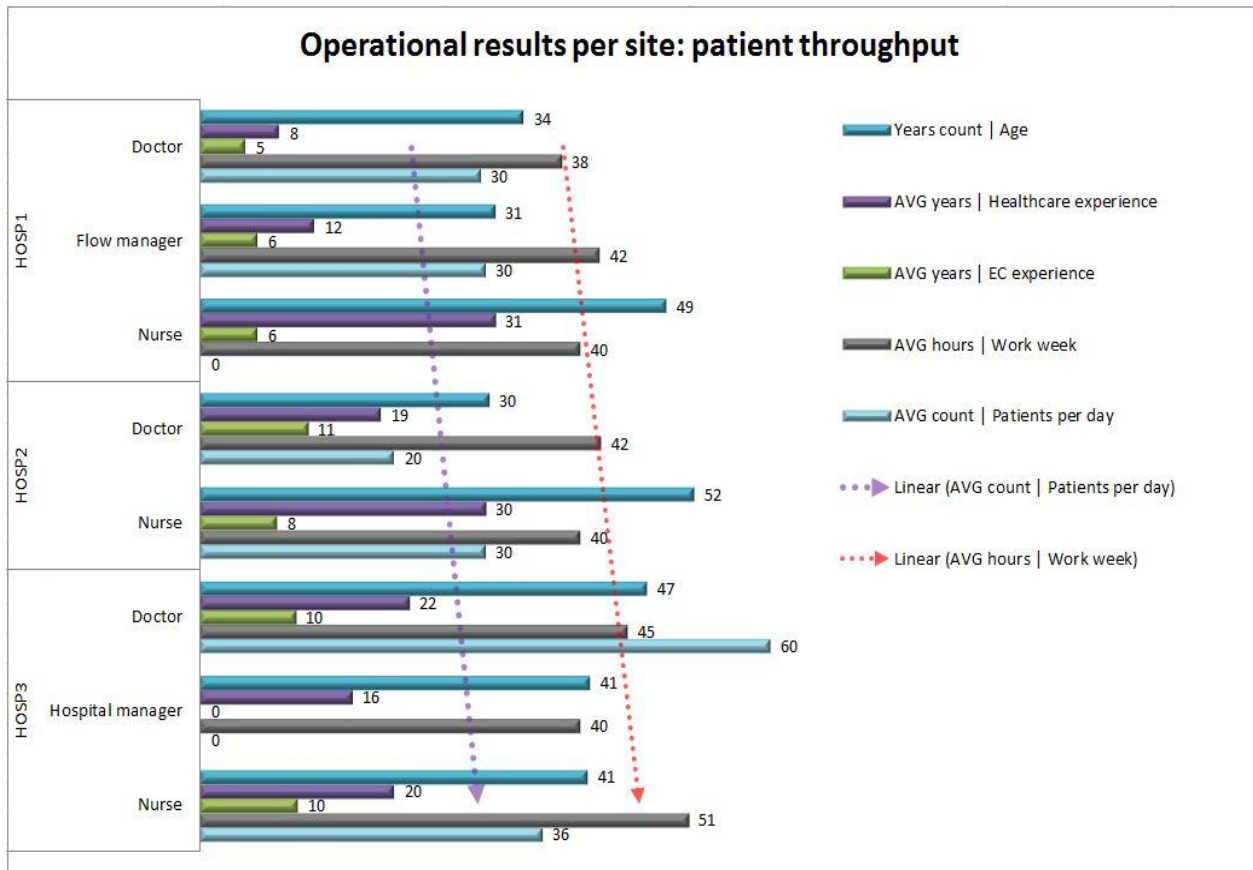


Figure 6.1: Average patient throughput per site

HOSP3 even has “divert processes” across organisations to increase control over flow processes and regulate patient load when there are no beds. The irony is that, when a patient cannot pay for service, HOSP3 will stabilise the patient before transfer to a public hospital, allowing the private hospital to process more patients. This reinforces the scale at which healthcare reform requires proactive collaboration. Clinical care is firstly based on the qualitative decisions of doctors. The data also confirmed that nurses and porters play a crucial part in navigating patients. At the private hospital, a nurse mostly manages EC operations. However, doctors fulfil this role at the public hospitals. Nevertheless, patient flow is regulated through collective effort and enablers. Strategic improvement in this context can therefore result in elevated process control and management, and lead to BPM adoption for

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better results. This will also lead to optimal resource management and the clarification of roles and responsibilities. Consequently, all process participants execute informed process activities, which generates service improvement under a BPM banner.

Triage, the pre-admission utility system used to regulate EC patient entry, is applied most appropriately at HOSP2. However, HOSP2 is a public hospital where a lack of funding prevents process improvement projects, compared to HOSP3, which is also triage process mature. This begs the question: What indicates process maturity? The process and funding maturity at HOSP3 shows in the electronic process support for triage and the management of patient waiting times in its EC. HOSP1, on the other hand, adopted a “make-do” approach by using a smartphone to determine bed availability. The main difference is that stringent financial control drives improvement strategies and thus the value stream at HOSP3. It requires operational efficiency to optimise cost through optimal resource usage. Although it goes against prescribed BPM practice, there are operational benefits. Despite increased process control, there are still inefficiencies when nurses have to walk to wards to search for available beds. This highlights the need for separate a BPM agenda for EC environments (Harmon, 2015; Ruelas et al., 2012). A clear BPM strategy, from which to derive inter-departmental business process integration, will highlight resource dependencies at both ends of the operational engagement. The end-goal is a more managed state of improvement for optimal resource usage and a common understanding along a structured BPM path.

Although all the sites displayed adversity to improvement strategies, each one exhibited unwavering devotion to saving lives. Focused BPM can and should be an asset. However, the clinical work will always be the priority: *“These management duties become so much that you don’t actually have time to participate and help your staff on the floor”* (INT2E). An investment in systems and technologies can therefore improve the quality of healthcare (Agarwal & Sebastian, 2014), which underlines the need for clear improvement strategies underpinned by Business Process Management (BPM) (Thompson et al., 2009). Hence, better operational results can be achieved through more attainable and managed targets derived from elevated process control (Harmon, 2015).

However, equitable healthcare demands policy-level inclusions aimed at healthcare transformation. A collaborative culture is required to nationally integrate private and public hospital services (D’Andreanmatteo et al., 2015). Therefore, it is crucial to encourage a desire for the common good and for improving healthcare to the benefit of all citizens. Consequently, the collective learning accountability to strengthen healthcare is literally “everybody’s business” (WHO, 2007). Finally, Roman Emperor Marcus Aurelius once explained reform as follows: *“Every duty is the completed sum of certain actions. You must observe these and follow each purpose methodically to its end”* (Bowman, 2014).

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Appendix A Research Authorisation and Participation

A.1 Research Consent Form



Department of Information Systems

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Engineering Mall, Upper Campus
OR
Private Bag. Rondebosch 7701
Tel: +27 (0) 21 650 4028 Fax: +27 (0) 21650 2280
Internet: <http://www.commerce.uct.ac.za/informationssystemsf/>

18 September 2015

Dear Sir/Madam,

I am a student enrolled in the part-time Master of Commerce programme of the Department of Information Systems at the University of Cape Town (UCT). As part of the course curriculum I am required to submit an empirical research report. This research has been approved by the Commerce Faculty Ethics in Research Committee and will be conducted under the supervision of a mentor. The supervisor for this research is Dr. Peter Weimann, a senior lecturer at UCT.

The purpose of this study is to investigate Emergency Units (EUs) of hospitals in the Western Cape of South Africa to determine what can be done to improve patient flow and optimise operational efficiency.

Your participation in this research will be greatly appreciated and it is voluntary. You can choose to withdraw from the research at any time. All information will be treated as confidential and used entirely for the purpose of this study. No individual will be requested to supply identifiable information. This will ensure anonymity of the responses. Interviews will be conducted with roughly 05 respondents per EU and each interview will be 30 minutes to 1 hour. Respondents are selected based on the focus areas detailed in the Research Design document.

The findings of this research study will be compiled in a dissertation that will be presented to the University of Cape Town for academic purposes. Participants' details will not be published as part of the report and all participants will remain anonymous. A copy of this research will be made available to all participants. Respondents will be asked to sign the attached participant consent form.

Should you have any questions regarding the research, please feel free to contact the researcher: Iziene Loriston: iploriston@gmail.com cell: 0834466536; alternatively, the supervisor.

Sincerely,

Iziene Loriston

MCom Student (LRSIZI001)
Department of Information Systems
University of Cape Town
Email: iploriston@gmail.com

Dr. Peter Weimann

Research Supervisor
Department of Information Systems
University of Cape Town
Email: peter.weimann@uct.ac.za

"Our Mission is to be an outstanding teaching and research university, educating for life and addressing the challenges"

A.2 Respondent Participation Permission Slip

I, _____, consent to participate and be interviewed for the purpose of this research study.

I am aware that participation is voluntary and that I may choose to withdraw from this study at any time if I so wish.

Signature: _____ Date: _____

Appendix B Research Instruments

B.1 Profiling Questionnaire

What is your occupation? (eg. Nurse, Doctor, Pharmacist, Other – please state)

Are you temporary or permanently employed by this institution?

Yes No Prefer not to answer

How long have you been employed here?

_____ Years _____ months _____ days

How long have you been working in this industry?

_____ Years _____ months _____ days

How many hours do you usually work at this facility?

_____ Hours _____ Minutes

Do you have employment elsewhere?

Yes No Prefer not to answer

How many patients have you personally dealt with during the past day (eg. 10 – 20)

Do you have any formal training to perform your duties (clinical and management if any)?

Yes No Prefer not to answer

Please state: _____

Do you have a backup with your skillset to perform your duties in your absence?

Yes No Prefer not to answer

Are you equipped and enabled to fulfil your duties?

Yes No Prefer not to answer

Notes if "No" _____

Are you satisfied with your work environment?

Yes No Prefer not to answer

B.2 Qualitative Interview Questions

What they need to do their role (Swift Even Flow)

QC1: INPUTS: Information, Materials, People

➤ INVOLVEMENT

- How long have you been working or worked in an EU?
- What is or was the clinical and administrative focus areas of your role? Job description (Day to day)
 - How would you define the nature of your interaction with patients?
 - Do you receive any assistance from or depend on other roles when aiding patients?
- Why did you decide to become a [insert role]? / How did you end up in this role?
 - [Doctor: Additional training] additional training above your clinical background to perform your role? – curriculum, exposure for more than clinical? What did they teach you on this course?
 - Practical way to address this?
 - What are the impacts?
 - Can you navigate past it?
 - [Nurse: What did you have to study or train for to equip you for this role?]

➤ INFRASTRUCTURE

- Do patients have one single entry point to the EU? How is access managed?
 - *how does this impact load*
 - What are the different means by which patients arrive at the EU?
- Where does a patient come from when they arrive at your role?

➤ INFORMATION / DOCS

- The patient information, how is it kept? (that you depend on to perform your role)
- What kind of information and documentation do you need when you receive a patient / patients carry with them?
 - *Do you make use of a computerised system?*
- How do you record / update this information?
- Where do the patient files and information come from?
- Are there any gaps in this information?
- Do you have sufficient time to complete it?

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Where they do it and whom they do it with

QC2: ENABLERS: HR Tools, Equipment, Systems, Facilities, Assets

➤ **MANAGEMENT**

- Who is in charge of the EU? / makes routing decisions?
- Do you manage any (EU) staff?
- Who do you report to (EU context) and what and sort of information do you supply in that chain?
- How often are audits performed at this EU? (Who is this info for?)
- KPA? HR – who evaluates your performance – how often?
 - [FOR MANAGEMENT: Do you think you can split admin and clinical duties into two roles?]
 - [How do you experience this EU's capability to handle the patient load?]
- Can you work down the load of daily tasks or do you carry work over from the previous day?

➤ **INFRASTRUCTURE**

- Is / was there enough space in the EU (do you get over crowded at times)?
- Where do you see the patients?
 - Do you have a dedicated separate area and how is it cordoned off? How was / is the EU laid out?
- Is it sufficient or would you change anything to make this better?
- Is the patient waiting area big enough?
 - Do patients ever get in the way when you perform your duties? Why?
- Does the EU operate in such a way that patient can flow through it well enough to prevent blocks?
 - **Where is the problem (if any)**
- In an ideal EU setup, what would you potentially like to see?
 - How would you like it laid out.

➤ **RESOURCES**

- How does this EU manage the available beds that you depend on?
- What happens with patients after they are classified stable? (insert care?)
- What information do you give them at this point? – remove other
- How is staff rotation managed?
- Do you have insight to the amount of permanent vs. temporary staff? (A dip in productivity?)
- Do you perceive the staff to be competent and eager to work here? (Vacant posts.)
- Do you have enough staff?
- Would you prefer a more consistent smaller & permanent staff compliment or more bodies (most efficient)? Difference in productivity between temporary and permanent?
- Do the staff in the EU work well together?
- What is excellent care? → patient centered care

Why, When and How they do what they do

QC3: **GUIDES:** Process, Activity, Task, Step, Trigger events

➤ **MAP, PATIENT JOURNEY**

- When is the EU at its busiest?
- In your experience, could you explain the generic journey of a patient through the EU?
- What are the biggest bottlenecks hindering patient flow through the EU?
- Have you ever had to redirect patients away from EU?
- Do you think the EU operates efficiently as could be? (*duplicate / combine*)
 - *What would you say are areas that you can improve?*

➤ **TRIAGE**

- What is your view on the EU admission process (getting a file)?
- Who performs triage?
- What is your view on the effectiveness of triage? Does it work well? (areas of improvement?)
- What happens to serious trauma cases? RED stabbed in the chest
- What happens to less serious cases? ORANGE chest pain
- What happens with the low priority cases? GREEN comes with a cold
- How do you measure patient stay and waiting periods?

What they produce or deliver

QC4: **OUTPUTS:** Results, information, deliverables, products, people, changes undergone

➤ What are typical outputs of your role?

- Where do you send a patient after you have completed your task / function?
- Do you have a backup to perform your duties in your absence?
- How do you interact with other parts of the hospital?
- Is there anything that would enable you to perform your role better in any way?
- What can you take from other sites and vice-versa?

➤ **PATIENTS**

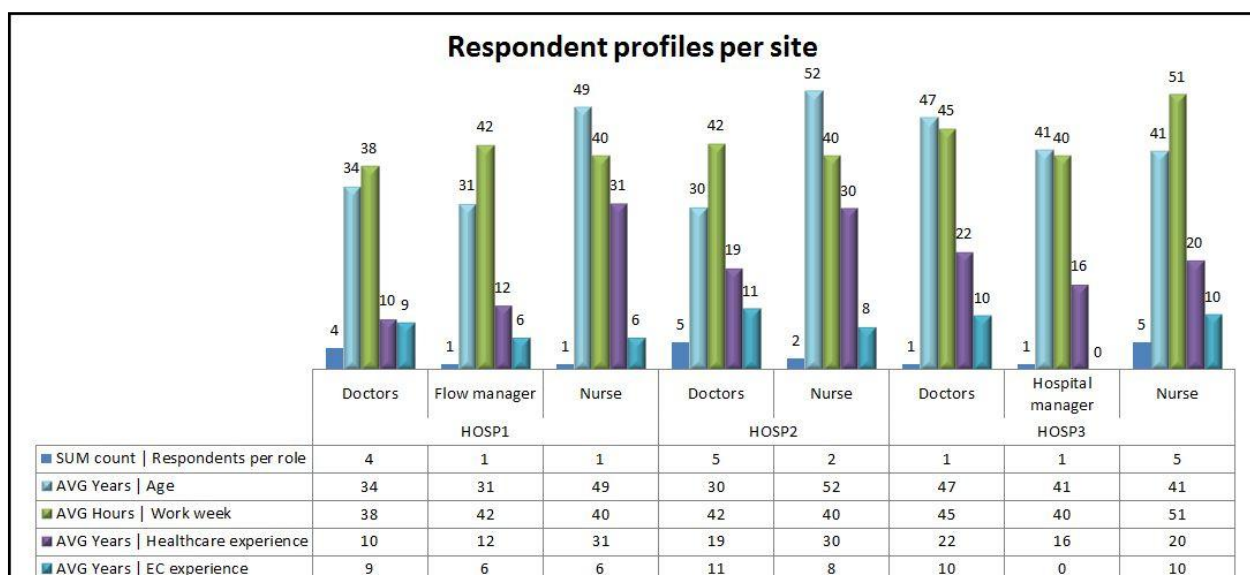
- How do you experience the temperament / mood of patients that arrive at the EU?
- Can you communicate with them effectively?
- Do patients generally know where to go? Or do they ask you for directions?
- Do you have time to listen to them further than their immediate problem?
- How would you define patient centered care? (*social worker*)
- Is there scope to be patient centered given your daily duties? (anything that wastes your time)
- How do you handle visitors and family of EU patients?
- What happens when patients need social guidance (aside from clinical)?
 - Only clinical or social as well?
- Lastly, your take on NHS for South Africa?

Appendix C Site Data and Respondent Profiles

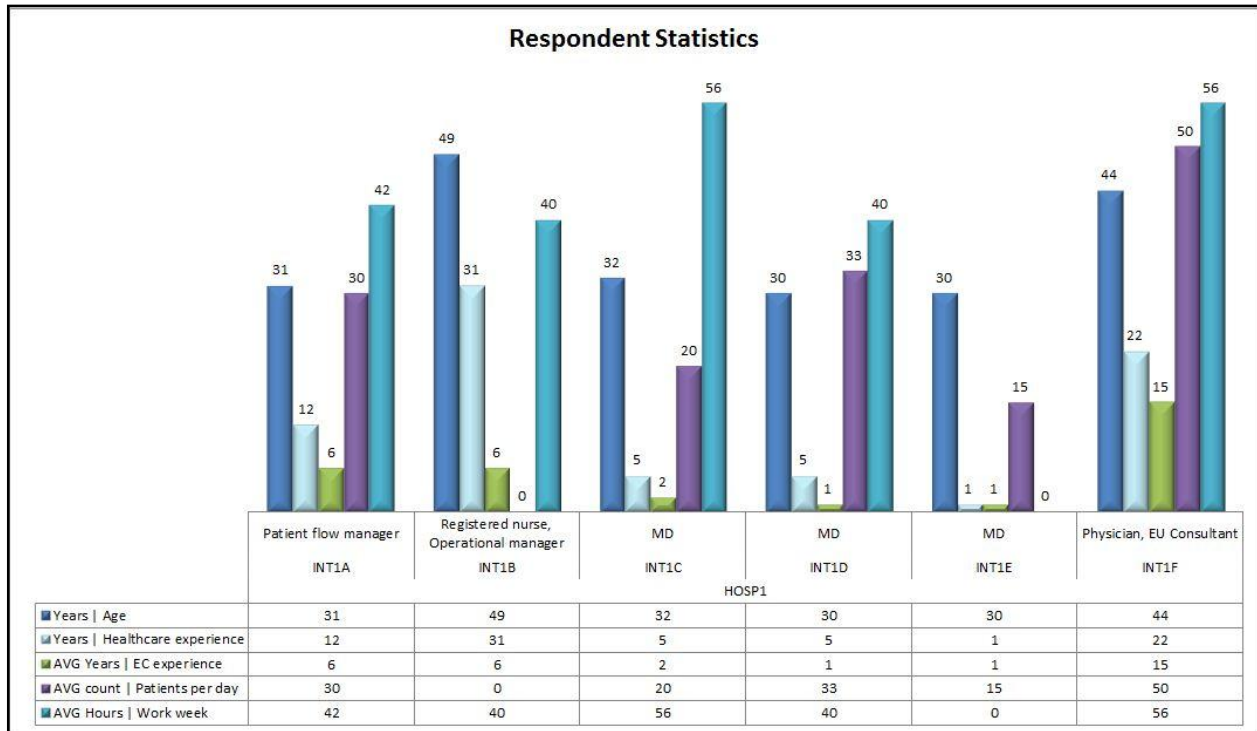
C.1 Data Sources and Abbreviations

HOSP1 (Public)		HOSP2 (Public)		HOSP3 (Private)	
Ref	Role	Ref	Role	Ref	Role
INT1A	Medical Doctor (MD)	INT2A	MD, Chief Operating Officer	INT3A	Hospital General Manager
INT1B	Patient Flow Manager	INT2B	MD (EM), Head Of Department	INT3B	Nurse, EU Manager
INT1C	Registered nurse	INT2C	MD	INT3C	Registered Nurse
INT1D	MD	INT2D	MD	INT3D	Clinical Nurse Specialist
INT1E	MD	INT2E	Nurse	INT3E	Nurse
INT1F	Physician	INT2F	MD, Chief Executive Officer	INT3F	Enrolled Nurse
-	-	INT2G	Assistant Director Nursing	INT3G	MD

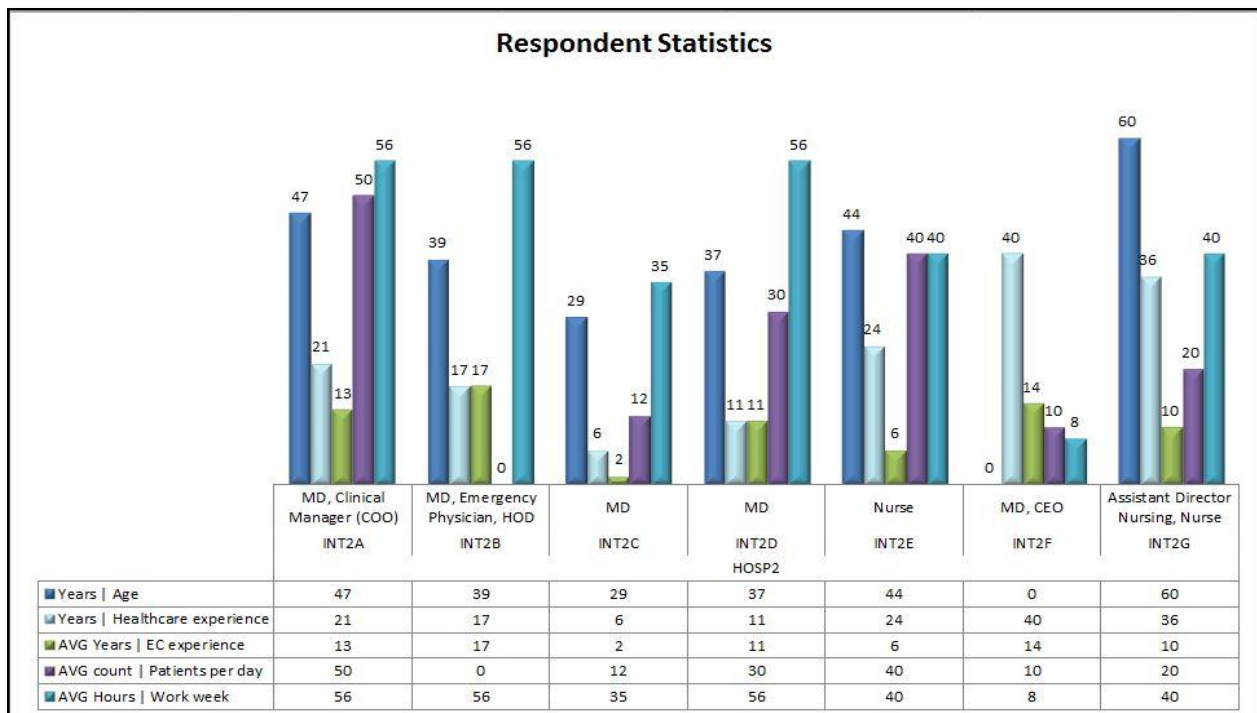
C.2 Overall Respondent Statistics



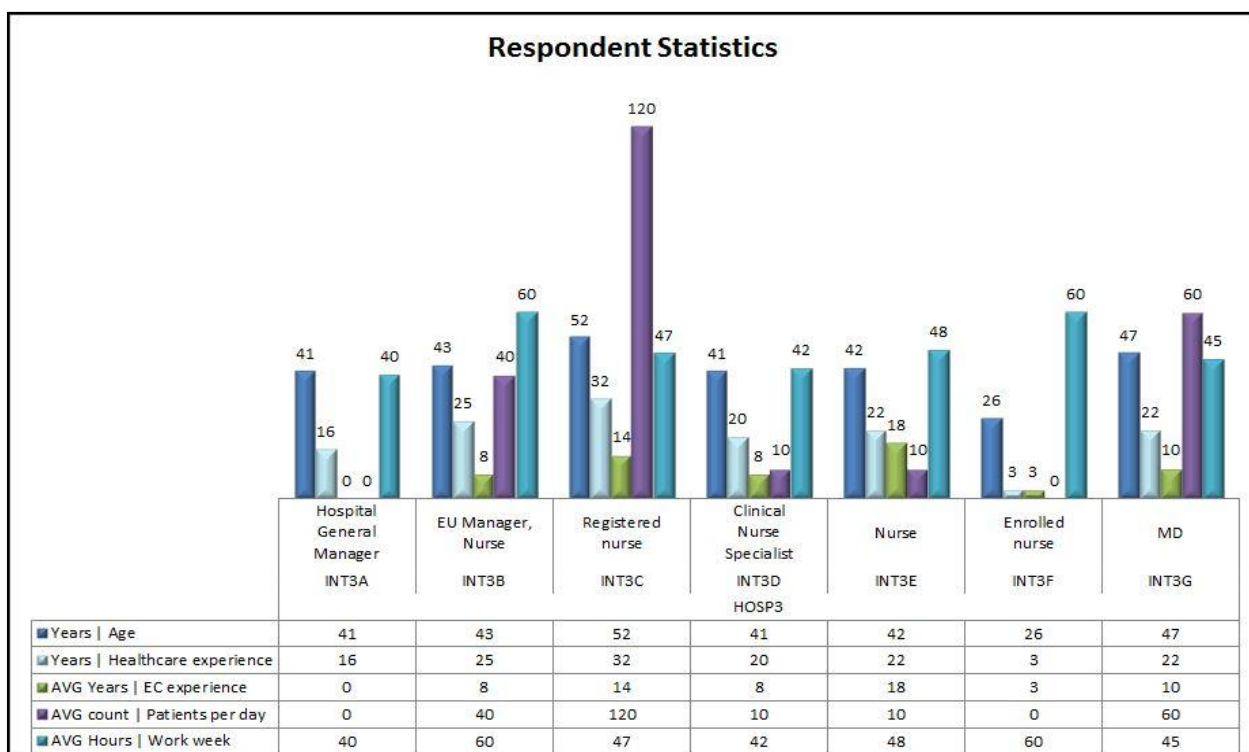
C.3 HOSP1 Respondent Profiles



C.4 HOSP2 Respondent Profiles



C.5 HOSP3 Respondent Profiles



Appendix D Summary of the Research Methods and Techniques

Summary of techniques and procedures	
Philosophy	Pragmatism, Qualitative, Inductive
Purpose	Descriptive (as-is case profiling), Exploratory (analysis), Prescriptive (results)
Approach	Cross sectional, case study (3 hospitals: 2 public, 1 private)
Theoretical lens	BPM, Theory of swift, even flow (TSEF)
Sampling	Main: Non-probability, purposive; Backup: Snowball
Descriptive data analysis	Thematic analysis
Data collection	Semi-structured interviews (IGOE Template)
Respondent profiling	Profiling questionnaire

D.1 The summarized research tactics

To deliver the research output, it was necessary to simplify the complex healthcare context in which the research was conducted. Also, there was no comprehensive framework to guide this IS investigation (Weimann & Stuttford, 2014). The following two sections provide an overview of the tactics applied in the research design. The theories mentioned are explained in Section 4.4.

Inquiry

The envisioned outcome of this thesis was to use BPM to order the complex healthcare setting of ECs into two main areas for inquiry: EC management and operations. Thereafter, TSEF applied as an overarching strategy to advocate optimal patient flow. In conjunction with Lean theory, this design provided the ability to assess process activity related patient flow. The IGOE template guided the data collection in the form of interviews.

Analysis

The theories underpinning the research made it possible to deduce from the raw data which actions contributed to or hindered patient flow. Because the IGOE template (E.3) was used, the four categories of questions contextualised how different business areas influence patients care, therefore contributing to the objectives of patient-centred outsets.

In order to present the findings, two frameworks were recruited. The BPTrends pyramid (E.4) was applied to understand which business or organisational level was impacted, and to deliver on practically useful research findings by conceptualising BPM practice for ECs. The Expanded BPM Success Model E.2 was applied to further link transformative BPM practice with the organisational levels.

Recommendations and conclusion

D.2 Theories in sum

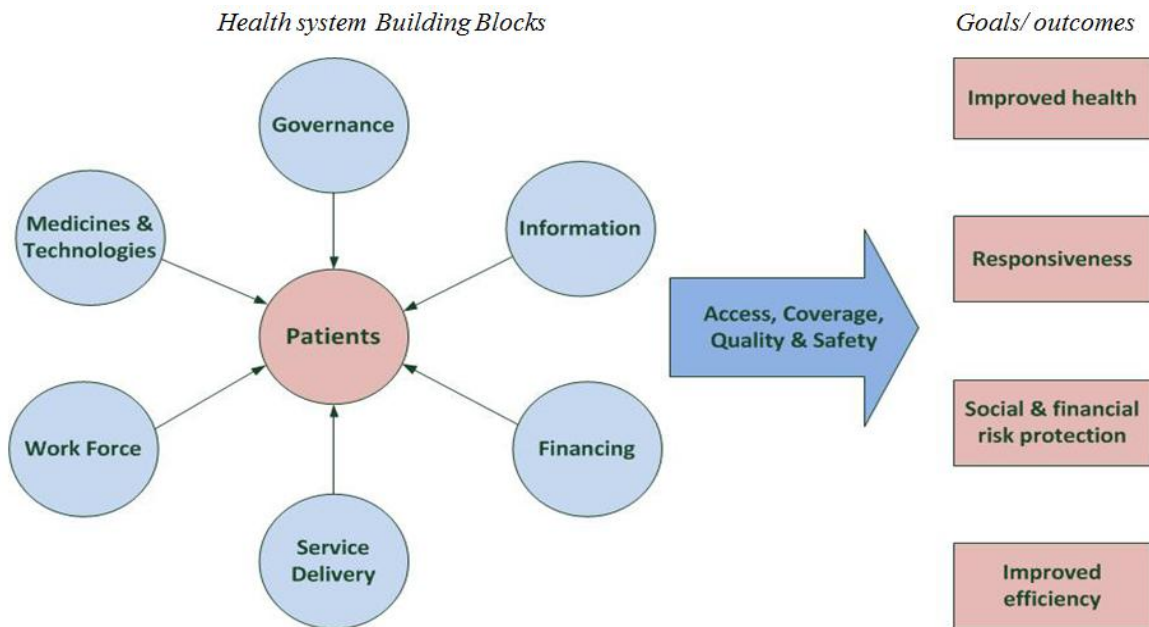
This study applies TSEF to gain an understanding of patient flows and process activity in emergency rooms. The production line approach, inherent to TSEF, allows for the handling of EC processes as a set of linked, interrelated activities, while a main metric of TSEF is throughput time (Schmenner & Swink, 1998) and therefore evaluates the time the patient takes to complete a process cycle (PwC, 2014). The strategic focus of TSEF informs value stream mapping to reduce process waste and bottlenecks, and to enhance operational efficiency. In conjunction with Lean theory, it will be applied during data analysis to assess process waste and bottlenecks by determining which activities do not contribute to the flow of patients and hence do not add value (D'Andreamatteo et al, 2015; Schmenner & Swink, 1998).

Triage concerns the optimal management of injured patients and the optimal usage of available resources (Augustyn et al., 2007). This pre-admission utility system is deployed at many hospitals in SA (Naidoo et al., 2014). The use of triage shows strategic intent to improve patient-flow processes (Thompson et al., 2009) and further supports the objectives this study.

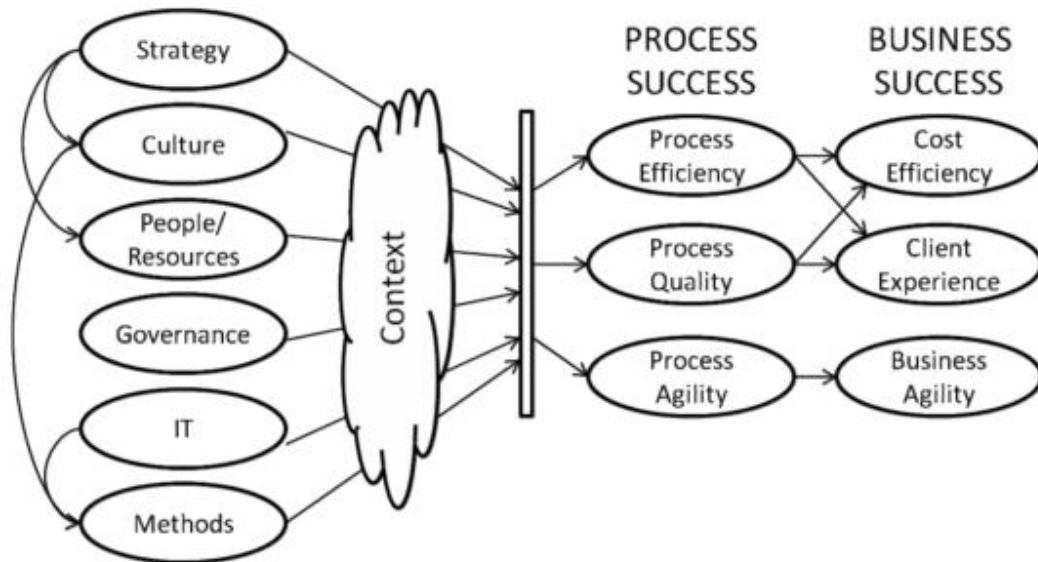
The IGOE template explained in the following section is a BPM scoping tool to evaluate process activity. This study is exploratory because it applies BPM and Lean methodology to develop conceptual and practical insights from the evidence-based descriptive data. By using the IGOE template, the data provided an evidence-based view of the current (as-is) model. Thematic analysis provided empirical evidence as input for the formulation of possible solutions.

Appendix E Theories and Models

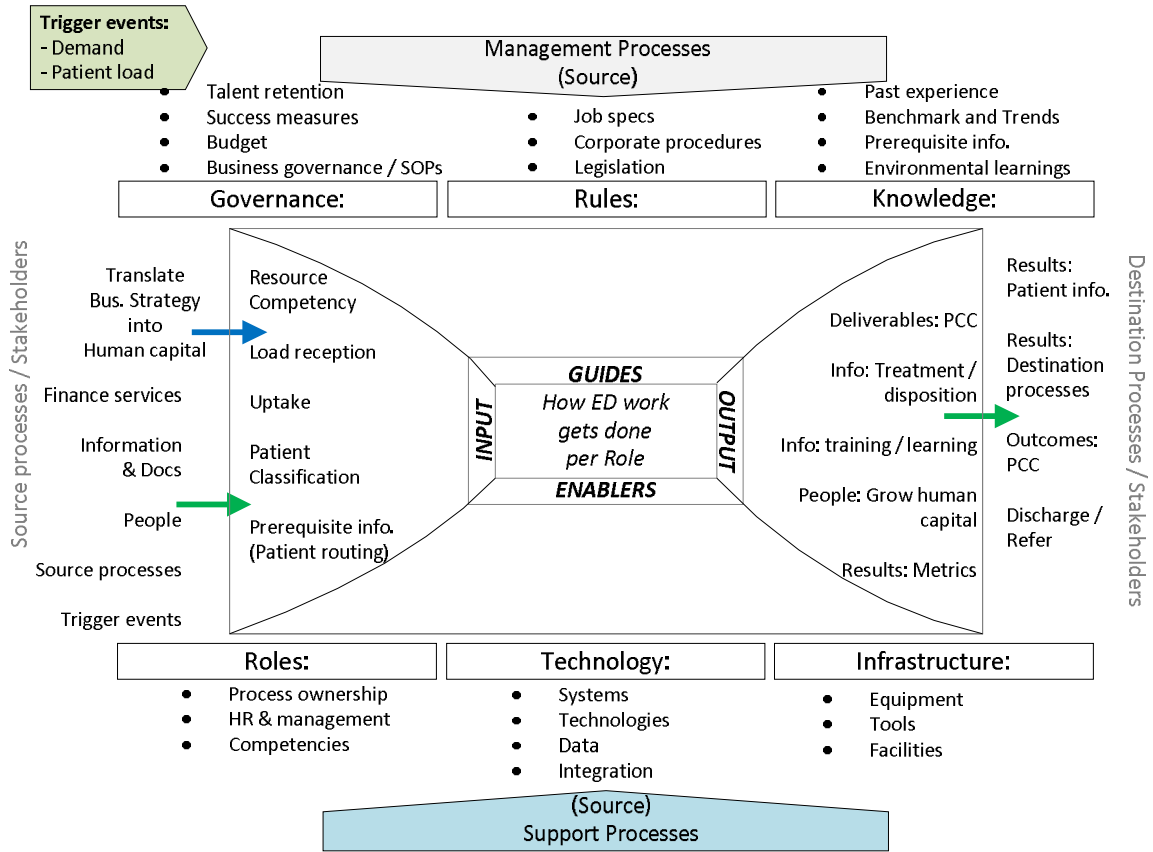
E.1 WHO Health System Building Blocks Framework



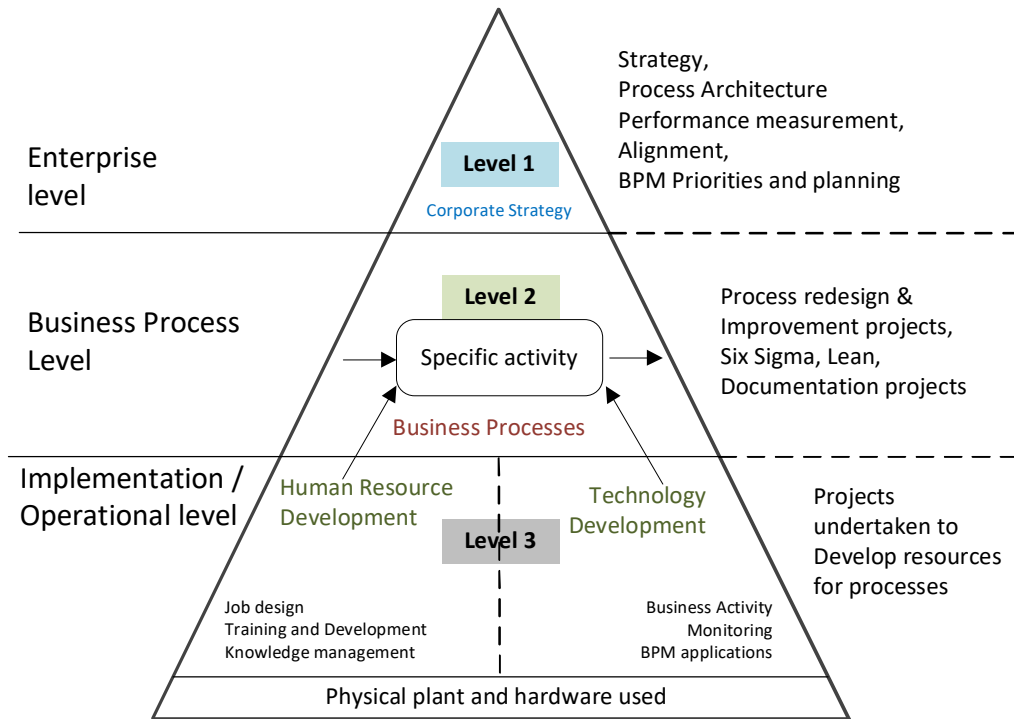
E.2 The Expanded BPM Success Model



E.3 IGOE Template



E.4 BPTrends Pyramid



E.5 Expanded BPM Success Model Enabler Categories (Thompson et al., 2009).

Strategy

- Define a value stream and consciously link it with core processes to support top-down change.
- Define a clear BPM strategy linked with strategic intent therefore an improvement methodology.
- Foster a process dimension across the organisation.
- A credible business case for BPM attracts funding which should be budgeted for and supported by specific project management.
- Results must be visible

Culture

- Adapt to smaller incremental changes, which are the least disruptive.
- Cultivate a culture of support and process encouragement with defined channels to allow continuous improvement for process development.
- Staff must be held accountable for non-compliance to process, likewise incentivised for good performance and promoting process.
- Caution: staff reduction due to cost saving (doing more with less) is not a crucial BPM objective and it deters adoption.
- Good change culture for adoption is important and smaller changes are easier to absorb.
- Cross-functional teamwork and interdepartmental integration is important for the management of processes that cross business boundaries.
- A cooperative business and technology relationship and alignment is a key IS issue and success factor.

People / Resources

- Consciously manage widespread process understanding. BPM is not process. It is holistic management. Everyone should understand process and continuous improvement.
- Training is important for BPM implementation and adoption.
- Process improvement require capacity: In healthcare, this includes human capital and infrastructure.
- A clear BPM strategy can solve many human resource management issues like training and improvement capacity.
- Increased staff capacity has a monetary impact: cost per head.
- Consequently, there is a close link between EC strategy and people.

Governance

- This aspect of BPM enablement suggests process accountability that is transparent and incentivised decision making, which guide action.
- Clear process ownership is necessary. It is crucial toward the integration of departmental processes.
- A cross-functional management capability is required for the processes that cross boundaries of departments. In the sites covered, this goes as far as bed management and triage task team.

Methods

- Enable and support consistent process actions.
- BPM does not have an inherent improvement methodology. Process improvement is inherently hierarchical to promote consistency. Improvement methodology depends on the type of methodology, either top-down or bottom-up (Harmon, 2015). It is important to consider the process improvement strategy - redesign, update or waste reduction.
- Select process improvements that solve and immediate business pain. It increases success potential. This proves the BPM value proposition BPM quantification and supports adoption.
- Choose a flexible process improvement methodology that suits org culture and process maturity.

Appendix F Success Factors to Promote BPM (Trkman, 2010).

To promote process improvement contingency the following is important

- The business environment should suit the process types. As mentioned, healthcare decision making can only be automated up to a certain point (Harmon, 2012; Trkman, 2010).
- Strategic alignment: between competitive business strategy and operational activity.
- Technology investment: align successful business strategy with technology strategy.
- Performance measurement: is crucial to sustain continuous improvement. Important measures include process: cost, duration, productivity, funding and quality.
- Employee specialisation level: a balance is required between generalist and specialist staff to conduct process activity.

To stimulate process agility, the following is important

- Organisational change: This like includes a structure change or introduction and formalisation of new BPM specific roles to avoid duplication and assign process accountability for better process management.
- Appoint process owners: clear process ownership is a good indicator of process presence and a key driver against change resistance.
- Change implementation processes depend on collaboration relative to expected benefit, either long or short term.
- A continuous improvement strategy offers important support for change management, which should be encouraged by organisational and formal structures. Moreover, it ensures sustained BPM benefits.

Appropriateness of technological support for processes toward automation

- Process standardisation increases capability and causes reliability.
- Do not mistake technology as a success recipe; rather see it as a process enabler that comes at a cost. Improved customer experience is rather a success indicator that should be measured and managed. Process renovation forms part of technology adoption.
- Process automation replaces routine employee activity with technology and depends on process renovation.
- Train and empower employees. It holds business success.