Enterprise e-Recruitment:

A Problem-Oriented Conceptual Model and

Ontology for Contextualising Recruitment

Problem Space

Supported by Methods for Requirements Analysis and Documentation

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A thesis submitted in partial fulfilment of the requirements of
Bournemouth University for the degree of Doctor of Philosophy

September 2018

Bournemouth University

Copyright Statement

Abstract

Internet-led labour market has become so competitive forcing many organisations from different sectors to embrace e-recruitment. However, it is challenging to realise the value of e-recruitment from a Requirements Engineering (RE) analysis perspective, which is the overall problem addressed in this thesis. The research was originated from the failure of realising the e-recruitment value in a real e-recruitment project conducted in the Secureland Army (SA). After reviewing the various challenges faced in that project through a number of related research domains, the thesis focuses on two major problems that are root causes of the overall problem of the thesis: (1) the difficulty of scoping, representing, and systematically transforming recruitment problem knowledge towards e-recruitment solution specification; and (2) the difficulty of documenting e-recruitment best practices for reuse purposes in an enterprise recruitment environment. These problems are related to some knowledge gaps in the research literature.

To address the foregoing problems, the thesis developed four artefacts leading to contributions to knowledge centred on enterprise e-recruitment: (1) a Problem-Oriented Conceptual Model (POCM) to contextualise and represent the various recruitment problem viewpoints from an enterprise perspective; (2) a complementary Ontology for Recruitment Problem Definition (Onto-RPD) to elaborate those problem viewpoints towards a comprehensive recruitment problem definition; (3) a POCM-informed Requirements Analysis Approach (POCM-RAA) to utilise POCM and systematically derive and analyse requirements through different levels of abstraction towards the e-solution space; and (4) an Enterprise Recruitment Metamodel (ERM) to enable a better documentation and reuse of Enterprise Recruitment Best Practices (ERBPs) by combining the elements of the three artefacts previously developed with the elements of a template defined for that purpose.

The overall research methodology adopted is design science, a scientific study for creating artefacts with the goal of solving practical problems. The POCM and Onto-RPD artefacts were developed incrementally using action-research conducted on three real case studies, and evaluated using a focus group. Based on the POCM and Onto-RPD, the POCM-RAA was developed using a literature study as well as well-established RE approaches. The ERM was developed by consolidating and integrating the previous artefacts with a defined template for documentation.

The evaluation indicates that the POCM and Onto-RPD provide a strong foundation for representing and defining recruitment problem from different enterprise perspectives. Moreover, the POCM-RAA can support a systematic guidance and transformation of recruitment problem domain knowledge towards e-recruitment solution. The ERM supported by an example of application showed its feasibility towards a better structuring and documenting of ERBPs. Finally, the four artefacts developed can collectively contribute to the resolution of research problem and enable realisation of e-recruitment value. However, some limitations with the artefacts were addressed for future work.

List of Acronyms

AR	Action Research
BA	British Army
BP	Best Practice
BPMN	Business Process Modelling Notation.
CAA	Civil Affairs Agency
CATWOE	Customers, Actors, Transformation Process, Worldview, Owners & Environment
CeGP	Central e-Government Program
CMP	Chief of Military Personnel
CRA	Crime Records Agency
DS	Design Science
EA	Enterprise Architecture
EE	Enterprise Engineering
ERBP	Enterprise Recruitment Best Practices
ERD	Early Requirements Definition
ERM	Enterprise Recruitment Metamodel
ERSS	E-Recruitment Solution Specification
ETF	E-Transformation Framework
ETM	E-Transformation Methodology
FEA	Federal Enterprise Architecture
FRD	Functional Requirements Definition
HR	Human Resources
HRM	Human Resources Management
ICTs	Information and Communication Technologies
IDEF	ICAM DEFinition, renamed as Integration DEFinition.
IEEE	Institute of Electrical and Electronics Engineers
IIBA	International Institute Business Analysis
IT	Information Technology.
KSAs	Knowledge, Skills, and Abilities
LeC	Local e-Committee
LNCOS	Law of Non-Commissioned Officer Service

MDA	Model-Driven Architecture
MH	Military Hospital
MOD	Ministry of Defence
MPC	Military Preparation Centre
MPD	Military Personnel Department
NATO	North Atlantic Treaty Organization
NFs	Navy Forces
Onto-RPD	Ontology for Recruitment Problem Definition
PA	Public Administration
PAD	Public Affairs Department
PAIIB	Perception, Attitude, Interest, Intention, and Behaviour
PhD	Doctor of Philosophy
POCM	Problem-Oriented Conceptual Model
POCM-RAA	POCM-Informed Requirements Analysis Approach
POG	Problem, Object, and Goal
RBPs	Recruitment Best Practices
RBT	Resource-Based Theory
RCA	Root Cause Analysis
RE	Requirements Engineering
RPD	Root Problem Definition
RRs	Recruitment Realms
SA	Secureland Army
SHRM	Strategic Human Resources Management
SSM	Soft Systems Methodology
TOGAF	Open Group Architecture Framework
UCAS	Undergraduate Universities and Colleges Admission Service
UML	Unified Modelling Language
xMDA	Extended Model-Driven Architecture

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Acknowledgement

Prima facie, I praise and give thanks to Allah, the Almighty, for providing me this opportunity, for good health, and for protecting me and granting me the capability to proceed successfully to complete this thesis.

Though only my name appears on the cover of this thesis, it is has been accomplished in more than six years at the Faculty of Science and Technology and a great many people have contributed to its production and appearance in its current form. I offer my sincere thanks to all of them.

First and foremost, I would like to express my deepest gratitude to my main supervisor Dr Huseyin Dogan for his unceasing help and encouragement while carrying out this research. I would like to thank you Huseyin for your experience, hard work, patience and for allowing me to grow as a research scientist. I have been very lucky to have you as a supervisor. Your positive and optimistic attitude has encouraged and inspired me throughout this journey. I would like to thank my second supervisor Prof Keith Phalp who supported, motivated and encouraged me throughout my studies and supported my second supervision change application. I would also like to thank School Research Administrator, Naomi Bailey for her advice and guidance.

Special thanks to Secureland Army for their official support to conduct the research through their military schools and units, and their financial support.

I am deeply thankful to my beloved wife, Ebtisam, who has been sacrificing a lot for my success. I also thank my kids Thekra, Abdulaziz, Mohammed, Monirah, and Sultan for their love, support and encouragement.

I am grateful to all members of the spinal clinic and physio therapy in Prince Sultan Military hospital, with special thanks to Dr. Barnawi, for their treatment of my back injury, and their medical advices in relation to writing my thesis. I would like also to thank my friends at Bournemouth University for their support and help throughout the past few years.

Finally, I would like to dedicate my thesis to the memory of my father-in-law who passed away during the third year of my PhD.

Saleh Alamro

Chapter 1: Introduction

1.1 Research Context and Motivation

Recruitment is a key strategic opportunity for achieving a competitive advantage over rivals (Bowen and Ostroff, 2004; Ployhart, 2014). Given that talent is rare, valuable, difficult to imitate, and hard to substitute, organisations that better attract this talent to fill their job vacancies should outperform those that do not (Ray et al., 2007). Recruitment is the practice of attracting sufficient numbers of qualified individuals on a timely basis to fill job vacancies with an organisation (Ahmed and Adams, 2010). It is very important since it is the primary way of influencing the performance and diversity of individuals in an organisation. It ensures the initial high quality abilities of recruits necessary for work performance (Rynes and Cable, 2003). It also influences the demographic composition of the workforce to meet the organisation's strategic, legal and social goals (Gatewood et al., 2008). It is regarded as an essential means to influence post-hire employee retention (Breaugh et al., 2008).

The internet-driven global labour market combined with many forces, such as a higher educational level of the new generations, strong economic situations and a low unemployment rate, has become very competitive (Tresch, 2008; Pfieffelmann et al., 2010). This, in turn, puts a great deal of pressure on organisations from different sectors to change their traditional recruitment practices towards more innovative, high-quality, customised, and timely e-recruitment solutions (Llorens and Kellough, 2007; Pfieffelmann et al., 2010; Young and Foot, 2005). In the military sector, for instance, the migration from old compulsory military recruitment to an all-volunteer force relying on labour market has increasingly pushed the military organisations to get into the continuum (NATO RTO, 2007; Tresch, 2008; Smalikiene and Trifonovas, 2012). E-recruiting is defined as any recruitment practice that an organisation conducts using web-based solutions (Kerrin and Kettley, 2003; Kim and O'Connor, 2009). Despite the different methods of e-recruiting, web recruiting (i.e. use of corporate web site) is the most commonly used e-recruiting method (Ahmed and Adams, 2010). E-recruiting can bring value for organisations including being reliable in attracting a diverse and qualified group of job seekers, agile in filling vacancies, cost-effective, rapidly responding to job seekers' changing needs and market opportunities, and flexible in normal and exceptional circumstances (Alamro et al., 2014).

The current maturity of information and communication technologies (ICTs) and the recent developments in design processes enable a relatively simple and reliable transforming of the conventional recruitment practice into e-recruitment solution (Sharp et al., 2007; Smalikiene and Trifonovas, 2012). To be innovative, the focus should be shifted from the e-solution space into the problem space where the desired effects (i.e. requirements) that an organisation wishes to be brought by the e-solution in the recruitment practice exist (Bray, 2002). With the help of Requirements Engineering (RE), the RE activities of the e-solution must be anchored to the domain knowledge of real-world recruitment problem so that the quality of the e-solution to be delivered can then be analysed (Nuseibah and Easterbrook, 2000; Viller and Sommerville 2000; Martin and Sommerville 2004; Siegemund, 2014). This front-end part of RE is called problem definition (Smith, 1993) or problem description (Jackson, 2001; Fouad et al., 2011).

Problem definition refers to how problems or concerns are represented: what problem elements should be included, what relationships among these elements are, and how these selections might vary over problem types (Smith, 1993; Jackson, 2001). Such a problem representation is created for structuring problem domain knowledge and orienting it towards RE in a systematic manner (Kossmann and Odeh, 2010). Hence, it offers an established problem definition and serves as a basis for eliciting and reasoning about requirements from different stakeholders perspectives (Viller and Sommerville 2000; Zachman, 2008). For instance, relevant stakeholders using this representation could be asked to identify the flaw, conflicts, incompatibility, and difficulties that define a problematic situation thereby effectively and efficiently informing complete and consistent requirements. As a result, the problem representation affects the quality of the requirements based on which the e-solution systems are built. It has been argued that if stakeholders do not agree with the choice of problem representation, it is unlikely that they will ever agree with any statement of the requirements (Nuseibah and Easterbrook, 2000; Jackson, 2001). These poor requirements largely account for the cancellation of e-solution development projects or the subsequent failure in building a successful e-solution (Hull et al., 2010; Neetu and Pillai; 2013).

The research in this thesis was originally motivated by the challenges faced in defining the recruitment problem in a real e-recruitment project from the military sector. The Author of this thesis was a member of that project. The project relates to the non-officer enlistment process in the Secureland's Army (SA). Secureland is the name given to the country for which the SA protects. The SA spreads over seven-independent distant military regions covering the whole

country. The military regions consist of many military units having many non-officer job vacancies prepared for recruitment. These vacancies are varied in type and related to 16 different military schools responsible for recruitment and training. The application for the SA's vacancies is voluntary. The target applicant is post-secondary school students. Each military school runs relatively similar enlistment processes to fill its related vacancies. Filling a vacancy using the enlistment process passes through two phases: (1) *the early enlistment* which starts from the event in which a vacancy exists until an applicant gets initially accepted for it as *cadet* in one of the SA's military schools; (2) *the post-enlistment training* in which a cadet must complete two types of military training (i.e. preparation course and specialisation course) to be officially hired. The main focus of this thesis is on the first phase. Further details about the case study and the reason of focus are provided in Chapters 4 and 5.

In 2012, the Secureland's Central e-Government Program (CeGP) according to its national e-government strategy (2012-2016) declared that "*it is time to move from e-enabling customer-facing services to more IT-led transformational change in public sector agencies*" (Secureland, 2013a). Following this, a centralised CeGP's policy for selecting and funding the e-transformation projects was set. In close cooperation between the CeGP and SA's Local e-Committee (LeC), the SA's enlistment process was selected as a promising project for the e-transformation. Three key reasons accounted for this selection: (1) The SA according to its large size is one of the biggest contributors to employment in Secureland; (2) the increasing demand for filling vacancies for national security purposes; and (3) the potential reuse of the practice over 40 other military organisations in the military sector (Secureland, 2013c). The selection was provided that both the CeGP and LeC work together according to a prescribed e-transformation framework for producing an e-transformation proposal (i.e. specifications) for the project and escalating it for validation and approval (Secureland, 2013c).

At the start of project, the vision of enlistment project was informally stated by the SA as: "*a reliable e-enlistment solution that enables the SA in filling its vacancies on a timely basis by highly qualified and regionally diversified recruits is needed*" (Secureland Army, 2013b). Guided by the e-transformation framework proposed (Secureland, 2012), the analysis exhibited remarkable range. At one extreme were those who questioned the value of e-enlistment in attracting highly qualified applicants. For instance, the SA's Head of HR raised an issue saying "*we recruit in a different environment and attract different categories of people compared to the other sectors*" *(*Secureland Army, 2013b*)*. He added "*the assumption that the SA can get a*

competitive advantage from e-enlistment is doubtful". In sharp contrast are some military schools who claim that competing for highly qualified applicants is possible. However, they raised an issue saying "*it is the regional diversity imposed by the SA that impedes enlistment of highly qualified applicants*". Disagreement on the value of e-enlistment in light of the absence of adequate reference models for both defining enlistment problem and solving quality-diversity conflict as well as the lack of experience in the military recruitment, caused the project to go over time and budget and finally being cancelled by the CeGP.

In large-scale, trans-national and multi-demographical organisations that are engineering-focused and need reliable and long-lasting e-solutions, it seems that problem definition is very complex and prone to failure (Kossmann and Odeh, 2010; Siegemund, 2014). Driven by the failure in the e-enlistment project of the SA, the thesis formulates the research problem to be tackled in the next section.

1.2 Problem Description

The research focuses on enabling the value of e-recruitment solutions to be realised from a Requirements Engineering (RE) analysis perspective. Therefore, the overall problem that this research tackles is *the challenges to realising the value of e-recruitment.*

This problem is related to some knowledge gap in the research literature which contributed to the practice (i.e. the failure of the SA's e-enlistment project). Therefore, the research is carried out to fill that gap. The thesis will focus on two major problems that are root causes of this overall problem.

1.2.1 Problem No. 1:

The difficulty of scoping, representing, and systematically transforming recruitment problem knowledge towards e-recruitment solution specification impedes the realisation of the value of e-recruitment.

From a requirements analysis perspective, realising the value of an enterprise including e-solutions relies on the integration of both an ontological structure (i.e. representation) and process (i.e. methodology) (Zachman, 2008). A representation establishes a reference of problem definition whereas a process provides a systematic transformation towards a solution.

Given the continued problems that organisations face in attracting and recruiting qualified applicants (e.g. SA's enlistment practice), the recruitment research provide insufficient domain knowledge and guidance about how these problems can be defined and solved (Ployhart, 2006; Gully et al., 2014; Ployhart and Kim, 2014). This gap has been long suffered. According to Rynes et al. (2002), the recruitment domain demonstrates the largest difference between academic findings and the practice of recruiting organisations. Three interrelated sub-problems may account for this gap as well as the failure in the SA's e-enlistment project: (1) the defined scope of recruitment problem space (Barber, 1998; Breaugh and Starke, 2000; Rynes, 1991; Saks, 2005; Breaugh, 2012); (2) the ill-representation and understanding of recruitment problem (Ployhart, 2006; Gatewood et al., 2008); and (3) the lack of an integrative RE process that systematically transforms the problem domain knowledge into the specification of e-recruitment (Viller and Sommerville 2000; Martin and Sommerville 2004; Siegemund, 2014). These three sub-problems including their respective knowledge gaps are explained below:

Sub-Problem No. 1.1: Defined Scope of Recruitment Problem Space

The ill-defined scope of recruitment problem space is caused by the fact that real-world situations often contain many interrelated problems, constituting what Ackoff (1979) termed a "mess." This raises a major concern in regard to how a real-world recruitment problem can be bounded. An unneglectable conflict is between the need to focus attention and the desire to include all important recruitment considerations that must not be ignored (Smith, 1993). The recruitment research has been widely criticised as being: limited to piecemeal and fragmented recruitment problems (Barber, 1998; Breaugh and Starke, 2000; Saks, 2005; Breaugh, 2012); heavily focused on the micro-level outcome, i.e. individual-based (Saks, 2005); and lacking contextual and strategic focus (Gully et al., 2014). Recruitment has been narrowly regarded as one function of Human Resource Management (HRM) (Gatewood et al., 2008; Taylor and Collins, 2000) which underestimates its strategic dimension (Ployhart, 2014; Phillips and Gully, 2015). Given recruitment is a foundational input to organisational performance (Rynes and Cable, 2003; Phillips and Gully, 2015), the recruitment research has recently progressed into aligning strategic recruitment with the business strategy at the organisational level, as similar to Strategic Human Resource Management (SHRM). Some excellent work can be found in (Polyhart et al., 2014; Gully et al., 2014; Phillips and Gully, 2015). However, no research has addressed recruitment from an enterprise perspective.

Enterprise is defined as a number of organisational entities sharing a definite mission, goals and objectives to offer an output (e.g. product and/or a service) to the market (Chen et al., 2008). The thesis claims that scoping the recruitment problem at the enterprise level gives insights into a better understanding of recruitment problem and its relationships from a multi-entity enterprise perspective, and promotes the requirements of leveraging the overall capability of enterprise e-recruitment system.

Knowledge Gap No. 1.1:

> *There is a lack of knowledge about enterprise recruitment problem and the multiple organisational entities involved.*

Sub-Problem No. 1.2: Ill-Representation and Understanding of Recruitment Problem

The ill-representation and understanding of recruitment problem is caused by the fact that representing a real-world problem explicitly has been one of the most challenges of system practice and theory (Jackson, 2001; Kossmann and Odeh, 2010; Checkland and Poulter, 2010; Siegemund et al., 2011). Problem representation enables problem domain knowledge, which in turn, is significantly important in requirements elicitation and analysis (Viller and Sommerville 2000; Martin and Sommerville 2004). However, the quality of problem representation varies according to many aspects such as the complexity of a real-world problem, the type of business or product, the type of project, the feature of analysis (Kettinger, 1997; Nuseibah and Easterbrook, 2000; Aquilar-Saven, 2004; Osada et al., 2007; Neetu and Pillai; 2013). Hence, there is no reference model by which the various characteristics that constitute a problem can be comprehensively represented (Vergidis et al., 2008; Pedell et al., 2014). Even if it existed, the requirements for such a reference model will be very huge, diverse, not precise and not agreed upon (Mohr and Rawlings, 2010).

Problem representation, therefore, shifts towards constructionism (Checkland and Poulter, 2010), proposing that a problem can be expressed by a chosen representation that is somehow grounded in reality; agreed on by all stakeholders; and best suited for requirements models (Landry, 1995). Modelling techniques and tools used by requirements engineers have dominated the way that they see and define problems (Nuseibah and Easterbrook, 2000; Aquilar-Saven, 2004; Vergidis et al., 2008). Although these techniques claim that they capture some aspects of a real-world problem, they have some limitations. One key limitation is that they are strongly solution-oriented, focussing on the solution to be built rather than the problems

to be solved (Robertson and Robertson, 2012; Jackson, 2001). Given problem orientation has been the subject of the recent RE research (Robertson and Robertson, 2012; Hall et al., 2010), the way how the various aspects of recruitment problem can be effectively and correctly modelled is not always clear, limiting the descriptive and prescriptive recruitment research.

Knowledge Gap No. 1.2:

There is a lack of knowledge about how recruitment problem is best represented.

It has been widely suggested that a better representation of the recruitment problem should rely in the first instance on an appreciation of its complexity (Breaugh and Starke, 2000; Rynes and Cable, 2003; Saks, 2005; Ployhart, 2006). This complexity stems from a set of cognitive, social and organisational variables involved and the nature of their relationships (Barber, 1998; Breaugh and Starke, 2000; Breaugh, 2012).

Sub-Problem No. 1.3: Lack of Integrative RE Process
The requirements elicitation and analysis techniques are driven by the choice of problem representation, and vice versa (Nuseibah and Easterbrook, 2000; Vergidis et al., 2008). In reference to the sub-problem 1.2, the third problem relates to how recruitment problem representation can be used in concert with other established approaches of RE to systematically enable a complete understanding of recruitment problem and derive requirements. This challenge results in a knowledge gap as described below:

Knowledge Gap No. 1.3:

There is a lack of knowledge about how recruitment problem representation can be systematically used to enable problem domain knowledge in order to derive requirements.

1.2.2 Problem No. 2:

The difficulty of documenting e-recruitment best practices in an enterprise recruitment environment hinders the realisation of the value of existing e-recruitment practices.

Recruitment Best Practices (RBPs) are already being shared and reused to some extent in some organisations (Scheweyer, 2004; Madia, 2011). Despite the industry, successful reuse of

RBPs can lead to shorter cycle times, faster ramp-up, higher performance, better decisions, lower costs (Scheweyer, 2004). There are many recurring recruitment problems that RBPs try to capture their solutions for reuse purposes (Alamro et al., 2015). However, they have some limitations that reduce their reusability. Two key problem factors are: (1) they are fragmented and limited in scope (Simard and Rice, 2007; Buschmann et al., 2007; Moral-Garcia et al., 2014); and (2) they lack proper documentation (Dani et al., 2006; Vesely, 2011).

Documentation and reuse of Best Practices (BPs) have been widely addressed as a difficult task (Mansar and Reijers, 2007; Simard and Rice, 2007; Hanafizadeh et al. 2009; Abd Rahman et al., 2011; Vesely, 2011). The challenge is to capture knowledge of the problem domain in which BPs are 'best' (Dani et al., 2006; Alwazae, 2015). The complexity of the recruitment problem mentioned in section 1.2.1 as problem no.1, imposes improper documentation that impedes realising the value of the RBPs and therefore reusing. According to Dani et al. (2006), modelling and structuring the knowledge of BPs are critically important for the successful documentation and reuse of best practice knowledge. Hence, the knowledge gap to be filled is that:

Knowledge Gap No. 2:

There is a lack of knowledge about how enterprise RBPs can be successfully modelled and documented.

1.3 Research Aim, Goals and Objectives

This section presents the aim, goals and objectives of the thesis.

The overall aim of this research is:

To develop a problem-oriented conceptual model (POCM) for conceptualising and defining recruitment problem root concepts from an enterprise perspective facilitated by an ontology (Onto-RPD) to elaborate these concepts towards a comprehensive recruitment problem definition, and hence to propose a systematic approach based on the above artefacts for deriving and analysing requirements into the specification for an e-solution. Consequently, this research leads to incorporating the resulting artefacts within an enterprise recruitment metamodel proposed for structuring and documenting the knowledge of Enterprise Recruitment Best Practices (ERBPs).

The aim of research will be achieved by a set of goals and objectives, which correspond to the research problem and its major constituents described in the previous section 1.2.

The first goal is:

> *To develop a Problem-Oriented Conceptual Model (POCM) for conceptualising the recruitment problem from an enterprise perspective supported by an ontology (Onto-RPD) for recruitment problem definition, and propose a systematic approach (POCM-RAA) for deriving and analysing requirements into the specification for an e-solution.*

While modelling techniques and tools have been used by recruitment analysts to define certain aspects of recruitment problem, no one has investigated how different people of enterprise recruitment routinely define their real-world recruitment problems. An appreciation and abstraction of these different perspectives on recruitment problem will promote development of a robust recruitment problem representation that encompasses its complexity. The thesis responds to this need by developing two artefacts: a problem-oriented conceptual model (POCM) and related ontology for recruitment problem definition (Onto-RPD). Both artefacts are derived from the analysis of empirical data from three real recruitment case studies and abstraction of fundamental problem concepts and their underlying structures using various problem analysis techniques and guidelines.

By means of the POCM, one can account for the great variety of problem definitions (i.e. problem types and their underlying structures) proposed by different stakeholders for a given problematic recruitment situation. The identification and representation of which will promote a comprehensive definition of recruitment problem. According to Smith (1989, 1993), problems are conceptual entities that do not exist in the world, but they must be externalised (i.e. by verbal or written expression) to be represented. Thus, recruitment problems are liable to be represented using conceptual models such as POCM. To enable correspondence with physical reality, the constructivist view of problem definition is adopted, and some techniques of Soft Systems Methodology (SSM), a well-known approach for that view, are used.

Given that the POCM is entirely problem-oriented, the objective of Onto-RPD is to aid clarity to the top-level problem concepts of POCM by defining the sub-concepts of POCM concepts and the other concepts related to the recruitment problem space; and grouping and structuring these sub-concepts hierarchically as well as the identification of the relationships between these concepts. The core purpose of developing an ontology for recruitment problem definition is two-

fold. It is a common approach to contextualise a problem space on one hand; and it helps stakeholders to communicate and share their views without ambiguity and thus encourage a course of actions (e.g. requirements elicitation and analysis) (Annamalai et al. 2011).

Given the dependency between problem representations and RE techniques addressed in Sub-Problem No. 1.3, the POCM and its related Onto-RPD require a unique set of integrative RE techniques (i.e. POCM-RAA artefact) that fit with them for requirements elicitation and analysis. To develop the POCM-RAA artefact, the Author will rely on the work of Fouad et al. (2011) titled "Extended Model Driven Architecture" or shortly "xMDA framework". The xMDA suggests a variety of RE techniques that can be used in different levels of problem domain analysis (Fouad et al., 2011). Thus, the xMDA will facilitate the selection and tailoring of RE techniques that fit in with the POCM and Onto-RPD artefacts.

The extensive study on the selected recruitment case studies led to a new approach for recruitment definition that is adopted throughout the whole thesis. This approach is built on the definition of recruitment by Randall (1987) as "*the set of activities (i.e. interactions) through which the people and the organisations can select each other based on their own best short and long term interest.*" The Author claims that it is the concept of *interest* that plays a key role in recruitment problem. Turning to study recruitment problem from the lens of interest by investigating the various interest-related aspects and how these aspects influence each other will give insights into a better understanding of recruitment problem and support the comprehension of its complexity. By extending the research focus into the enterprise level of recruitment, the recruitment problem is seen as multi-dimensional complex interests embodied in multi-entity enterprise system. Identifying and representing these dimensions as well as the organisational entities involved will offer a fruitful contribution to understanding recruitment problem and enabling effective and efficient RE.

The first goal will be investigated through the following operational objectives:

The objectives for the first goal:

- To identify the various challenges faced in the previous SA's e-enlistment project that led to the failure of that project.
- To investigate the key challenges of the SA's e-enlistment project through literature reviews centred on research areas of recruitment, requirements engineering, problem definition and representation, and enterprise system.

- To define the various recruitment problem concepts based on the SA enlistment case study and analyse them within the context of enterprise recruitment and recruitment practices from other domains.

- To develop and evaluate a Problem-Oriented Conceptual Model (POCM) and its corresponding ontology (Onto-RPD) for conceptualising the enterprise recruitment problem space and defining recruitment problem.

- To develop and evaluate a POCM-informed Requirements Analysis Approach (POCM-RAA) for deriving and analysing requirements towards specifying an e-recruitment solution.

The second goal is:

To develop an Enterprise Recruitment Metamodel (ERM) for structuring and documenting the knowledge of Enterprise Recruitment Best Practices (ERBPs).

Recruitment is an information system in which e-recruitment software is embedded. To enable the value of e-recruitment best practices to be realised and successfully shared and reused, an Enterprise Recruitment Metamodel (ERM) is developed. The metamodel will build on the results of research conducted for developing the POCM, Onto-RPD, and POCM-RAA artefacts, and incorporate the core elements of these artefacts with the elements of a template defined for documentation. The metamodel will offer routes for a better documentation of ERBPs, and open windows for further research towards the exploitation of ERM. The second goal will be investigated through the following operational objectives:

The objectives for the second goal:

- To review the literature in order to identify the recruitment best practices and address the challenges in transferring and reusing them.

- To define a template for documenting RBPs.

- To integrate the elements of POCM, Onto-RPD, and POCM-RAA artefacts with the elements of the template defined to develop an enterprise recruitment metamodel for structuring and documenting knowledge of ERBPs.

- To develop the ERM artefact supported with five UML diagrams to describe the ERM.

- To apply the ERM to an enterprise recruitment problem showing how it can be used for documentation.

1.4 Research Contributions, Publications and Limitations

The research offers the following contributions:

- Contextualisation of recruitment problem space, using the POCM and its corresponding ontology, for better representation and definition of enterprise recruitment problems.
- A systematic guidance using POCM-RAA, of how the POCM and its related Onto-RPD artefacts can be used with other established approaches of RE for realising the value of e-recruitment solutions.
- An Enterprise Recruitment Metamodel (ERM) for structuring and documentation of ERBPs.

The thesis provides a valuable contribution into the understanding of recruitment problem and its relation to RE for e-recruitment solution. The author developed a high-level Problem-Oriented Conceptual Model (POCM) suited for contextualising and synthesizing the various problem root concepts of recruitment problem space and their relationships, supported by an ontology (Onto-RPD) that explains and elaborates the POCM towards a thorough recruitment problem definition. The POCM and its related ontology provide means of a better understanding and analysis of how recruitment problem may arise, develop, and change over time from an *interest* point of view. It also enables representing and reasoning about different, possibly conflicting, aspects of recruitment interests arising from different enterprise recruitment entities. The POCM-RAA systematically transforms the knowledge of recruitment problem embedded in the POCM into recruitment requirements in a form that is compatible with established RE methods so that the quality of requirements can be validated. The ERM provides a route for documenting Enterprise Recruitment Best Practices (ERBPs) in pursuit of supporting their sharing and reuse. Using the elements of the artefacts abovementioned as well as a template defined for documentation, the ERM will provide a model-driven documentation of ERBPs that can be reused in the context of enterprise recruitment.

The publications that are resulted from the thesis are, as follows:
1. Alamro S., Dogan H., Phalp K., 2014, E-military recruitment: a conceptual model for contextualizing the problem domain. Proceedings of the International Conference on Information Systems Development: Transforming Organisations and Society through Information Systems.

2. Alamro S, Dogan H, Phalp K. 2015. Forming enterprise recruitment pattern based on problem-oriented conceptual model, Procedia Computer Science, 64: 298-305.

3. Alamro S, Dogan H, Cetinkaya, D, Jian N. 2018. Problem-Oriented Conceptual Model and Ontology for Enterprise e-Recruitment, International Conference on Enterprise Information Systems, 20: 280-289.

4. Alamro, S., Dogan, H., Cetinkaya, D., Jiang, N. and Phalp, K., 2018. Conceptualising and Modelling E-Recruitment Process for Enterprises through a Problem Oriented Approach. Information, 9 (11), 269.

There have been a considerable set of limitations that reduced the ability of the Author to exploit the research into the full potential; (1) lack of resources about recruitment in military sector; (2) the inflexibility to conduct research in the military sector for security reasons; (3) the restrictions upon the research methods to be used in the military sector; (4) the restrictions on the type of data given and confidentiality; (5) challenges associated with access to documentation; (6) a great time required in order to get permissions for research and data release; (7) the restrictions on research documentation such as photocopying or photos taking; (8) the limited time and cost for conducting further validation of the research outcomes; and (9) difficulty in translation from Arabic to English and vice versa; and (10) the spine medical issues of the Author.

1.5 Thesis Structure

The thesis structure is presented in in Figure 1. As depicted, the research is driven by the failure occurred in the SA e-enlistment project. Following the overall research problem as well as the goals and objectives of research are formulated and included in Chapter 1. The review of literature and research methods are presented in Chapter 2 and Chapter 3 respectively. Chapter 4 gives an extended overview of the SA enlistment case study including the various challenges faced. Based on this overview, the major problems which were the root causes of the challenges faced are addressed in Chapter 5. The result of analysis and investigation conducted on the SA enlistment case study and other case studies which led to developing the POCM and Ontology are provided in Chapter 6. The POCM and its related Onto-RPD resulting from Chapter 6 are integrated into a RE process for recruitment requirements in Chapter 7. The outcomes of Chapters 5, 6, and 7 contribute to achieving the sub-goal 1 which is related to the sub-problem 1. Subsequently, the artefacts resulting from the research conducted on these three chapters

are included in an enterprise recruitment metamodel in Chapter 8. This leads to the achievement of sub-goal 2 that relates sub-problem 2. The conclusions and future works are provided in the last chapter.

1.6 Summary

This chapter provided an outline of the motivation of the research followed by the research problem and its constituents. The knowledge gaps related to the research problem are presented. The aim of the thesis including the goals and objectives to fill these gaps is described. The contributions and limitations of research are outlined. The thesis structure depicted in Figure 1 has presented the relationships between the research problem, goals, and chapters.

Research Stimuli:
The failure in the SA e-enlistment project

Overall Problem:
It is challenging to realise the value of e-recruitment

Problem 1: The difficulty of scoping, representing, and systematically transforming recruitment problem knowledge

Problem 2: The difficulty of documenting and reusing e-recruitment best practices in an enterprise recruitment environment

Chapter 1:
Introduction
Chapter 2:
Literature Review
Chapter 3:
Research Methodology
Chapter 4:
SA E-Enlistment Project

Chapter 5:
Explicating the problems in SA E-Enlistment Project

Chapter 6:
POCM & Onto-RPD : Scoping and Conceptualising Recruitment Problem Space

Chapter 7:
POCM-RAA: Requirements Analysis Approach informed by POCM

Sub-Goal 1:
POCM, Onto-RPD & POCM-RAA

Chapter 8:
ERM: Enterprise Recruitment Metamodel for ERBPs documentation

Sub-Goal 2:
ERM

Chapter 9:
Conclusion and Future Works

Keys for abbreviations:
- POCM: Problem-Oriented Conceptual Model
- Onto-RPD: Ontology for Recruitment Problem Definition
- POCM-RAA: POCM-informed Requirements Analysis Approach
- ERM: Enterprise Recruitment Metamodel
- ERBPs: Enterprise Recruitment Best Practices

Figure 1.1 Thesis Structure

Chapter 2: Literature Review

2.1 Introduction

This chapter presents a review of the key research domains related the overall problem of research as well as its sub-problems described in chapter 1. Figure 2.1 gives an overview of the structure and the process of literature review in relation to the study of discovering and explicating the root causes of the failure in SA e-enlistment project (see chapter 5). As depicted, the areas of related research are partitioned into major domains and subdomains (triangles). The implications of the review of these domains for the research gaps (trapezoids), and the dependencies between these gaps are all mapped. As a result, the way how the author should conduct the research and develop the artefacts that address these gaps can be smoothly defined.
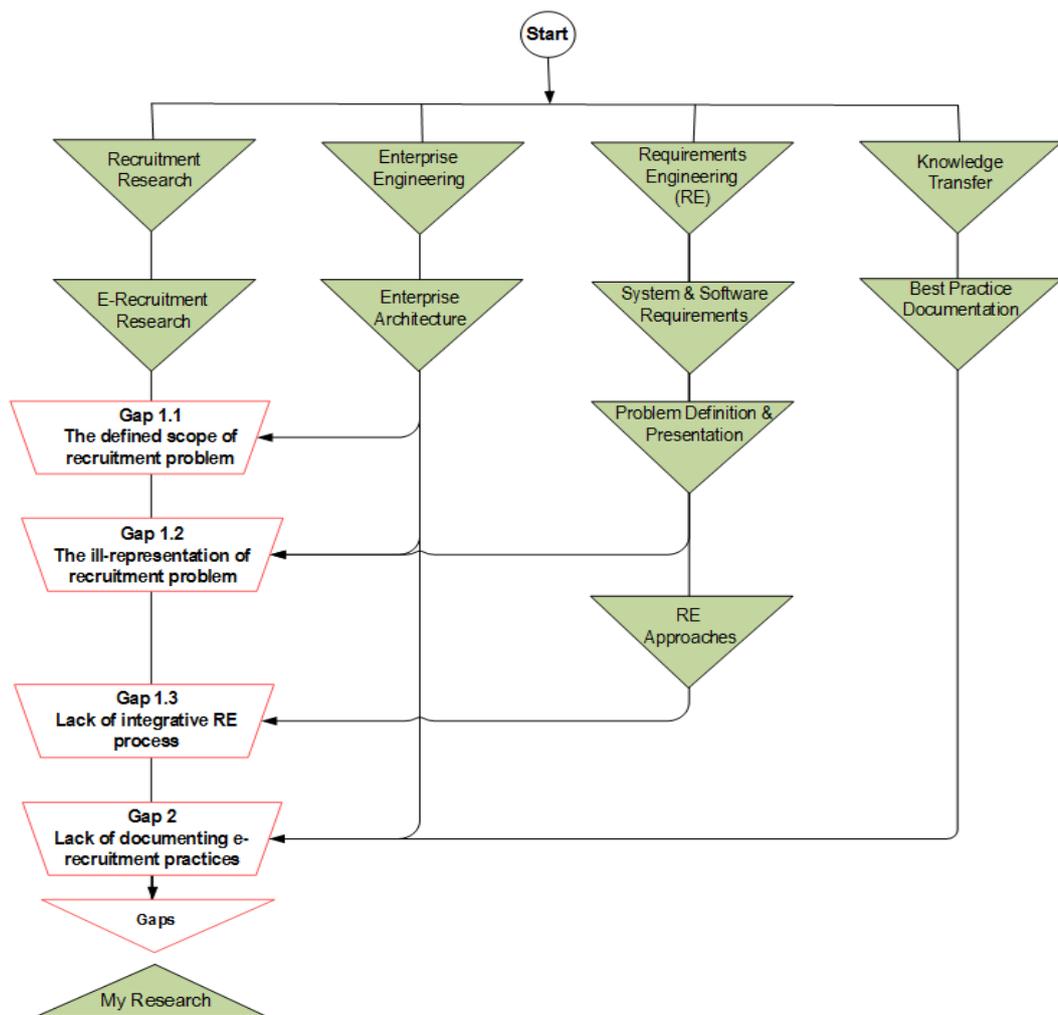
Figure 2.1 The Structure and Process of Literature Review

2.2 An Overview of Recruitment Research and Practice

2.2.1 Definition of Recruitment

A great deal of research from both Human Resources (HR) and Industrial and Organisational (I/O) psychology domains has been conducted to define recruitment. However, there has been no consensus on its definition. Randall (1987) states that recruitment is *"the set of activities through which the people and the organisations can select each other based on their own best short and long term interests"*. This definition highlights recruitment from the perspectives of the two key players: organisation (i.e. employer) and people (i.e. job seekers). However, from an organisation-based perspective, Barber (1998) defines recruitment as *"the practices and activities carried on by the organisation with the primary purpose of identifying and attracting potential employees"*. He delineated three phases of recruitment: (a) generating applicants, (b) maintaining applicant status, and (c) influencing job choice decisions.

Breaugh (2008) distinguishes between two types of recruitment: *internal* in which a job applicant is a member of the employing organisation; and *external* in which a job applicant is not a member of the employing organisation. Internal recruitment is similar to employee promotion and move. However, external recruitment is defined as the organisational activities that are intended to: (a) bring a job opening to the attention of potential job candidates who do not currently work for the organisation; (b) influence the number and/or the types of applicants to apply for the job opening; (c) influence their interest in the position to stay until a job offer is extended; and (d) influence their interest to accept a job offer (Breaugh, 2008). Likewise, Rynes and Barber (1990) states that recruitment is the activities designed to influence the number and type of applicants who apply for a job and accept job offers. Another definition stressing timing is the practice of attracting sufficient numbers of qualified individuals on a timely basis to fill job vacancies with an organisation (Ahmed and Adams, 2010).

Saks (2005) describes recruitment as *"the set of actions and activities taken by an organisation in order to identify and attract individuals to the organisation who have the capabilities to help the organisation realising its strategic objectives."* This definition implicitly combines the activity of *selection* in which the capabilities and qualifications of individuals are evaluated against who apparently owns those capabilities that help the organisation in realising its strategic objectives. In contrast to this, Gatewood et al. (2008) defines another type of recruitment called *hiring*. Hiring refers to the type of employment in which job offers are extended with no evaluation of

the applicant's capabilities and qualifications (Gatewood et al., 2008). This is often carried out when an organisation desperately needs applicants to fill unskilled or semi-skilled positions within a limited time.

Looking to recruitment from a broad sense, Philips and Gully (2015) define strategic recruitment as "*the practices that are connected across the various level of analysis and aligned with firm goals, strategies, context, and characteristics.*" They suggest that strategic recruitment overlaps with four complex disciplines: Resource-Based Theory (RBT); Strategic Human Resources Management (SHRM); Human Capital; and levels of analysis (Philips and Gully, 2015). The work of Philips and Gully (2015) highlights the need to extend the focus on recruitment from a higher level of analysis as same as the SHRM approach.

The review of the abovementioned recruitment definitions (Randall, 1987; Rynes and Barber, 1990; Barber, 1998; Saks, 2005; Breaugh, 2008; Gatewood et al., 2008; Ahmed and Adams, 2010; Philips and Gully, 2015) gives insights into the common and divergent characteristics of recruitment as follows:

- It involves specific activities and actions that are undertaken to achieve particular outcomes;
- It indicates the importance of generating a pool of applicants with desirable capabilities;
- It addresses the interest of relevant stakeholders such as organisation and applicant to fill vacancies;
- It addresses the need to increase the probability that applicants will apply, stay, and accept a job offer;
- It indicates the overlap between recruitment and the selection activity by acknowledging that those persons who are attracted to the organisation might/might not have the capabilities desired. Hence, it is the purpose of selection to determine whether applicants have the required capabilities;
- It distinguishes between internal and external recruitment;
- It distinguishes between recruitment and hiring;
- It indicates the overlap between pre-hire outcomes of recruitment (e.g. filling vacancies by the qualified applicants) and post-hire outcomes (e.g. employee retention and work performance).

- ▪ It asserts the strategic focus on recruitment thereby making it clear that recruitment can and should play an important role in helping an organisation achieve its strategic objectives.

For the purpose of this thesis, the focus will be mainly on:
- ▪ Recruitment as *enterprise* (refer to the definition in section 2.3)
- ▪ Analysis of different interests from different enterprise stakeholders' perspectives.
- ▪ External recruitment rather than internal one.
- ▪ Recruitment rather than hiring.
- ▪ The activity of selection is included within recruitment.
- ▪ Pre-hire outcomes rather than post-hire outcomes.

2.2.2 Definition of E-Recruitment

E-recruitment is defined as the use of the internet to attract potential employees to an organisation and hire them (Ghazzawi and Accoumeh, 2014). Dhamija (2012) describes e-recruitment as "*the practice whereby the online technology is used particularly websites as a means of attracting, assessing, interviewing, and hiring personnel.*" E-recruitment could be defined as any recruiting process that an organisation conducts using Web-based tools (Cappelli, 2001; Kerrin and Kettley, 2003; Kim and O'Connor, 2009). There are some common methods of e-recruitment. First method is Web recruiting (use of the organisation's Web site) is the most commonly used e-recruiting method (Ahmad and Adams, 2010; Ghazzawi and Accoumeh, 2014). A survey conducted in 2003 shows that 92% of Fortune 500 companies had career web sites (Compensation and Benefits for Law offices, 2003). Another survey conducted by Lee (2005) demonstrated that among Fortune 100 corporations, 94% have owned career web sites. The use of this method will continue to increase (Breaugh, 2012). The second method is the use of internet job boards (Braddy et al., 2006; Steel, 2007) where organisations rely upon third-party recruiters (e.g. CareerBuilder.com, Monster.com, and HotJobs.com). The third is social media recruitment (Ladkin and Buhalis, 2016).

Despite the contributions of these recruitment methods are varied, the common advantages that e-recruitment can offer are: savings in time, money, and resources; the outreach potentiality to a diverse broader group of job seekers; establishing a brand identity; more communicative and adaptive to job seekers' changing needs and market opportunities, better service and applicant

satisfaction; and more flexible in normal and exceptional circumstances (Ahmed and Adams, 2010; Alamro et al., 2014).

2.2.3 The Importance of E-Recruitment

Recruitment is a foundational input of organisational effectiveness (Taylor and Collins, 2000; Rynes and Cable, 2003; Phillips and Gully, 2015). Competitive advantage is rooted in the individual and organisational capabilities that are leveraged for strategic execution (Ployhart et al., 2014). Since recruitment influences these capabilities so that it is a key source of competitive advantage (Phillips and Gully, 2015). Recruitment is the first entrance to influence the characteristics and quality of new employees (Rynes and Cable, 2003). It has also implications for all other human resources activities (Gatewood et al., 2008). For example, the type of applicants attracted has implications for selection and training activities.

The e-recruitment has made a new competitive environment for organisations to rethink and adapt technology to increase effectiveness and efficiency of recruitment practice. Combined with various challenges such as the increased importance of human capital, the increased level of qualifications with new generations, strong economic situations, and less unemployment rates (Tresch, 2008; Alamro et al., 2014), recruitment has been marked as a top priority (Saks, 2005; Ladkin and Buhalis, 2016). Research has offered evidence about the rationale behind this increased interest in e-recruitment. First, the passive recruitment which implies people to make themselves available to employers has outmoded. This may account for why many organisations have been experienced substantive crisis in attracting high-quality employees (Ahmad and Adam, 2010). Second, Scheweyer (2004) reports that the demand of e-recruitment has been rapidly increasing due to the competitive advantages it offers. This, in turn, has put a great deal of pressure on organisations to shift into e-recruitment (Llorens and Kellough, 2007; Pfieffelmann et al., 2010; Young and Foot, 2005). Third, e-recruitment allows job seeker to be more selective in their job choices which increasingly forces organisations to adopt more innovative ways to satisfy their needs (Ladkin and Buhalis, 2016).

2.2.4 Challenges for E-Recruitment
2.2.3.1 Failure Stories in Recruitment Practices

The thesis is originally driven by the failure stories in SA's enlistment practice. This will be presented in details in Chapter 4. However, the research on recruitment has provided some

disappointing results. Many organisations have unfortunately reported problems in finding and recruiting qualified employees. For instance, a survey of 33,000 employers from 23 countries found that 40% of them had difficulty finding and hiring the desired talent (Saks, 2005). In UK a survey conducted between 2011 and 2015 shows that skill-shortage vacancies represent a growing challenge for employers in filling their vacancies (UKCES, 2015). According to the findings of survey, skill-shortage vacancies continued increasing in 2015 by 43% compared to 2011. Furthermore, over two-thirds of employers admitted a difficulty in filling their vacancies which led to a direct financial impact through either loss of business to competitors, or increased operating costs. In Canada, it is predicted that a critical shortage of skilled workers could reach one million by the year 2020 (HRSSD, 2012). The problem is just as severe in the USA where 80% of employers say they are having trouble attracting and retaining employees with critical skills (Cusato, 2016). At worst, some organisations are even experiencing difficulty hiring employees with non-critical skills (Cusato, 2016). Taking these results into account, recruitment is the most pressing problem (Saks, 2005).

2.2.3.2 Gaps in Recruitment Research

Given the continued challenges that organisations will face in attracting and recruiting qualified applicants, recruitment research has provided little knowledge and guidance about how these challenges can be confronted (Ployhart, 2006; Gully et al., 2014; Ployhart and Kim, 2014). According to Rynes et al. (2002), the recruitment domain demonstrates the largest gap between academic findings and the practice of recruiting organisations. There are a number of factors that helps us to understand this gap and try to close it. Informed by the problem of SA's enlistment practice as well as the failure results mentioned in the previous section, some key factors are addressed in this thesis.

The defined scope of recruitment problem:

The first factor causing the gap is the ill-defined scope of recruitment problem. Real-world problems, such as recruitment, contain many intertwined problems, constituting what Ackoff (1979) termed a "mess." To define such problems, one must bound the issue in question in order to limit the complexity included (Smith, 1989; Smith, 1993). Given the complexity of recruitment being having many cognitive, social and organisational issues (Barber, 1998; Breaugh and Starke, 2000; Breaugh, 2012), the recruitment problem definition has demonstrated some limitations. The first limitation is that recruitment problem definition has

been limited to micro and fragmented recruitment problems (Barber, 1998; Breaugh and Starke, 2000; Saks, 2005; Breaugh, 2012). Three subjects of recruitment problem has dominated the recruitment research called 3 R's: Realistic job previews, Recruitment sources, and Recruiter behaviours (Saks, 2005). Although the study of each subject has produced few substantive and practical implications for organisations, they suffer from being studied in isolation from each other limiting the provision of complete and consistent guidance to organisations (Breaugh and Starke, 2000; Saks, 2005; Breaugh, 2008; Breaugh, 2012). Some fruitful attempts to close this gap can be found in (Rynes and Cable, 2003; Ployhart, 2006; Breaugh, 2012). However, there has been still a concern that recruitment research will continue to fragment itself into very complex small theories while the practical implications will be lost in between (Breaugh, 2013; Yu and Cable, 2014).

The second limitation is the difficulty in defining a robust definition of recruitment problem. There are many overlaps and conflicts that have made recruitment problem definition a difficult task. This can be noticed from the definitions of recruitment provided in Section 2.2.1. Some examples are: the overlap between recruitment and selection (Rynes and Cable, 2003); the conflict between pre-hire and post-hire recruitment outcomes (Rynes and Cable, 2003; Saks, 2005; Breaugh, 2008); the conflict between the applicant and organisation perspectives (Saks, 2005; Ployhart, 2006); and the overlap between recruitment and other HR functions (e.g. training) (Gatewood et al., 2008).

The third limitation is that recruitment problem definition has lacked a contextual and strategic focus (Saks, 2005; Ployhart, 2006; Ployhart et al., 2014; Gully et al., 2014). Problem definition research has stressed the importance of looking at the larger system and related objectives in order to ensure that all important considerations are not lost from the definition (Smith, 1993). Recruitment has been predominantly defined as only a function included in HRM (Gatewood et al., 2008; Philips and Gully, 2015). This definition points up two drawbacks. One drawback is that it neglects the strategic value of recruitment as a source of competitive advantage (Saks, 2005; Philips and Gully, 2015). To overcome this drawback, Philips and Gully (2015) define *strategic recruitment* and link it to the business strategy as same as the function of SHRM. Despite their work gives insights into the strategic role of recruitment, the analysis was limited to the employing organisation point of view. Another drawback is that it also neglects the contexts in which different types of recruitment take place beyond HRM (e.g. student recruitment in colleges and universities).

To close the gap caused by the ill-defined scope of recruitment problem and the related limitations, this thesis defines recruitment problem from a holistic view. It enlarges the scope of recruitment problem definition by addressing *enterprise recruitment.* This will enable us to include and analyse all important considerations in recruitment definition that might have been overlooked in the current recruitment research. For this purpose, the definition of enterprise, and enterprise architecture and related concepts are reviewed in the coming sections.

The ill-representation and understanding of recruitment problem:

From the cognitive view, problems are conceptual entities that do not exist in the world, but they must be externalised (i.e. expressed) so represented towards solution-oriented thought (Smith, 1989; Smith 1993). Problem representation enables problem domain knowledge which is, in turn, very crucially important in problem solving (Viller and Sommerville, 2000; Martin and Sommerville, 2004). This task is very difficult for a real-world problem due to the various aspects that constitute it (Jackson, 2001; Kossmann and Odeh, 2010; Checkland and Poulter, 2010; Siegemund et al., 2011). Hence, there is no reference model by which all these various aspects can be comprehensively represented (Vergidis et al., 2008; Pedell et al., 2014). Therefore, recruitment problem can be expressed by a chosen representation that is somehow grounded in reality; agreed on by all stakeholders; and best suited for problem solving (Landry, 1995; Checkland and Poulter, 2010). However, there are many criteria that have been proposed for assessing the quality of such representation such as validity and generativity (Smith, 1993; Vergidis et al., 2008); abstraction (Viller and Sommerville, 2000; Osada et al., 2007); viewpoints (Osada et al., 2007); and expressiveness and communicativeness (Vergidis et al., 2008). However, the quality varies based on many aspects of real-world problem such as the context and complexity of a real-world problem, the type of business, the type of project, the feature of analysis (Kettinger, 1997; Aquilar-Saven, 2004; Osada et al., 2007; Neetuand Pillai, 2013).

There are a number of descriptive and prescriptive recruitment models proposed for conceptualising recruitment problem. The most cited ones are Rynes's (1991) model for future recruitment research, Saks's (2005) dual-stage model of the recruitment process, and Breaugh et al.'s (2008) model for the organisational recruitment process.

- ▪ *The model for recruitment research: Rynes (1991)*

In Figure 2.2, Rynes (1991) proposes a model that consists of four major components: recruitment context; recruitment activities and decisions; recruitment process; and recruitment

outcomes. The component of recruitment context includes three context variables (external environment, organisation characteristics, and institutional norms) that can influence the other components (recruitment activities and decisions, recruitment processes, and recruitment outcomes). The recruitment activities include recruiters, sources, vacancy characteristics, selection standards, and administrative procedures (realistic job previews, timing, expenditures). These activities are linked to recruitment processes (self-selection, time-related processes, information-related processes, post-hire adjustment processes, and individual differences) which, in turn, lead to outcomes: pre-hire (perceptions, intentions, and behaviours) and post-hire (attitudes, behaviours, effects on insiders).
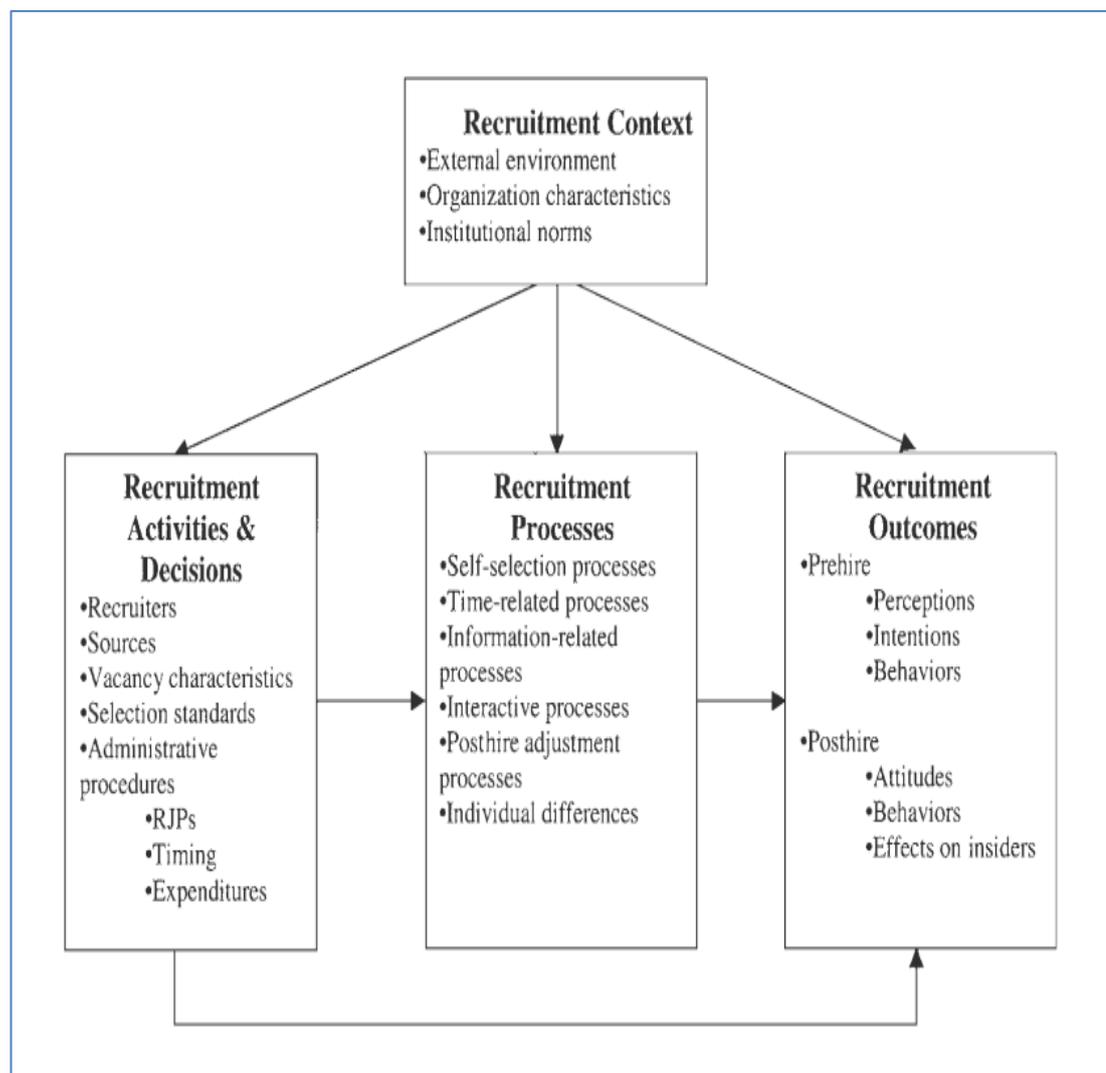
Figure 2.2 Rynes's Model for Recruitment (1991)

The Rynes's model (1991) provides a good contribution for redirecting the recruitment research into more combination between applicant's perspective and organisation's perspective. It also gives insights into linking (a) the component of recruitment activities and decisions (i.e.

independent variables), to (b) the component of recruitment outcomes of those practices and activities (i.e. dependent variables), using (c) the component of recruitment process (i.e. intervening variables) believed to determine the precise nature of the impact of recruitment activities on outcomes. However, Rynes (1991) calls for a broader conceptualization of the recruitment problem to address the context in which recruitment problem occurs, and study the adaptive and interactive features of the recruitment problem.

- *A Dual-Stage Model of the Recruitment Process. Saks (2005)*

In Figure 2.3, the model of Saks (2005) contextualises the recruitment problem from a process-oriented view. His model is based on Barber's (1998) description of the three phases of the recruitment process (generating applicants, maintaining applicant status, and influencing job choice decisions). The model presents three similar stages of the recruitment process: the application stage, the interaction stage, and the job offer stage. In addition, the model also highlights the perspective of both the applicant and the organisation along with the relevant outcomes for both. For example, during the first stage, organisations must generate applicants for positions and applicants must decide whether they will apply for jobs. In the second stage in which organisations and applicants interact with each other, applicants and organisations must try to find out about each other, make themselves attractive, and assess their fit to each other. In the job offer stage, organisations want to increase the chances that applicants accept job offers, and applicants want to receive job offers and then decide whether they should accept or reject them. The arrows that connect the applicant and the organisation at each stage demonstrate that they influence each other throughout the process.

The model is very insightful into the organisation and applicant needs in each stage of the recruitment process and the nature of interactions towards achieving these needs. However, it is a dual process-oriented view of recruitment problem leaving many important considerations such as the contextual aspects, the problem variables influencing these needs and interactions, and different actors and stakeholders involved.
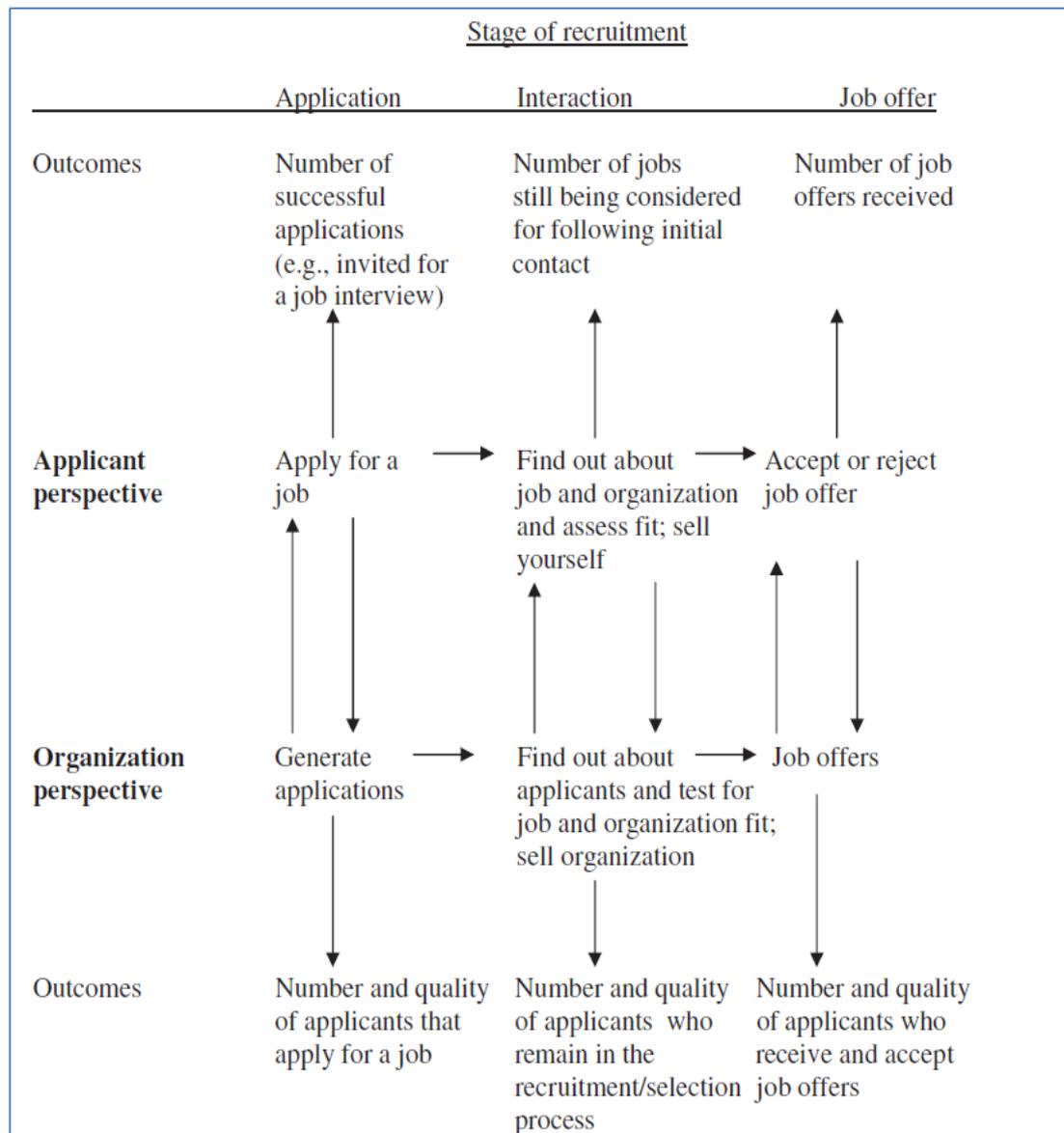
Figure 2.3 Dual-Stage Model of the Recruitment Process (Saks, 2005)

- *The Model of Recruitment Process: Breaugh et al. (2008)*

The model of Breaugh et al. (2008) is intended to the organisational recruitment process. In Figure 2.4, the establishment of objectives is the first stage of the recruitment process. This stage involves the answer of the key question of: what type of applicant that an organisation wants to recruit (e.g., knowledge, skills, and abilities). This fundamental question will influence recruitment strategy as where and how an organisation recruits as well as other strategy-related issues. An organisation's recruitment strategy determines the type of recruitment activities required to achieve the objectives. This strategy, in turn, leads to recruitment activities such as recruitment sources, recruiters, and the recruitment message (i.e. realism, completeness, and timeliness). These activities influence a number of intervening-process variables, such as

applicant attention, applicant interest, and applicant self-insight that will lead to recruitment results (e.g. greater satisfaction and retention rate).
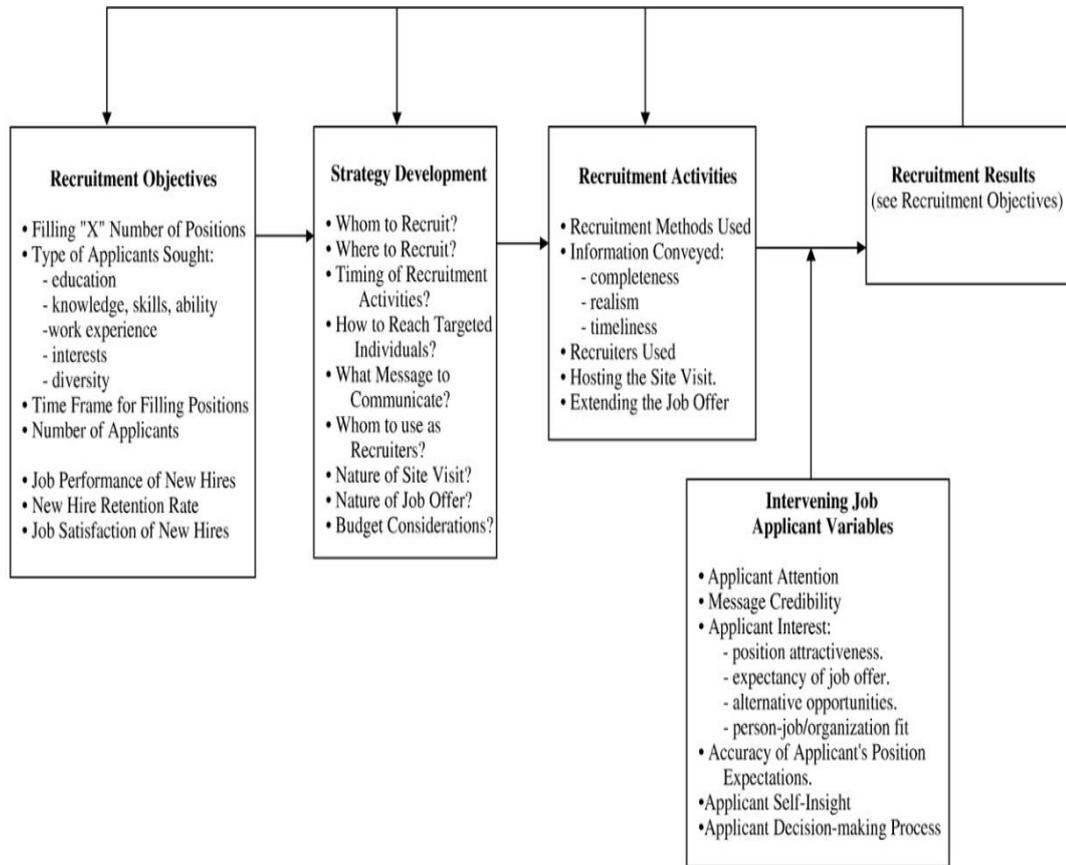
Figure 2.4 The Model of Recruitment Process (Breaugh et al., 2008)

The model of Breaugh et al. (2008) addresses some gaps in recruitment research by taking into consideration an organisation's goals and objectives. However, it focuses on these goals and objectives from organisational perspective rather than applicant perspective. It also fails to address both the contextual issues with which such a recruitment process occurs, and the influential relationships between internal and external variables towards a robust recruitment problem definition.

In summary, the extant models of representing recruitment problem are devoted to the links between recruitment practices, processes, and outcomes. While these models address some aspects of recruitment problems, they are strongly solution-oriented, focusing on *what* and *how* rather than *why*. Ployhart (2006, p869) comments on the research-practice gap of recruitment

saying "*it seems organisational decision makers do not understand staffing (recruitment) or use it optimally.*" We believe that because recruitment problem has never been completely represented, it has never been correctly understood. In this regard, it has been widely reported that when stakeholders ask for new features or capability, they quite often state their needs as an implementation (i.e. solution-based) (Robertson and Robertson, 2012; Hall et al., 2012).

To close the gap caused by the ill-representation and understanding of recruitment problem, the thesis will extend the study into the inclusion and representation of different problem viewpoints of recruitment problem that exist in different enterprise contexts. After addressing the central issues involved in representing and defining real-world problem situations, the thesis will review the key approaches to problem representation and definition proposed by theorists. The thesis will then provide an established contextualisation of recruitment problem concepts and their relationships that describe the recruitment problem space from different enterprise perspectives, and show how these problem concepts might vary over different types of recruitment problems. This depiction of the constituent concepts of recruitment problem and their overlapping relationships will pave the way towards a comprehensive recruitment problem representation and definition. Thus, the gap aforementioned might be closed. This representation will support delaying of solution consideration until a good understanding of the problem space is gained. It will also provide a means of analysing and decomposing problems into simpler sub-problems that can be readily addressed. It will also help stakeholders to capture and share the necessary problem domain knowledge, and this will be driven into the negotiation over trade-offs and consideration of details of the solution support.

2.3 Enterprise Engineering

In this section, the basic concepts related to enterprise engineering are defined. The key research areas of enterprise engineering and their implications for the research problem are reviewed.

2.3.1 The Concepts of Enterprise and Enterprise Engineering

The concept of enterprise implies that the organisation is much more than the sum of its parts (Sherwood, 2005). It emphasises that the organisation is perceived as a single entity rather than as a collection of cooperating units. In line with this definition, Chen et al. (2008) defines enterprise as a number of organisational entities sharing a definite mission, goals and objectives

to offer an output (e.g. product and/or a service) to the market. Enterprise engineering is defined as the body of knowledge, principles, and practices to analyse and design whole or part of an enterprise (Molina, 2003; Molina et al., 2005; Vallejo al., 2012). It aims to create synergies among all enterprise entities by (re)engineering them in a harmonious, coherent way towards the shared goals and objectives, rather than to achieve local optimisation at business unit level (Vallejo al., 2012).

The advantages of enterprise engineering can be: (1) enhanced overall organisational performance, (2) increased competitiveness in the marketplace, and (3) operational excellence in service and product delivery to customers (Sherwood 2005; Penaranda et al., 2010; Vallejo al., 2012). In the context of recruitment, enterprise engineering is thought to be a useful tool to properly engineer different organisational recruitment entities' lifecycles towards leveraging the overall attractiveness capability needed for the competitiveness in the labour market. Hence, extending the focus of research into the enterprise level will help addressing the gaps in the current recruitment research explained in section 2.2.4.2 and support a better recruitment problem definition. However, enterprise engineering is a complex task (Gartner, 2008; Zachman, 2015). Therefore, enterprise engineering seeks support from a number of enterprise reference frameworks, methodologies, techniques, and tools in order to manage this complexity (Jonkers et al., 2004; Vallejo al., 2012; Moral-Garcia et al., 2014). To give insights into the gaps related to the research problem within the context of enterprise engineering, some of the key areas of enterprise engineering will be reviewed. These are: Enterprise Architecture (EA) and Enterprise Modelling.

2.3.2 Enterprise Architecture (EA)

Architecture is defined as "*the fundamental organisation of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution*" (IEEE Computer Society, 2000). The concept of Enterprise Architecture (EA) or previously called Information Systems Architecture (Zachman, 2008) was originated from the conventional areas of life such the building of towns and cities (Sherwood, 2005). The concept of EA has evolved to address two key problems (Roger, 2007). The first problem is to manage the increasing complexity and change in IT systems (Zachman, 2015). The second problem is the increasing difficulty in realising business value with those systems (Roger, 2007). To solve these key problems, a bundle of EA reference frameworks were proposed.

EA is defined by Ameri and Dehghan (2013) as "*a rigorous description of the structure of an enterprise, which comprises enterprise components (business entities), the externally visible properties of those components, and the relationships (behaviour) between them.*" Another definition by Gartner (2008), an EA is "an *approach for translating business vision and strategy into effective enterprise change by creating, communicating and improving the key requirements, principles and models that describe the enterprise's future state and enable its evolution.*" The two examples of EA definitions aforementioned give insights into the disparity in the definition of the EA. For instance, the definition of Ameri and Dehghan (2013) stresses representation of enterprise whereas the definition of Gartner (2008) stresses the process of translation or transformation. Taking these EA definitions and the disparity aspects included into account, some of the key EA references will be described and their implications for the research problem will be analysed.

2.3.3.1 Enterprise Architecture Reference Frameworks

An enterprise architecture framework defines how to create and use an EA (Gartner, 2008). There are a number of EA reference frameworks proposed for enterprise engineering. According to Roger (2007), the most leading ones are Zachman Framework, The Open Groups Architecture Framework (TOGAF), Federal Enterprise Architecture (FEA), and Model-Driven Architecture (MDA). Hence, these four EA references frameworks will be briefly discussed.

- *Zachman Framework for Enterprise Architecture:*

According to Zachman (2008), the framework is an ontology – a theory of the existence of a structured set of essential components of an object – for which explicit expressions is very significant for creating, operating, and changing the object. Zachman's framework is simply a taxonomy for classifying and organizing the descriptive architectural representations (i.e. artefacts) of an enterprise that takes into account both whom the artefact targets (planner, owner, designer, builder, implementer, user) and what particular aspect (inventory sets; process flows, distribution networks, responsibility assignments, timings, motivations) is being addressed (Vallejo al., 2012). The framework is depicted in Figure 2.5.

According to Zachman (2015), today's information age with the increased complexity and change in the global market needs a holistic view that address the wide range of business requirements rather than just focusing upon technical solutions. Hence, it is not an IT issue (Sherwood, 2005; Vallejo al., 2012; Zachman, 2015); however, it is a problem definition issue (Bray, 2002; Wieringa, 2004; Zachman, 2015). According to Zachman (2015), an EA, therefore,

needs a structure (i.e. representation) that establishes a reference of problem definition and guides the transformation process (i.e. methodology) towards the solution. Without such a structure, transformation processes will be ad hoc, fixed and dependent on practitioner skills (Zachman, 2015).
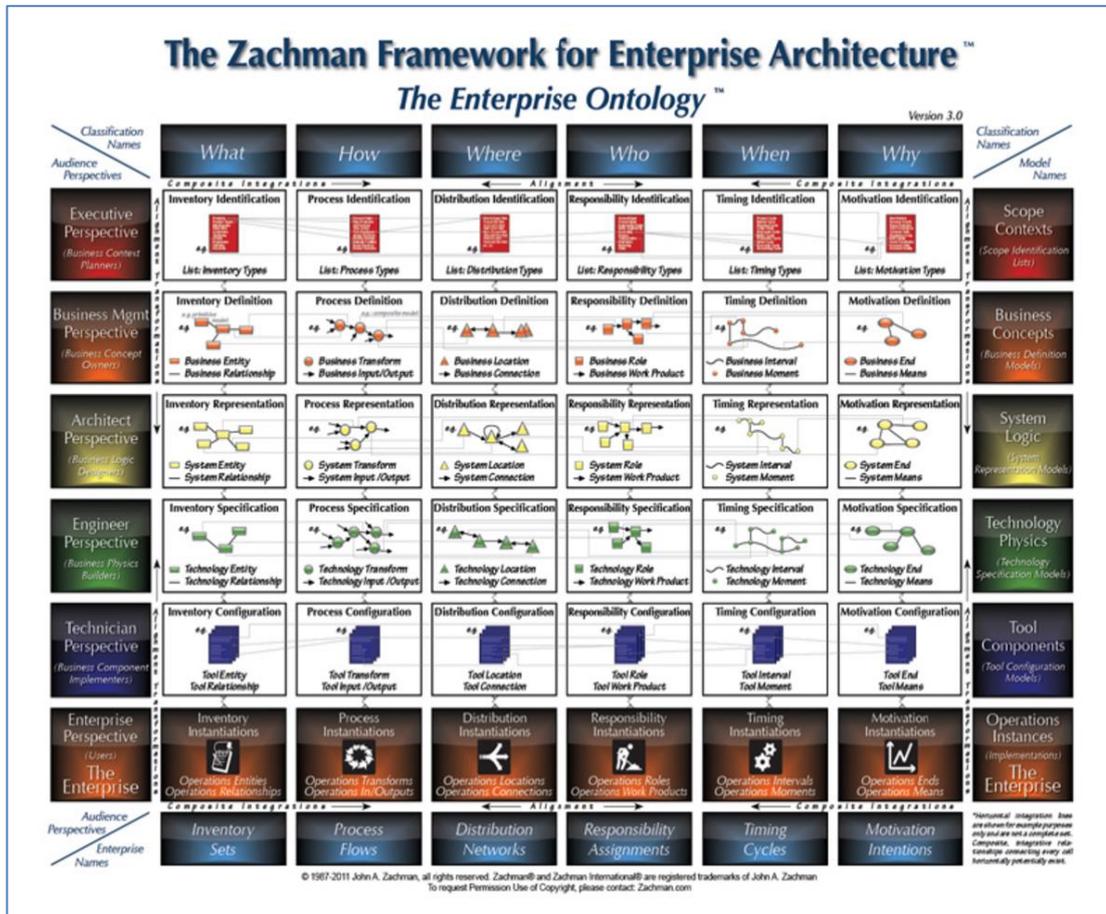
Figure 2.5 The Framework of Zachman (Zachman, 2008)

Despite the insights given by the Zachman's framework (i.e. the importance of problem representation), the framework has some limitations in regard to the recruitment research problem. First, the framework lacks a step-by-step supportive process for enterprise engineering (Roger, 2007). The framework is a structure (i.e. problem representation) and not a transformation process (Zachman, 2008). Second, the framework builds on the argument that the conventional architecture representations of the manufacturing and constructions can be analogously applied into a complex real-world problem (e.g. recruitment). According to Gaver (2010), this conceptual argument is faulty and incomplete. In general, a real-world problem is not an ordinary system, such as a machine or a building, to be structured and engineered. In particular, recruitment problem has many social and subtle features that cannot be easily

represented in a reduced form as same as that of the Zachman's framework. These social features are often neglected or trivialised (Bloomberg, 2014).

- *The Open Group Architecture Framework (TOGAF):*

TOGAF is a proven enterprise architecture framework used by the world's leading organisations to improve business efficiency (Open Group, 2016). TOGAF is divided into four domains: *business architecture* which describes the processes the business uses to meet its goals; *application architecture* which describes how specific applications are designed and how they interact with each other; *data architecture* which describes how the enterprise data stores are organized and accessed; and *technical architecture* which describes the hardware and software infrastructure that supports applications and their interactions. TOGAF is best described as an *architectural process* rather than a *framework* since the most visible part of it is the *Architecture Development Method* (ADM) (Roger, 2007; Open Group, 2016). The ADM is depicted in Figure 2.6.
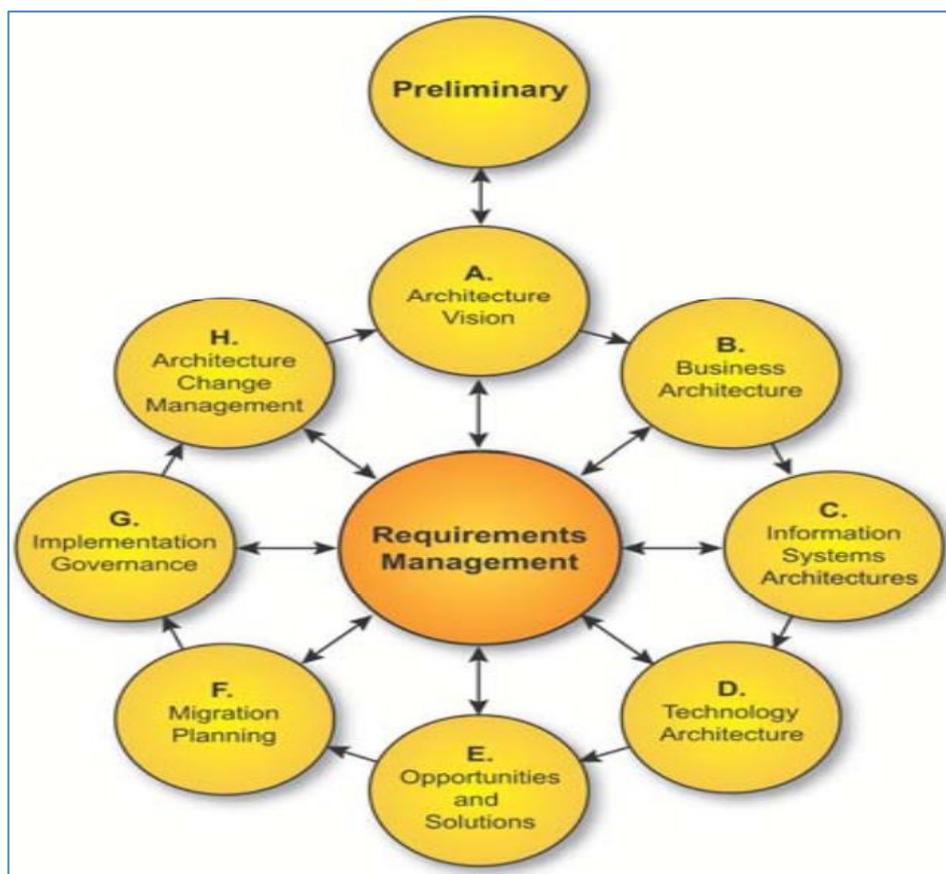
Figure 2.6 The TOGAF's Architecture Development Method (Open Group, 2016)

The TOGAF offers some advantages for enterprise engineering. It provides a step-by-step method facilitated by a set of tools for defining an EA as a set of building blocks, and shows

how these blocks fit together. It also provides a common vocabulary and a list of recommended standards. Although TOGAF is considered as the de facto standard in an EA practice, it suffers from some drawbacks. TOGAF is criticised being as "a toolkit for generating a random EA" providing less guidance of how to generate a right EA (Kotusev, 2016). Hence, it is dependent on the experience of stakeholders and TOGAF consultants (Roger, 2007). This supports the previous claim of Zachman (2015), i.e. the need of a problem structure. Another criticism is that the real best practices of applying TOGAF are missing (Anderson et al., 2009).

- *The Federal Enterprise Architecture (FEA):*

FEA is the enterprise architecture developed for the U.S. Federal Government. It provides a common approach to promote increased levels of mission effectiveness by standardizing the development and use of architectures within and between Federal Agencies (EOPUS, 2012). As depicted in Figure 2.7, the FEA consists of a number of high-level components that must be present in an EA: primary outcomes, levels of scope, governance, principles, method, tools, standards, use, reporting, and audit (EOPUS, 2012).

Figure 2.7 FEA: The Federal Enterprise Architecture (EOPUS, 2012)

The FEA components ensure that an EA program is complete and can be effective in developing solutions that support planning and decision-making. FEA has both a comprehensive taxonomy, like Zachman, and a methodology for creating an EA, like TOGAF (Roger, 2007).

The FEA is categorised into six architectural domains describing different perspectives of the enterprise architecture. These are strategic, business, data, applications, infrastructure, and security. These architectural domains are populated with references models that determine the types of artefacts needed for modelling and analysis to meet stakeholder requirements (EOPUS, 2012). The FEA also provides a taxonomy for cataloguing assets that fall within the purview of the enterprise architecture (e.g. segment model).

The methodology is called Collaborative Planning Methodology (CPM). The CPM consists of two major phases: (1) Organise & Plan; and (2) Implement and Measure. The CPM is stakeholder-centred with a focus on understanding and validating requirements from all stakeholder perspectives, planning for those requirements, and ensuring that specifications ultimately match these requirements. Finally, the CPM provides stakeholders with some guidance for EA implementation and measurement. The FEA also provides a transitional process for migrating from a pre-EA to a post-EA paradigm.

The FEA has some fruitful contributions to the EA (Roger, 2007). It provides much support in understanding and creating effective governance model for EA. It also supports setting up a classification of architectural assets that can be reused in future. However, it has some weakness points being (Gaver, 2010): (1) difficult and demands much time and money to apply; (2) lack of institutional commitment; and (3) the results of its practice are considered unsatisfactory.

- *Model-Driven Architecture (MDA) and Extended MDA (xMDA):*

Model-Driven Architecture (MDA) is an enterprise approach defined by the Object Management Group for software development under the model-driven engineering framework (OMG, 2003). MDA defines four viewpoints of a software system, which are modelled with specific models: (1) the Computation Independent Model (CIM), which is used by the business and software analysts, and is focused on the context and requirements of the software system without considering its structure or processing; (2) the Platform-Independent Model (PIM), which is used by software architects and designers and is focused on the operational capabilities of a software system outside the context of a specific platform; (3) the Platform-Specific Model (PSM), which

is used by software developers and programmers and includes details related to the system for a specific platform; and (4) the Implementation-Specific Model (ISM), which is used to code and document the PSM in a specific technology.

The MDA is offered as one way forward in software systems design and modelling to connect software design with the business domain. However, the general focus of the MDA is the development of software systems by performing transformations between software design models, and the automatic generation of application code from those models. Thus, the MDA is a software-oriented architecture that is used by software designers and developers who are not always in line with the stakeholders from the problem domain (Fouad et al., 2011). Consequently, the MDA does not explicitly consider the stakeholders and their requirements in the problem domain, namely problem definition. To fill this gap, Fouad et al. (2011) extended the MDA by adding three viewpoints to address problem domain analysis called xMDA Framework. The xMDA is depicted in Figure 2.8.
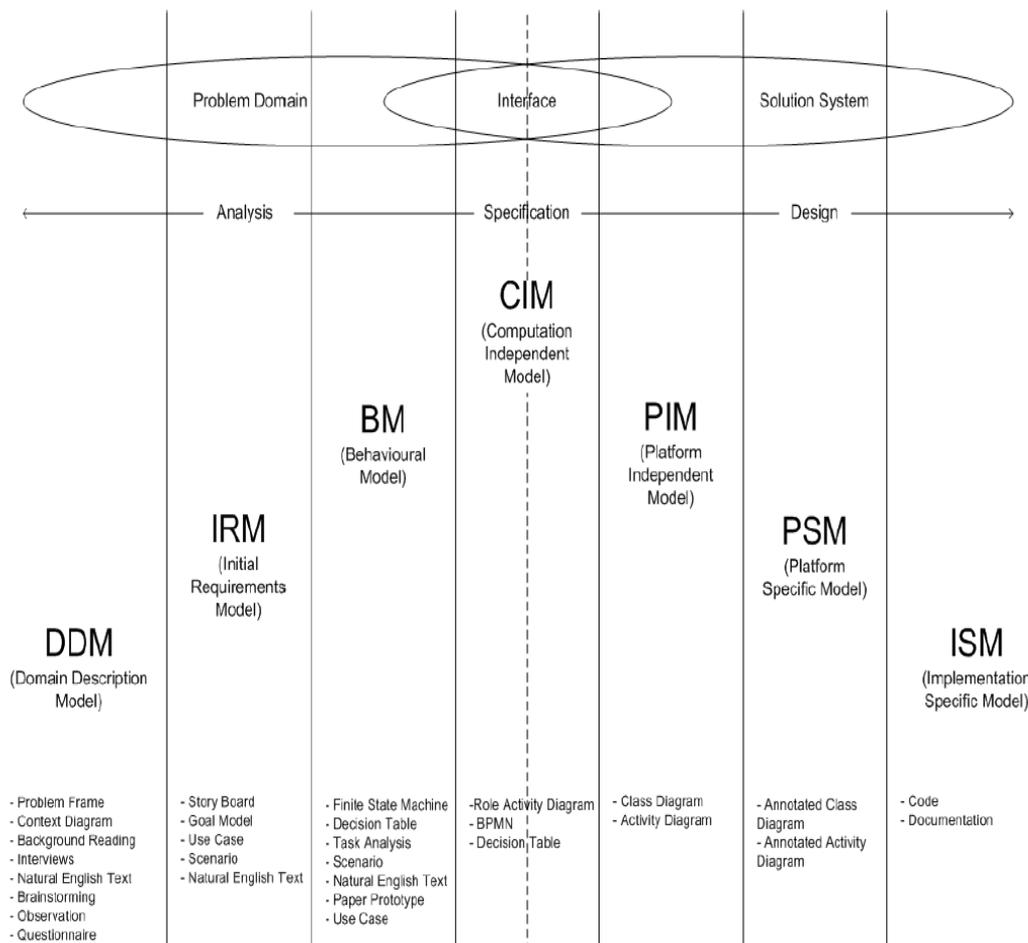
Figure 2.8 xMDA Framework (Fouad et al., 2011)

As shown in Figure 2.8, the three viewpoints added to the MDA viewpoints for problem domain analysis are on the left side. These viewpoints are Domain Description Model (DDM), Initial Requirements Model (IRM), and Behavioural Model (BM). These viewpoints are integrated with the MDA, therefore, the CIM is redefined. The DDM is used to define the PD context as it is. The IRM is used to define any requirements (both functional and non-functional) to be imposed by the new system. The BM is then used to highlight specific functional requirements and the behaviour of the involved process. All these pre-CIM viewpoints are developed in the context of business, and not software. The xMDA framework also suggests a variety of modelling techniques that can be used with each viewpoint of xMDA.

The xMDA framework directly addresses Requirements Engineering (RE) and distinguish analysis from design. It utilises the MDA by making it accessible to a wide range of business stakeholders and enabling specification to be a direct output from business user involvement in the requirements phase of the MDA.

2.3.3.2 Reflections on Enterprise Architecture Reference Frameworks

According to Gartner (2008), EA reference frameworks support enterprise engineering by: (1) enabling communication and coordination within and across the enterprise entities through a better visualisation and understanding of the enterprise components from different perspectives; (2) providing a step-by-step methodology for transforming the enterprise facilitated by different principles, methods, and tools; and (3) providing means for enterprise performance measurement and governance. However, these frameworks suffer from two major gaps. One is the absence of consensus on what the *architecture* is and what it should include. For instance, the Zachman Framework is self-described as a framework, while it is more accurately defined as a taxonomy (Roger, 2007); The TOGAF is called a framework while it is more accurately defined as a process (Gaver, 2010); the FEA can be viewed as either an implemented enterprise architecture or a proscriptive methodology for creating an enterprise architecture (EOPUS, 2012); and the MDA is software-oriented and a model-driven design process.

Another gap is that these frameworks conceptualise the enterprise according to the conventional view of buildings with a great focus on the objective aspects (i.e. the externally visible properties of enterprise components) while ignoring the subjective ones (Sherwood, 2005; Ameri and Dehghan, 2013). It is important to acknowledge that value realisation is supported in every perspective including the subjective aspects not only by integrating those

visible ones, but also by using appropriate tools that promote the desired integration of such overlooked aspects (Penaranda et al., 2010; Vallejo al., 2012). Recruitment research has shown the large impact of the subjective aspects (e.g. social and psychological) on recruitment. Thus, the thesis attempts to conceptualise the enterprise-wide recruitment problems and provide supporting tools to incorporating them with an EA. To do this, the extended MDA (xMDA) shown in Figure 2.8 will be adopted for such incorporation. The selection of xMDA is based on some reasons: (1) the xMDA is problem-oriented and; (2) xMDA suggests a variety of RE techniques that can be used in different levels of problem domain analysis (Fouad et al., 2011); and (3) the xMDA will facilitate the selection and tailoring of RE techniques that can be integrated with the artefacts to be built for conceptualising recruitment problem.

2.4 Requirements Engineering

2.4.1 Definition of Requirements

A requirement is a statement that identifies a product or process operational, functional, or design characteristic or constraint, which is unambiguous, testable or measured, and necessary for product or process acceptability by consumer or internal quality assurance guidelines (IEEE Computer Society, 1998). This definition emphasises a number of key features of a requirement. One is that a requirement should be a statement that needs to be captured in some form, such as text, tables, or notations, and must be understandable, traceable, measured and manageable. A second feature is that there are many different kinds of requirements, e.g. operational, functional, characteristic, or constraints, that accord with different kinds of language, analysis, modelling, process and solution. A third feature is that requirements may define product as well as process. For instance, requirements may define a product as things to be built whereas they may define a process or procedures for using those things that are built or even procedures about how those things should be developed for quality control purposes. A final feature is that although requirements serve to define what should be designed and developed, they also define how the designed solution should be tested and accepted. Consequently, they are necessary in the earliest stages of the development process as well as in the latest stages during acceptance.

2.4.2 Definition of Requirements Engineering

Engineering refers to the creation of cost-effective solutions to practical problems by applying scientific knowledge (Shaw, 1990). Therefore, Requirements Engineering (RE) is a process

concerned with anchoring development activities to a real-world problem, so that the appropriateness and cost-effectiveness of the solution can then be analysed (Nuseibeh and Easterbrook, 2000; Bray, 2002).

2.4.3 Views on Requirements Engineering

There has been no explicit agreement on the scope of RE and what it includes. While some broaden the scope of RE to include a variety of activities at the systems level (Kotonya and Sommerville, 1998; Hull et al., 2010), others relatively restrict RE into the upstream activities at the software level (Kovitz, 1999; Zave, 1997). From a system RE perspective, software cannot function in isolation from the system (i.e. the context) in which it is embedded so that it is a subsystem. From this perspectives, RE is defined by Hull et al. (2010) as the subset of systems engineering concerned with discovering, developing, tracing, analysing, qualifying, communicating and managing requirements that define the system at successive levels of abstraction. However, from a software RE perspective, RE is defined as the branch of software engineering concerned with the real-world goals for, functions of, and constraints on software systems. It is also concerned with the relationship of these factors to precise specifications of software behaviour, and to their evolution over time and across software families (Zave, 1997).

Wieringa (2004) described two views of RE: problem-oriented RE and solution-oriented RE. In the problem-oriented RE, requirements specify a problem and RE, therefore, is called problem analysis or problem definition (Wieringa, 2004; Smith 1989). Similar to this view, Kovitz (1999) defines RE as a process of converting an open-ended problem into a well-defined problem. However, in the solution-oriented RE requirements specify a solution and RE, hence, RE is called solution design (Wieringa, 2004). In Figure 2.9, the four views of RE are depicted and demarcated, and the relationship between problem domain, software system, and specification are shown.
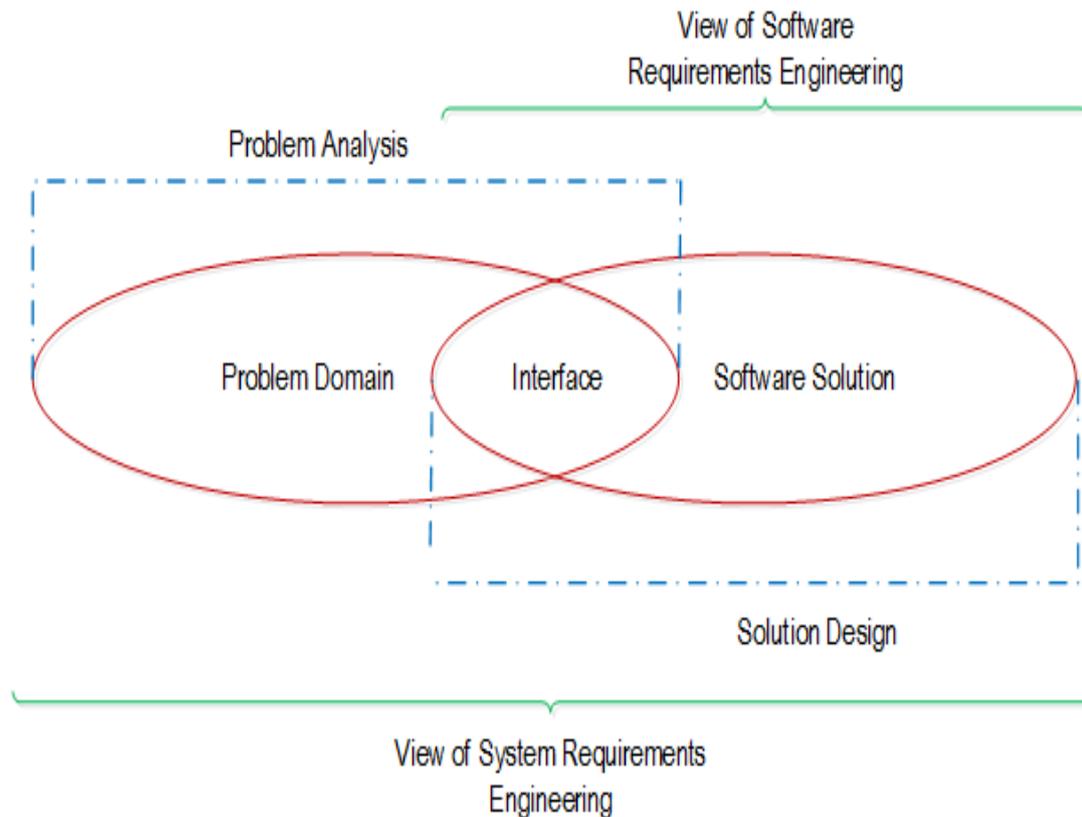
Figure 2.9 Views of Requirements Engineering (Adapted from Bray, 2002)

2.4.3.1 The Relation between Problem Domain, Software System, and Specification

A system is a man-made solution that is developed to achieve a pre-planned goal or purpose (Grady, 2006). A pre-planned goal or purpose is converted into a practical solution system using a RE project. However, the RE project is unlikely to be carried out until the knowledge of problem domain is obtained. The problem domain is the area where a defined problem exists as such the solution system is built to solve that problem (Bray, 2002). This closely corresponds to the idea of quality as fitness for purpose where a solution system can only be judged fitted if it achieves the purpose, e.g. ensuring that the needs of all the stakeholders are taken into account (Hull et al., 2010). Hence, RE can be seen as the process of discovering that purpose (Nuseibeh and Easterbrook, 2000).

A solution system must be effectively designed in order to produce the desired effects (i.e. its purpose) during its use. This specifically constitutes the interaction between the problem domain and the solution system called specification. The concept of specification is to reconcile the differences between what the business user requirements are (i.e. which are derived from analysis) and what is required by design in the engineering process.

Accordingly, specification serves as an interface through which the mutual conformance to requirements from both problem and system domains might be realised. On one hand, specification(s) is the basis for analysing requirements and validating that they are indeed what stakeholders need (Nuseibeh and Easterbrook, 2000). On the other hand, it defines what designers have to build. According to Bray (2002), specification is rooted in the behaviour of a system which does not yet exist. In software engineering, Jackson (1997) points out that a specification is a restricted form of software requirements. This means that the specification is to provide a designer with enough information for building the solution system without any further knowledge about the problem domain (Jackson, 1997; Jackson, 2001).

2.4.3.2 RE as Problem Definition

Given that requirements defines a problem, RE can carry various synonyms terms such as problem analysis (Davis, 1993), requirements analysis (Zave, 1997; Kovitz, 1999), or problem domain analysis (Bray, 2002). Davis (1993) defines the term problem analysis as the activity that encompasses learning about the problem to be solved, understanding the needs of potential users, trying to find out who the user really is, and understanding all the constraints on the solution. However, according to Kotonya and Sommerville (1998), problem analysis cannot rely only on learning the details of a specific problem that requires some kind of systems solution. Instead, it requires a focus on understanding the problem domain, including business context and stakeholders' needs, which necessitates an extensive elicitation task. Therefore, Kovitz (1999) defines the term requirements analysis as learning the problem and the problem domain from the customer, and communicating this information to the rest of the development staff by writing a requirements document. A quite similar definition of Kovitz (1999) comes from Bray (2002) referred to as problem domain analysis. Bray (2002) defines it as the achievement of understanding problem domain and the documentation of the characteristics of that domain and the problems (requiring solution) that exist within that domain. According to Wieringa (2004), if RE is to define a problem, then requirements should describe what the problematic phenomena are, what the causal relationships between these phenomena are, by which norms these phenomena are problematic, and which stakeholders have these norms. From a common sense, it can be said that all aforementioned definitions obviously serve to introduce the concept of RE as problem definition, learning about problem domain and finding out what the problems to be solved are.

2.4.3.3 RE as Solution Design

The view of RE as solution specification is taken by a number of authors on requirements (Davis, 1993; Robertson and Robertson, 1999). In this view, requirements consist of: a specification of the context in which the solution system will operate; a list of desired functions of the system; a definition of the semantics of these functions; and a list of quality attributes of those functions (Wieringa, 2004). According to Hull et al. (2010) solution system requirements shall encompass: (a) the context of the solution system within its environment defined with respect to: the existing systems with which the new system is required to co-operate, people who are intended to interact with the system, the threats that the system must defend against, and the adverse effects that must be prevented; (b) the internal functionality that the system must exhibit; (c) a specification of the internal structure of proposed system (i.e. architectural components of system and the way in which they interact).

2.4.3.4 Reflections on Requirements Views

Based on the foregoing, some key features related to each view of requirements can be derived. RE as problem definition focuses on requirements in problem domain which often starts with a vague statement or wish list. However, RE as solution specification focuses on requirements in solution domain which often starts with a well-formed set of requirements (Hull et al., 2010). Given these facts, one can argue that a solution system is basically built to solve problems so that it is crucial for it to produce some effects within the problem domain. Hence, it is these desired effects that constitute the requirement (Bray, 2002). Based on this, requirements can be regarded as being not much different from the problem itself so that the focus should be shifted from the solution domain to the problem domain and requirements should be viewed as problem-oriented. Aligned with the main focus of this thesis being conceptualisation of the real-world recruitment problem in pursuit of defining a specific problem to solve, the problem-oriented view of requirements will be adopted. Therefore, this problem-oriented view will be reviewed in the next section.

2.5 Problem Defintion and Representation

2.5.1 Definition of the Concept of Problem

The concept of *problem* is central in research on systems and software engineering (Jackson, 2001). More broadly, it presents in every study requires action-oriented thought (Smith, 1993). Despite this centrality and its widespread use, it is still not clearly defined. Osigweh (1989) states that problem is a vague concept: the more a word of 'problem' is used for everything, the less we know what it means. One common definition is that it is a gap, difference, or disparity between what is and what might/should be (Smith, 1993; Landry, 1995). Another definition of Agre (1982) is that a problem is an undesirable situation that is significant to and may be solvable by some agent, although probably with difficulty. According to Landry (1995), the key characteristics of the presence of problem can be concluded as follows:

- Problem is an unsatisfactory situation.
- The existence of gap between preferences and reality.
- The importance of closing this gap (i.e. solution).
- The expected difficulty or uncertainty arising from where the means to close the gap are, either not obvious or not immediately available.
- A sense of minimal control (e.g. available resources) over situation or event.
- Problem has an owner/solver.
- Problem changes over time.
- Problem has a boundary.
- Interrelated with another construct "opportunity" which draws attention to potential goods, instigating thoughtful problem solving activity.

2.5.2 Definitions of Problem Definition and Representation

Problem definition is a broad term that interrelates with many similar terms defined by the theorists such as problem setting, problem representation, problem framing, and problem locating. Problem setting is defined as the intellectual process by which a problem situation is translated into a specific problem (Majone, 1980). Smith (1993) defines problem representation as developing a mental picture of a problematic condition that can be externalised in various symbolic media in a means of solving it. Problem framing is the process in which one selects and organizes important aspects of a problematic situation, and identifies particular concerns

therein (Jackson, 2001). Maier (1963) describes the notion of locating the problem as identifying obstacles that prevent attainment of an objective. To some extent, problem definition can be referred to as setting, representing, framing, and locating problems. From a RE perspective, Kovitz (1999) defines problem definition as converting an open-ended problem into a well-defined problem.

Problem representation or modelling – the construction of abstract descriptions, objective or subjective, that are amenable to interpretations – is a fundamental activity in problem definition (Smith, 1989; Nuseibah and Easterbrook, 2000; Osada et al., 2007; Vergidis et al., 2008). Arguably, problem definition is a representation of problematic situation expressed in some form (Smith, 1993). A support of this argument comes from cognitive theories which hold that problem solving works from a mental representation of a problem, and that performance is significantly affected by representational adequacy (Shaw and Gaines, 1996; Nuseibah and Easterbrook, 2000). To adequately represent a real-world problem, this demands a complex representational model to be employed (Kossmann and Odeh, 2010; Checkland and Poulter, 2010). However, there is no such existing modelling technique that can capture all aspects of a complex real-world problem (Vergidis et al., 2008; Pedell et al., 2014). Therefore, the representational adequacy is relative and dependent on many factors such as the paradigms of knowledge generation (Landry, 1995); the views of problem definitions (Smith, 1989); the type of business (Osada et al., 2007); the type of project (Kettinger, 1997); they type of product (Nuseibah and Easterbrook); the purpose of the model used (Aquilar-Saven, 2004); and the elements (i.e. notations) and capabilities of the model used to express that problem (Vergidis et al., 2008). This makes each modelling technique having distinctive advantages and disadvantages. In next sections, the relationship between problem definition/representation and knowledge generation is explained. Consequently, the key views of problem definition, the key modelling approaches related to each view, and the evaluation of these views and approaches in relation to the real-world recruitment problem are presented.

2.5.3 The Relationship between Problem Definition and Knowledge Generation

There is a mutual connection between problem and knowledge (Churchman, 1971). To conceptualise a problem, knowledge is essential for such activity. It seems difficult, if not impossible, to recognise a problem and evaluate whether it deserves a further investigation without recalling previously acquired knowledge. On the other hand, the emergence of problem

produces an inquiring process that is a knowledge generation process. Hence, Landry (1995) states that "*it is only by reference to a previous state of knowledge that the genesis of a problem can be explained; it is only by producing knowledge that a problem can be solve*". Given this relationship, Landry (1995) suggests that the major views of problems can be conceptualised by looking at the different ways by which knowledge is generated. This refers to epistemology where knowledge forms its central component.

There are a bundle of theories related to epistemology. However, a fundamental one is Piaget's (1970) genetic epistemology. According to this theory, any activity of knowledge generation must imply a knowing *subject* and a physical or ideal *object* to be investigated. As such, Piaget points out three major directions in epistemology in regard to the relative importance of the subject and the object in knowledge generation activity. These are: the objectivist view where knowledge mainly produced from the object; the subjectivist view where knowledge mainly produced from the subject; and the constructivist view where knowledge mainly produced from the interaction between the subject and the object. These trends will be explained in the next section along with their implications on Smith's (1989) problem definition process (i.e. problem identification, problem representation, and problem structuring).

2.5.3.1 The Objective View of Problem

Empiricism is an essential component of the objectivist view. It posits that knowledge originates from experience that it imposes itself on the subject. Hence, the knowledge is object-dependent and reflects the organised concrete entities of the outside world. In other words, there is an existence of a reality that is external and independent of the knowing subject and the way this reality is known is through experience. In this way, knowledge is seen as mirroring reality in the sense of being a carbon copy of it (Landry, 1995).

Characteristics of Problem's Objectivist View	
1. **Emphasis of View**	▪ Problems are concrete entities or abstract ones ▪ Analysis of hard facts as being the key of the legitimisation of the whole knowing activity ▪ More oriented to analysis of problematic reality (i.e. *what is)* than searching for goals (i.e. *what might/could* be) as goals are exogenous variables
2. **Knowledge is mainly orginated from**	▪ From the object
3. **Problem Definition Process**	
a. Problem Identification	▪ Autonomous emergence of problem independent of subject ▪ Problem assumed to be known with external object assessment ▪ Problem is identified though observation and discovery of empirical facts ▪ Problems originates from inconsistency or deviation of standards of normality and desirability
b. Problem Representation	▪ Problem is represented independently of actor ▪ Representing the just-discovered unsatisfactory reality ▪ Reflecting the organised entities of the outside world in their own rights
c. Problem Structuring	▪ Rigorous/coercive investigation strategy is required ▪ Uncovering 'real facts' of the problem to the point where an intervention is possible ▪ Understanding problem and its situation based on analysis of quantitative data ▪ Conflicts, if any, must be resolved empirically ▪ There is only one real problem but stakeholders provide clues to it ▪ Judgement on right/wrong problem is reasonable based on empirical grounds
4. **Role emphasised**	▪ Solver not owner
5. **Origin of View**	▪ Operations Research (O.S)
6. **Supporting Theories**	▪ Empiricism & Platonism
7. **Examples of View**	▪ Garbage Can Model (Cohen et al., 1972) ▪ Problem-solving and decision making approach (Kepner and Tregoe, 1975)

Table 2.1 The Objectivist View of Problem

Hence, the subject's role is reduced to encoding and recording incoming experience with no role in the organisation of objects uncovered by that experience. Another theory of this view is Platonism. This theory also puts a great deal of emphasis on the object to be known. In contrast to empiricism, this object is an ideal one (i.e. ideas and abstract entities), not a concrete one. However, there must be no confusion with that which in the subject's mind which will be discussed in the next view.

In the objectivist view, problems are treated as if they were part of the external reality whether it is physical, social, or ideal. The Table 2.1 presented earlier lists the major implications of this view on the activities of problem definition. As depicted, problems have an autonomous existence that does not depends on any subject's knowledge despite that someone must be aware of their existence. A problem is realised when someone first notices elements of reality or is faced with external events of irregularity or inconsistency. Problem identification is seen as an objective assessment of what is empirically observed. Scoping of a problem is also an empirical question. The definition implies depicting what just-discovered as being unsatisfactory and uncovering its structure to the point where a solution can be proposed. The view of problem from the objectivist paradigm leads to better ways of problem discovery and problem solving process. The contribution can be seen through possible distinction of right/wrong problems, and no biased interpretations since the emphasis of problem is on concrete facts which really exist, not on stakeholders' knowledge. Another contribution of this view is that since the active and decisive role is of the experts rather than several actors and stakeholders involved, a minimal problem analysis effort is needed, and an accurate and systematic solving process is possible.

2.5.3.2 The Subjective View of Problem

Many theories fall into this paradigm. Two major theories will be discussed here are apriorism and conventionalism. Apriorism implies that the general nature of the world could be established by wholly non-empirically demonstrative reasoning (Bullock and Stallybrass, 1981). The philosophy derives from that something knowable, if at all, by inference from what is known of mind. Conventionalism sees the knowing subject as being pre-equipped with some fixed epistemic categories and actively engaged in structuring incoming perceptions within those categories (Bullock and Stallybrass, 1981). They stress that scientific theories are not summaries of passively received experience, but are free creations of the mind for the simplest and most convenient interpretation.

Characteristics of Problem's Subjective View	
1. **Emphasis of View**	▪ The nature of world could be established by wholly non-empirical demonstrative reasoning ▪ Problems are conceptual entities (i.e. artefacts made by people rather than existing concrete entities in the real world) ▪ Without owners, there can be no problem so that knowing actor's perspectives is much more important than the facts ▪ Heavy emphasis on communication and argumentation as the keys to legitimising the whole process ▪ Concrete intervention into subject's environment as interpreted and reframing the perceptions
2. **Knowledge is mainly orginated from**	▪ From The subject
3. **Problem Definition Process**	
a. Problem Identification	▪ Problem must be associated with a subject ▪ Problem can be inferred by self-reflection ▪ Problem can be aspiration-level triggers
b. Problem Representation	▪ Problem represents the subject more than anything else (subject-dependent) ▪ Reflecting the mind's categories and structure ▪ Depicting the subject views of problem (i.e. how they see it and why?) ▪ Intended to facilitate subject communication and argumentation ▪ Acceptability measure for validity
c. Problem Structuring	▪ To structure someone's mind: fitting incoming perceptions with mentally stored ones based on personal moral and values ▪ Translating and articulating of the uncomfortable state of mind experienced and explaining the essence of problem in a way that suggests a more desirable state of mind ▪ Reconciling different views of actors ▪ Substantial difference between collective problem and individual one
4. **Role emphasised**	▪ Owner more than anyone else
5. **Origin of View**	▪ People stream of problem structure
6. **Supporting Theories**	▪ Apriorism & Conventionalism
7. **Examples of View**	▪ People stream (Pidd and Woolley, 1980)

Table 2.2 The Subjectivist View of Problem

Unlike the objectivist paradigm, the subjective view maximises the role of subject in knowledge generation. Table 2.2 lists the major implications of this view on the activities of problem definition. The view mirrors problems as artefacts that do not exist by themselves; rather they are made by the subject. Thus, a problem is an abstract entity resulting from a subject's attempt in structuring incoming perceptions and making them fit with both previously accumulated perceptions and with personal, moral, rational or aesthetic values. This activity triggers a state of uneasiness in the subject's mind. To intervene in a problem is to find a means to relieve this state. As such, problem solving is the process of investigating and selecting the most convenient means to transform the uncomfortable state into another state more desirable in agreement with the subject's moral, rational, personal values. Scoping the problem relies on the subject's mind as the one that will be the ultimate judge of the boundary of problem and will be able to distinguish between the right and wrong problem. The view of problem in a subjective paradigm logically offers better ways of organising problem definition. Communication and arguing are central activities that must be facilitated during the whole process. Hence, knowledge of the actors' views becomes much more important than having the facts. A major emphasis must be placed on the quality of the arguments supporting the actors' positions. However, the difficulty lies in reconciling and integrating different views.

2.5.3.3 The Constructive View of Problem

This view is a result of some kind of interaction between a subject and an object. The view implies that both the object and the subject are actively engaged into knowledge generation activity. To give an overview of this view, Piaget's genetic theory (1970) will be taken into account. The constructive paradigm builds on the constant interaction between subject and object in search for adaptation (Landry, 1995). However, it is only through knowledge that the subject can adapt with the objects. Knowledge provides the subject with a bank of potential actions on the objects thereby favouring adaptation. On the other hand, knowledge is generated by actions on these objects. Thus, knowledge and action are recursively connected. Unlike the previous views, it is action rather than observation or self-reflection by which the subject learns about environment and adapt with it. According to Piaget, adaptation is achieved through action in a quasi-automatic mode as long as it is successful. When it fails, a switch to reflection before further action becomes essential. In the knowing activity, the subject must somehow assimilate the object within his/her cognitive structures otherwise the object will not be recognised. In

contrast, the cognitive structures of the subject must be modified to accommodate the newness in the object.

Characteristics of Problem's Constructive View	
1. Emphasis of View	▪ Active interplay between object and subject ▪ Problems are not concrete but grounded in some objective reality ▪ Problems are not unique reflection of the subject's mind ▪ Problems are very pragmatic devices used by subjects to organise their continual adaptation activities with an object
2. Knowledge is mainly orginated from	▪ From interaction between subject and object
3. Problem Definition Process	
a. Problem Identification	▪ An acknowledged need of adaptation with objects (i.e. a judgement that something should be undertaken) ▪ A recognised interest of inquiry about the reasons of an undesirable situation, in order to remedy the situation
b. Problem Representation	▪ Construction of multiple representations of reality ▪ Which representation is best suited for adaptation ▪ Validaty relates to the improved capacity of adaptation
c. Problem Structuring	▪ Reflections and negotiations on the problem representations being both objectively valid and subjectively meaningful ▪ Delicate balance between different facts, interests and perspectives plan and trigger an adaptation activity.
4. Role emphasised	▪ Owner and solver
5. Origin of View	▪ Business and management studies
6. Supporting Theories	▪ Piaget's genetic epestomology
7. Examples of View	▪ SAST (Mason and Mitroff, 1981) ▪ SSM (2010)

Table 2.3 The Constructivist View of Problem

In Table 2.3, the constructive view of problem considers the concept of problem as very much action- and adaptation-oriented (Landry, 1995). This paradigm keeps some features from the previous views and rejects others. For example, problems are not concrete but are grounded in some objective reality. On the other hand, problems are not exclusively subject-dependent. Problems are very pragmatic devices used by the subjects to organise their continual adaptation activities. In Piaget (1970), he suggests that there is no problem without a recognised interest in adaptation by someone bearing a judgement that something should be undertaken. Hence, problems are neither given not created; but are identified and retained by the subject. Problem is defined through the construction by the subject of a representation of the object which is at the origin of the adaptation. To solve the problem is to reflect on the selected representation in a way to plan and trigger an adaptation activity. However, there might be several representations that clash and that reconcilable only with difficulty. In this case, an emphasis must be on the search for equifinal representations where a delicate balance between different facts, interests, and perspectives can be obtained.

2.5.3.4　Reflection on the Three Views

The review of literature on the views of problem definition from knowledge generation perspectives has brought forward several findings that together support our understanding of these views and their different implications on problem definition and representation. To this point, a generic comparison between the different characteristics of each of these three problem views is carried out. This comparison is used by the author as a roadmap to select the appropriate view to define the real-world recruitment problem, and to evaluate the various views of problem definitions and representation approaches that are represented in section 2.4.4. In the last-sections, the impact of each problem view, be it objective, subjective, or constructive, was mapped into each activity of the Smith (1989)'s problem definition model. Here, the purpose of the comparison is to provide an insight into the overall impact of these views as well as their key characteristics, see Table 2.4.

Characteristics of View	Comparison between Problem Views of Knowledge Generation		
	Objective	Subjective	Constructive
What is problem situation?	Objective unsatisfactory reality	Uncomfortable state of mind	An acknowledged need for adaptation
How is problem triggered?	By sensing	By feeling	By recognising the failure of an adaptation activity
What is the genesis of problem?	Discovery, detection, or finding	Feeling, sensing, or experiencing	Raising
What is the focus of problem?	Object-oriented (i.e. hard)	Subject-oriented (i.e. soft)	Both object- and subject-oriented (soft & hard)
What does problem reflect?	Reality	The knowing subject	The result of subject's interaction with object's
How is reflection achieved?	Observation	Self-reflection	Constructing representations of objects
What is the criteria for problem definition?	Fit with facts	Acceptability	Improved capacity of adaptation
How is problem structured?	Uncovering the structure of reality	Structuring one's mind	Constructing a representation of an object to plan an intervention
What are the typical activities?	Fact finding	Communication and conciliation	Participation in the adaption activity of the organisation
What is the attitude of problem owner/solver?	"The expert knows best"	"the owner knows best"	"let us work together"
What is the paradigm of problem analysis?	Coercive/directive	Empathetic	Negotiative
What is focus of problem representational models?	Models for goal-seeking (i.e. decision theory)	Cognitive-based	Models for learning (i.e. decision-assistance theory)
What is the language of problem solving spoken?	"Problem" and "solution"	"Perceptions" and "reframing"	"Issues" and "assimilation & accommodation"

Table 2.4 A Comparison between the Views of Problem from Knowledge Generation Perspectives

Table 2.4 A Comparison between the Views of the problem from knowledge generation perspectives

The review of literature has shown different directions in relation to real-world problem definitions. On one hand, those theorists who challenge that a real-world problem can be defined. In this regard, they claim that the social world is too complex to properly define (Pedell et al., 2014; Morris et al., 2011). Checkland (1981) also argues that unstructured problems cannot be defined, since time changes the problem and one's perceptions of it. Proponents of this direction may regard problem definition as a discretionary activity that one might choose not to do (Smith, 1993). One the other hand, those claim that a well-chosen problem definition is necessary although by no means sufficient (Checkland and Poulter, 2010). With this direction, the quality of problem definitions vary according to the three views: objectivism, subjectivism, and constructionism. As explained earlier, objectivists claim that some problem definitions are better than others (van der Aalst, 1996). They assert that only a relatively small set of structurally significant problem elements need to be captured in a formal representation (i.e. mathematical models (van der Aalst et al., 2003; Vergidis et al., 2008). Subjectivists propose that a given problem can be defined from various stakeholder perspectives, beliefs, preferences, or capabilities, however, there are no better or worse definitions since there being no grounds for preferring one definition over another. Hence, a problem can be expressed by any number of equally valid definitions (Shaw and Gaines, 1996). Constructionists suggest that problem definition implies the construction by the subject of a mental representation or the search for equifinal representations of the concert object which is at the origin of the adaptation search (Checkland 1981; Checkland and Poulter, 2010). Unlike the subjective tradition, this definition is somehow grounded in some objective reality but it is not as 'correspondence to reality' as in the objectivist view. However, it is still relativistic proposing that there is no absolute way to guarantee the quality of definition.

The foregoing has shown that the three views of problem definition tend towards relativism. This highlights a gap in the existing research in relation to the lack of a clear guidance on the criteria on which a specific view can be adopted for problem definition. Nevertheless, there is some evidence that can be used as justification for the choice between these views. Objectivism trades an approach in which the effective validity of problem definition can be achieved through a formal representation that reflects the problem's structural heart (Phalp, 1998; Vergidis et al., 2008). This approach typically requires a problematic situation to be all represented as quantified variables and relationships. This approach has been criticised for some drawbacks. One is that it ignores the conceptual entities included in a real-world problem (Pedell et al., 2014; Morris et al., 2011). Second, not all problems can have the underlying structure that this

approach supports (Tiwari, 2001; Pedell et al., 2014). Third, some theorists argue that the syntax and semantics of a problem definition (i.e. representation) don't evidence its quality (Smith, 1993; Aquilar-Saven, 2004). Given the real-world recruitment problem involves a set of cognitive, social, organisational aspects, this view is inappropriate for defining and representing the real-world recruitment problem.

In sharp contrast, subjectivism defines problems as conceptual entities (i.e. artefacts), that is they are made by people rather than existing as concrete entities in the real world. Hence, there is no such thing as the problem, or even the real problem, but differences in perception by individuals and group (Landry, 1995). This approach may produce a number of problem definitions (i.e. representations) that are subjectively meaningful, but no guarantee being objectively valid (Smith, 1989; Smith, 1993). On the other hand, constructionism seems to fill some gaps that both subjectivism and objectivism suffer from. It asserts the existence of an objective reality on which the cognitive representations of problem are based and formed by the subject (Landry, 1995). In this way, these mental representations, whatever their limitations, are inevitably employed, making it desirable that problems be defined and represented as effectively as possible (Checkland and Poulter, 2010). This view provides fruitful contributions to real-world recruitment problem definition which makes it the appropriate selection for the purpose of thesis. First, definitions resultant from this view are closer to reality than other views, and more likely to inform problem solving. Second, in this view, problem definition or representation is a less constrained form of formal modelling while it still addresses the problem's heart. Third, a given problematic situation involves different stakeholders with different values and perspectives that cannot be easily compared, resulting in no grounds for preferring one definition over another (Smith, 1989; Shaw and Gaines, 1996). Hence, it is only by this view that these values and perspectives must be defined and reconciled to encompass the values of all parities (Viller and Sommerville, 2000; Checkland and Poulter, 2010).

2.5.4 Views on Problem Definition and Representation Approaches

There are different views of what problem definition is or involves. Each of which may have a number of representation approaches. The views and their major reorientation approaches are discussed in next sections.

2.5.3.1 Gap Specification

Problem can be viewed as an existing state-desired state gap (Landry, 1995; Vallejo al., 2012). Hence, problem can be defined as the specification of this gap provided that both states can be described appropriately and compared. However, there is a difficulty in describing these states because of some reasons. One is that problems may evolve and emerge during problem definition (Wieringa, 2004; Hull et al., 2010). Another reason is that problem cannot be defined without identification of the factors and circumstances that are making the situation problematic (i.e. obstacles, conflicts, etc.) (Nuseibah and Easterbrook, 2000). The specification of an existing state-desired state gap can be represented (i.e. expressed) by natural language with concrete and operational terms (Smith, 1993).

2.5.3.2 Scoping and Bounding

This view of problem definition denotes where the problem is located. To define a problem, an appropriate scope of the problem situation must be set (Smith, 1993; Nuseibah and Easterbrook). Different scopes of the problem situation leads to different problem definitions and representation (Osada et al., 2007). In this regard, two issues must be taken into account (Smith, 1989): Breadth (i.e. the amount of complexity that can be appropriately be included at the same level of generality); and depth (i.e. the various levels of generality at which problems can be defined). Defining the scope of problem situation can be set more or less broadly using different steps in a goal hierarchy, different points in a causal chain, different systemic levels, or based on the extent of evidential support (Smith, 1993). In some cases, the view sometimes refers to the geography and location-related aspects of problem situation (Checkland, 1981). Scoping implies the balance between the desire to focus attention and the need to ensure that important considerations pertaining to the problem situation are not neglected.

For this view of problem definition, there are a number of approaches proposed for setting and representing the scope of a problem. One very common representation method is *context diagram*. Context diagram defines the boundary of the problem from a system perspective, showing the intended system, or part of a system, and its environment including the adjacent systems that interact with it (Robertson and Robertson, 2012). This diagram is a high level view of a system. Another representation method is problem diagram (Jackson, 2001). Limited to the scope of software problem, Jackson (2001) supports the types of things shown on a context diagram with requirements and requirements references. Other approaches proposed for

scoping a problem are Stakeholder, Goal, Scope (SGS) (Robertson and Robertson, 2012); Use Case diagram (Stevens and Pooley, 2000).

2.5.3.3 Specification of Goals, Values and Preferences

This view relates to why the problem needs to be solved. Within this view, a problem can be defined by specifying the goals and values pursued by problem solving activity (Smith, 1989; Easterbrook, 2004). This involves: identification of ultimate stakeholders' values and preferences; specifying a particular goal state to be achieved; and identification of means or strategies towards the achievement of the goal state. There are some key issues related to this view of problem definition. First, there are various stakeholders affected by the problem so that they all must be identified and taken into account by an effective solution. Majone (1980) cautions against overlooking relevant stakeholders. Secondly, a single stakeholder can have multiple values that are difficult to determine. Thirdly, stakeholders can be mistaken about the preferences they have expressed as well as the assumptions about effective means and strategies towards solution (Kavakli, 2004).

For this view, goal-oriented approaches are commonly used for problem representation. One key example of these approaches is goal modelling (Kavakli, 2004). Goal modelling is based on the premise that in collaborative work situations, people are aware of and share common goals and act towards their fulfilment (Kossmann and Odeh, 2010). Hence, the problems associated with business structure, resources, processes, and their supporting systems that inhibit the achievement of these goals can be defined (Kavakli, 2004). However, a real-world problem concerns the goals of humans which is not simple to model for several reasons: (a) they are not known in advance; (b) they are often abstract and imprecise and can evolve during the life of a project; and (c) the means that lead to goal achievement are not known beforehand.

2.5.3.4 Causal Diagnosis

The problem can be defined by identification of many possible causes of the problem state. However, a problem situation can be understood as the product of both higher macro-causes and lower micro-causes (Smith, 1993). Thus, more general or underlying causes should not be neglected in defining a problem. Defining the problem in terms of one throws others out of consideration might misdirect the process of problem solving problem. Another issue is that a real-world problematic situation is a mess (Ackoff, 1979), consisting of many intertwined causes.

Hence, it is necessary to encompass the complexity with a problem situation by ensuring that underlying causes are adequately understood and effectively addressed. Key representation approaches in this view are cause-effect diagrams or fish bone diagrams (Kettinger et al., 1997).

2.5.3.5 Perspective Setting

Problem definition involves an interpretation of the observable facts by different individual worldviews. Problem definition needs to be sensitive to how stakeholders perceive and understand the world around them (Nuseibah, Easterbrook, 2000). However, the challenge is the notion of a shared understanding of the world by all relevant stakeholders (Smith, 1993). A key approach used to represent these different perspectives is Soft Systems Methodology (SSM) (Checkland and Poulter, 2010). The SSM provides techniques such as CATWOE and conceptual models that are used to capture and represent different system perspectives. Another approaches could be mind maps and low-fidelity prototypes (Robertson and Robertson, 2012).

2.5.3.6 Linguistic Variations

Problems can vary according to the language used to express them. A problem can be expressed by various linguistic forms, some of which may have subtle and potentially important effects on problem definition. Linguistics are important because problem definition is largely about communication (Nuseibah, Easterbrook, 2000). To address these variations and enable communication and sharing of different problem-related concepts and terms, ontologies are commonly used with problem definition and representation (Annamalai et al., 2011)

2.5.3.7 Problem Framing

Problem framing is the process in which one selects and organizes important aspects of a problematic situation, and identifies particular concerns therein (Jackson, 2001; Hall et al., 2008). This frame captures the characteristics and relationships of the parts of the world it is concerned with, and the concerns and difficulties that are likely to arise. This helps to focus on the problem space instead of moving into the solution space. Some key representation approaches are problem schemas (Smith, 1993), and problem frames (Jackson, 2001). In these

approaches, frequently occurring problem structures and types are identified and related to a problem frame. However, they have been criticised being limited in scope; and focusing on the objective aspects of problems (Hall et al., 2008).

2.5.3.8 Business Process View

This view of problem definition concerns *how* a problem manifests itself, or *how* a solution might be achieved from a business perspective. It is based on the claim that managing a business problem means managing its processes (McCormack and Johnson, 2001). Hence, Davenport (1993) defines a business process as a structured set of activities designed to produce a specific output. This view of problem definition has been widely criticised being limited to operational aspects (Melao and Pidd, 2000; Lindsay et al., 2003), while a real-world problem is more complex than the input-transformation-output relationship (Lindsay et al., 2003). In response to this limitation, Melao and Pidd (2000) classify four views of business processes: deterministic machines; complex dynamic systems; interacting feedback loops; and social constructs. Such classification encouraged a bundle of business process modelling techniques with different perspectives of use to emerge (Aguilar-Saven, 2004; Vergidis et al., 2008). These modelling techniques suffered from the lack of guidance of how to properly select them for use in a certain cases (Bushell 2005; Kemsley, 2006; Skrinjar et al., 2007; Van der Aalst, 2013).

To remedy the gap, a number of frameworks were proposed to classify these modelling techniques based on their uses and capabilities. Kettinger et al. (1997) provide a variety of modelling techniques and tools with some guidelines for use. Aguilar-Saven (2004) presents a set of the main process modelling techniques and classifies them based on two dimensions: the purpose of use; and the mode of use (active or passive). Vergidis et al., 2008 classify business process modelling techniques according to their characteristics and capabilities for analysis and optimisation. They classify three main categories of models: diagrammatical models; mathematical models, and business process languages. As a result, they populate the major business process models to these categories taking into account that some models can serve in more than on category.

Despite these classifications of business process models give insights into some aspects of their use and capabilities, they have some limitations in representing a real-world problem. They provide no explicit distinction between business-oriented (i.e. problem domain) and IT-oriented

(i.e. solution domain) (Irani et al, 2002) on one hand; and between process-related and data-related (Fouad et al., 2011; Van der Aalst, 2013) on the other hand.

In regard to the classification of Vergidis et al. (2008), diagrammatic process models rely on qualitative notations to enable observational and subjective analysis of a problematic situation which correspond to the nature of real-world problems (Zakarian, 2001). However, the analysis depends on the knowledge and skills of the analyst (Vergidis et al., 2008). Examples of these models are flowcharts, BPMN, RAD, and IDEF. Mathematical process models and business process languages are formal having well-defined syntax and semantics for enabling quantitative, rigorous and consistent analysis of a problem situation (Phalp, 1998; Koubarakis and Plexousakis, 2002; Van der Aalst et al., 2003; Vergidis et al., 2008). Examples of these mathematical models are Petri-nets. Although they are less dependent on the knowledge and skills of the analyst, they have been criticised for many reasons. One reason is that a real-world problem often contains elements and constraints that have qualitative nature, such as decision points, feedback loops, and parallel or hierarchical flow (Hofacker and Vetschera, 2001), which makes it hard, if not impossible, to be modelled in a formal technique (Tiwari, 2001). As a result, the modelling of such a business process using formal techniques may result in complex models (Hofacker and Vetschera, 2001). Another reason is that building a formal business process model is time consuming (Aguilar-Saven, 2004) since it requires much attention to creating complex mathematical notations, maintaining formality, and retaining its consistency (Koubarakis and Plexousakis, 2002). From a modeller perspective, this might discourage the business analyst to adopt and use formal models. Finally, formal models are complex and excessively large (Aguilar-Saven, 2004) so that they are difficult to understand and validate by a business user (Phalp, 1998)

2.6 Knowledge Transfer and Best Practices

2.6.1 Knowledge Transfer

Knowledge transfer or sharing is defined by Wang and Noe (2010) as "*the provision of task information and know-how to help others and to collaborate with others to solve problems, develop new ideas, or implement policies or procedures*". Another definition by Wikipedia (2015) is "*an activity through which knowledge (namely, information, skills, or expertise) is exchanged among people, friends, families, or communities or organisations.*" According to Wang and Noe (2010), research has shown that knowledge transfer and sharing is positively related to reductions in production costs, faster completion of new product development projects, team

performance, firm innovation capabilities, and firm performance including sales growth and revenue from new products and services.

Renzl et al. (2006) classify two different approaches to knowledge transfer: (1) approaches for transferring tacit knowledge (e.g. communities of practice and storytelling); and (2) approaches for transferring explicit knowledge (e.g. best practices and patterns). The focus in this thesis is on the transfer of explicit knowledge and specifically through best practices.

2.6.2 Definition of Best Practice (BP)

BP is related to different domains and contexts, and is therefore subject to a variety of circumstantial definitions. Graupner et al. (2009) define Best Practice (BP) as "*the most efficient (least amount of effort) and effective (best results) way of accomplishing a task, based on repeatable procedures that have proven themselves over time for large numbers of people*". Investopedia (2016) defines BP as "*a set of guidelines or ideas that represent the most efficient and prudent course of actions*". According to WhatIs.com (2016), BP is "*a technique or methodology that, through experience or research, has proven to reliably lead to a desired result*".

These definitions focus on not only the content of the BP, but they also emphasise that the implementation of BP should lead to improvement in performance. Therefore, from an enterprise perspective, BP regards as a good practice if it enhances enterprise performance. The term 'best' in a BP is not used in a strictly way (Fragidis and Tarabanis, 2006). Rather, it can be sometimes only understood as promising approaches and activities that organizations may consider as useful tools and experimental practices (Fragidis and Tarabanis, 2006). This argument led to different classifications of BPs. Jarrar and Zairi (2000) divide a BP into three levels: a good idea, a good practice and a proven BP. Similarly, the American Productivity and Quality Centre (1997) proposes four stages by which a BP becomes 'best". These are: good idea, good practice, local best practice, and industry best practice.

In this thesis, the BP-related research in general and recruitment-related BPs are investigated as to whether BPs enable their values to be realised in pursuit of reusing and sharing. The investigation has shown that there are a number of challenges that impede the value realisation of BPs and consequently their reuse and sharing. In next section, some of these challenges are discussed.

2.6.3 Challenges for Reusing and Sharing Best Practices

The literature review has shown a number of challenges for the successful reuse and sharing of BPs, including the ones addressed in *Problem No 1.2.1* in the first chapter. These challenges can be outlined, as follows:

2.6.3.1   Challanges in Documenting BPs

One of the key challenges in reusing and sharing BPs is the lack of proper documentation of BPs. More precisely, incomplete description of BPs reduce their reusability. Regardless of the industry of BPs, some examples of such incomplete description are: lack of description of the purpose of the BPs and how to measure the value of knowledge within them (Hanafizadeh et al. 2009); lack of descriptions of how BPs actually work in organizations and their usefulness (Abd Rahman et al., 2011); and lack of description of the problem domain in which BPs are 'best' (Dani et al., 2006; Alwazae, 2015). Complete description of BPs is very crucial their successful application and reusing (Mansar and Reijers, 2007; Simard and Rice, 2007). Given the complexity of real-world practices, one way to promote BP completeness is to model the various attributes of a BP and establish a consistent structure for documentation (Dani et al, 2006). This will enable a proper documentation and reuse of BPs. However, the way how a BP is properly modelled and structured has not been examined extensively in the literature (Dani et al 2006). Hence, it is a knowledge gap for which the thesis attempts to fill by providing new routes for modelling and proper documenting of BPs.

2.6.3.2   Challanges in the Scope of BPs

There are many recurring problems that BPs try to capture their solutions. In terms of recruitment, there have been some BPs that are already being shared and reused to some extent in some organisations (Scheweyer, 2004; Madia, 2011). Regardless of the industry of BPs, they have been criticised being limited in scope (Simard and Rice, 2007; Scheweyer, 2004; Madia, 2011). This implies being intended to piecemeal and fragmented problems, and being seen as building blocks with no means to be combined in one meaningful entity (Stephenson and Bandara, 2007). Given that the focus of thesis is on enterprise recruitment, this scope will require new ways to capture and document enterprise recruitment best practices. This points up a knowledge gap in research for which the thesis will try to address.

2.6.3.3   Challanges in Finding and Selecting BPs

These challenges concern the difficulties in finding and selecting BPs in large collections, or repositories (Simard and Rice, 2007; Dani et al. 2006; Mansar and Reijers, 2007; Hanafizadeh et al. 2009; Vesely, 2011). In this thesis, the focus will be on providing domain-independent recruitment concepts that serve as search indices (Vesely, 2011; Graupner et al. 2009). These indices consists of terms that are not associated with a specific domain. Hence, practitioners are able to find and select BPs from different domains and industries.

2.7 Reflections of the Literature Review

The chapter presented a review of the key research domains related the overall problem of research as well as its sub-problems described in chapter 1. In reference to the failure in SA e-enlistment project (see chapter 4) and the study to explicate the problems in that project (see chapter 5), the author conducted the following: (1) an extensive review of the central issues and subjects involved in representing and defining problem situations in general and recruitment problem situations in specific; and (2) an assessment of many approaches of problem definition and representation proposed by theorists from different research domains such as recruitment, enterprise architecture, requirements engineering, and problem definition and representations. The purpose of assessment was to assess their adequacy for representing recruitment problem domain knowledge in reference to the SA enlistment problem. There were many criteria that could be used for such assessment. However, the author reduced them to the major ones: consistency and validity – their correspondence with reality; generativity – their ability to promote domain knowledge and systematic problem solving, and abstraction – their ability to represent different stakeholders' perspectives.

The results of assessment showed that there were three major views involved in representing real-world problem situations: objectivist, subjectivist, and constructionist. The objectivist view regards problem representation as a relatively objective, more or less formal modelling activity. In contrast, the subjectivist view claims that problem representation shall reflect different stakeholder perspectives on a situation. The disagreement on this issue shifted problem representation towards the constructivist view. This view accommodates the disagreement and promotes that a problem can be represented by a chosen model that is relatively grounded in reality; agreed on by all stakeholders; and best suited for problem solving.

Most of the problem representation approaches that were assessed in this chapter relatively fall into either the objective or subjective view, or sometimes share some aspects from one another. In the objectivist view, some examples of the representation models that were assessed are problem framing and mathematical process models (e.g. petri-nets). The key advantage of such models is being generative by allowing the use of computational procedures that promote insights and solution. However, they represent a small set of structured problem concepts that are amenable for formalism, and oversimplify the complexity of real-world problems. Another limitation is that they reflect the modeller's perspective rather than the stakeholders' perspectives. Back to the SA enlistment case study, these models are impropriate for representing such a real-world recruitment problem whose complexity is derived from the various subtle and social concepts it includes.

For the subjective view, some of the models assessed are low-fidelity prototypes and mind maps. The key advantage of such models are that they can encompass the richness of real-world recruitment problems by being conceptual and able to incorporate different perspectives. This make them suitable for representing and defining problem concepts. Smith (1989) defines problems as "conceptual entities that do not exist in the world, but must externalised and represented". However, these models, being conceptual and loosely defined, have been criticised that they represent problems as being designed, not found in the external reality which, in turn, makes them less generative than objective models.

In addition to the models that are clearly related to the two categories (views) above, the assessment came over a set of models that relatively share mixed aspects from both categories. One example is Enterprise Architecture (EA). A core set of EA models that were assessed are Zachman, TOGAF, and FEA. The assessment of these models showed that these frameworks conceptualise the enterprise according to the objective view of things, e.g. buildings, with a great focus on the visible aspects (i.e. the externally visible properties of enterprise components), and ignores the subjective ones (Sherwood, 2005; Ameri and Dehghan, 2013). However, a good representation model of a real-world problem should support every perspective including the subjective aspects not only those visible ones, and promote the desired integration of such overlooked aspects (Penaranda et al., 2010; Vallejo al., 2012).

Other key examples of the models having mixed aspects were goal models and business process models. Goal models are a goal-oriented view of a problem situation built on the premise that people are aware of and share common goals and act towards their fulfilment

(Kossmann and Odeh, 2010). However, a real-world problem representation concern the goals of humans which is not simple to model for several reasons: (a) they are not known in advance; (b) they are often abstract and imprecise and can evolve during the life of a project; and (c) the means that lead to goal achievement are not known beforehand. Business process models are process-limited view of a problem. Although they are commonly used, they suffer some limitations. One was that a real-world problem is more complex than the input-transformation-output relationship. Another was that some process models provide no explicit distinction between business-oriented (i.e. problem domain) and IT-oriented (i.e. solution domain. Finally, they are more dependent on the experience and knowledge of the analyst in the problem domain.

To remedy the gaps with the two views (objective and subjective) of problem representation, the constructive view is adopted to support development of new artefacts for representing and defining real-world recruitment. A key approach in this view that would support this development is Checkland's Soft Systems Methodology (SSM) (Checkland and Scholes, 1990). SSM is a well-known approach (i.e. research framework) to capture the different worldviews and build conceptual models that are grounded in the reality and suitable for problem solving. These aspects of SSM inspired the author to adopt this approach to capture the various recruitment problem worldviews and develop root problem concepts that enable representation of real-world recruitment problem domain knowledge. This development, in turn, will contribute to solve the lack of adequate representation of real-world recruitment problem. As a result, this development would logically contribute to solve the other dependent problems explicated in chapter 1, which are related to the lack of systematic transformation of knowledge to the e-solution space and lack of documentation of enterprise recruitment best practices.

2.8 Summary

The chapter presented an extensive review of the literature related to the major areas involved in the overall problem of research as well as its sub-problems described in chapter 1. The review was guided by the framework, see chapter 5, adopted to study the root causes of the failure in the SA enlistment project. Throughout this review, the central issues in representing and defining real-world problems were defined, and many problem representation approaches and techniques were assessed for adequacy. The result of that review and assessment gave insights into the gaps in the research that might have contributed the practice (i.e. failure in the SA enlistment project).

Chapter 3: Research Methodology

3.1 Introduction

In this chapter, an overview of the research strategy, i.e. the discussion on philosophical underpinnings, is provided. The research approach that depicts the various research activities conducted for the achievement of research goals and objectives described in Chapter 1.0, and research methods adopted are explained.

3.2 Research Strategy

To achieve the research objectives, it is very important to first gain an understanding of the foundations of research. There are multiple views of how research relates to the kind of knowledge being pursued. Paradigms provide guidance towards this relationship. A paradigm is simply a belief system (or theory) that guides the way we do things, or more formally establishes a set of practices (eReseach Methods, 2013). Burney (2008) provides a useful research framework in examining the relationship between theory and practice (see Figure 3.1).
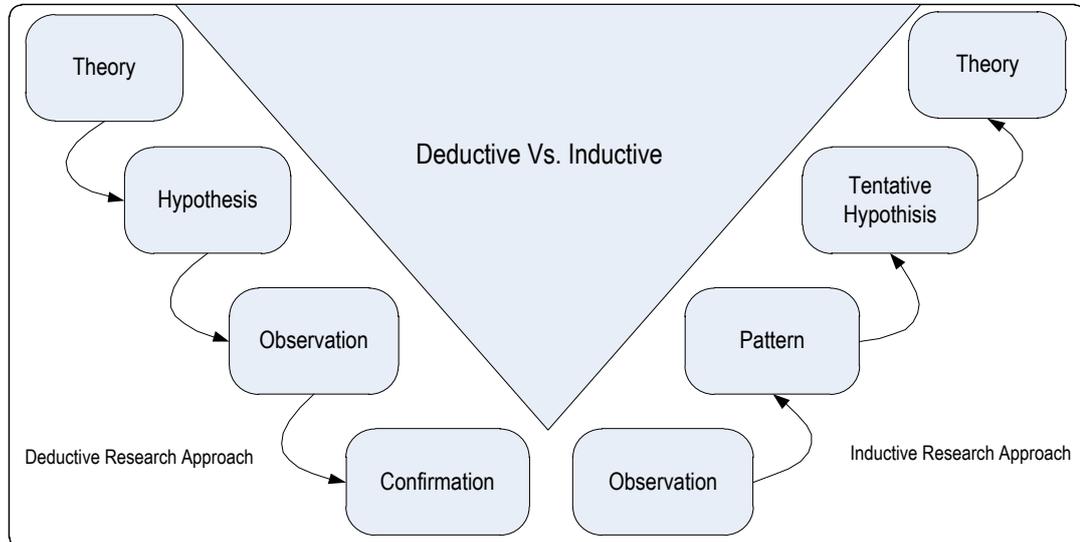
Figure 3.1 A Framework of Deductive and Inductive Research Approaches (source: adapted from Burney (2008))

In research, there are two broad methods of reasoning: deductive and inductive approaches. The deductive research method represents a positivism view, while the inductive method represents an interpretivism view. Deductive research is the art of precise, empirical observations of available facts (premises) with the objective of testing a theory. Inductive research works the other way, thereby theory being the product of induction via the observation

and reflection on experience (Kolb et al., 1979). Deduction is usually described as moving from the general and ends with the specific, while Induction begins with the specific to the general. Table 3.1 shows the differences between deductive methods (positivist) and inductive methods (interpretivist).

Positivist Methods	Interpretivist Methods
▪ Deductive	▪ Inductive
▪ Moving from the more general to the more specific (Top-Down)	▪ Moving from specific observations to broader generalizations and theories (Bottom-Up)
▪ Arguments based on laws, rules and accepted principles	▪ Explanation of subjective meaning and understanding (observations)
▪ Generation and use of quantitative data	▪ Generation and use of qualitative data
▪ Conclusion follows logically from premises (available facts)	▪ Conclusion is likely based on premises (involving a degree of uncertainty)
▪ Highly structured	▪ less structured

Table 3.1 Comparison between Positivist and Interpretivist Methods (derived from Gill and Johnson (1997) and Burney (2008))

In fact, there are a number of key considerations that guide the Author to adopt inductive research approach (interpretivist). Firstly, the initial motivation of this study is the shared interest between the Author, Secureland's Army (SA), and Central e-Government Program (CeGP) to come up with a specification of e-enlistment solution that can be generalised over the various organisations of the military sector in Secureland. This shifts the focus into the real-world recruitment problem space to be observed with the objective of contextualising the various problems to be solved by the e-recruitment solution. This results in a problem-oriented conceptual model that can be generalised as a basis for eliciting and reasoning about requirements from different recruitment stakeholders perspectives. This comes in line with an interpretivist approach. Secondly, the complexity of enterprise recruitment problem is also of high consideration. This requires a detailed view using different lenses and understanding of different issues such as social, organisational, legal, etc. This makes an inductive approach more appropriate than a deductive approach which relies on specific quantitative variables. Thirdly, the absence of comprehensive theories to explain the behaviour of recruitment participants entails that theories need to be developed. Finally, the knowledge (experience) of the application of the existing e-transformation framework proposed by the CeGP (Secureland,

2012) upon the SA's enlistment case study is available; therefore, an inductive methodology can be followed in order that theory might result from the study of such experience. In the military sector, there is scarce availability of accurate facts, quantitative data is limited and a sufficient test arena to produce worthy output from deduction is unavailable.

3.3 Research Approach: Design Science

The overall research approach used in this thesis is design science. According to Hevner et al. (2004), design science creates new artefacts for solving practical problems. These artefacts can be methods, models, constructs, frameworks, prototypes or IT systems, which are introduced into the world to make it different, to make it better (Johannesson and Perjons, 2014). Design science is, therefore, the process to generate these artefacts and test hypotheses about them, i.e., artefacts that can, when introduced, solve problems for a practice and change its future behaviour (Bider et al. 2012). Hence, the solution needs to be evaluated to assess its ability to solve a practical problem as well as to fulfil stated requirements (Hevner et al., 2004). Different strategies and approaches have been presented for design science processes and conducting solution assessment, for example, Alturki et al. (2013), Hevner et al. (2004), Kuechler and Vaishnavi (2008), Peffers et al. (2007), and Johannesson and Perjons (2014). Peffers et al. (2007) have designed and demonstrated a process for applying a design science methodology with information systems. This process consists of activities such as problem identification and motivation, objectives for a solution, design and development, evaluation, and communication. Informed by these activities, Johannesson and Perjons (2014) suggest the design science method framework shown in Figure 3.2. This framework is represented using the IDEF0 technique where channels conveying data or objects are related to each activity, and represent different types of knowledge depending on the direction of the arrows. In Figure 3.2, Johannesson and Perjons (2014) define the channels as follows:

- Input describes what knowledge or object is the input to an activity (arrows from left);

- Output describes what knowledge or object is the output from an activity (arrows to right);

- Controls describe what knowledge is used to manage an activity, including research strategies, research methods, and creative methods (arrows from above);

- Resources describe what knowledge is used as the basis of an activity, i.e. the knowledge base including models and theories (arrows from below).
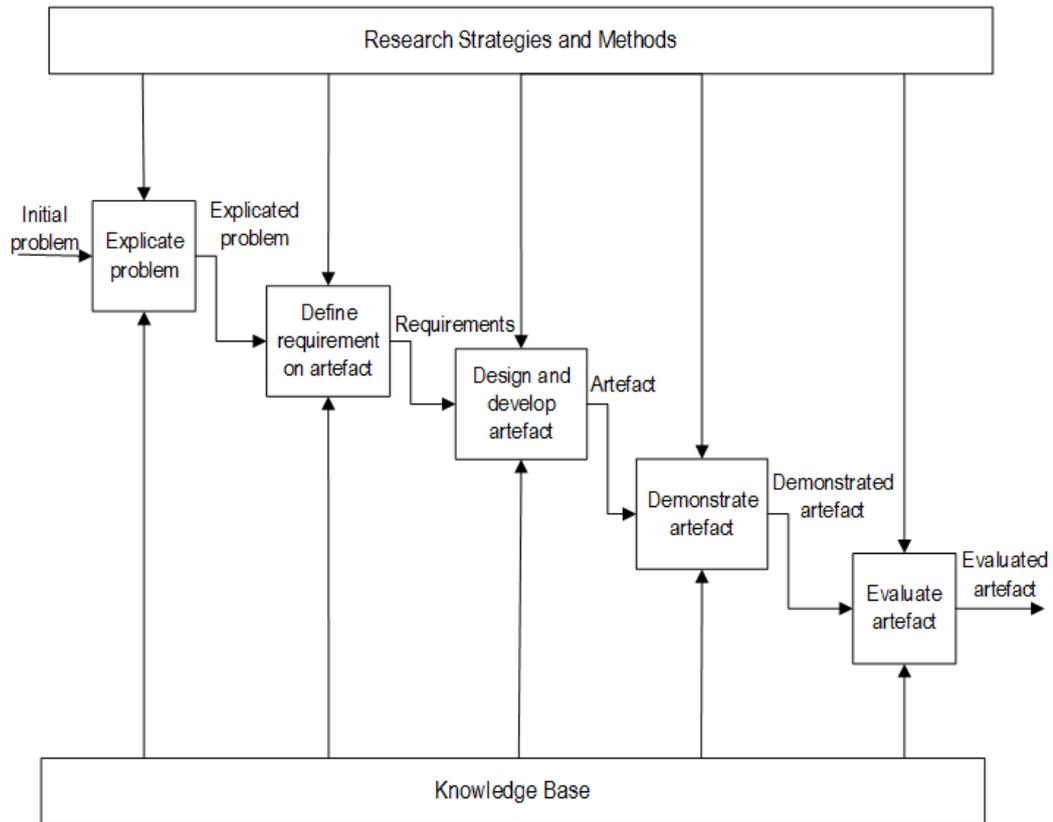
Figure 3.2 Design Science Process including Inputs, Activities, and Outputs (Source: adapted from Johannesson and Perjons (2014))

Based on the challenges faced in defining the recruitment problem of the SA's e-enlistment project of Secureland, the initial problem (i.e. *the difficulty of realising the value of e-recruitment*" was identified. After investigating these challenges using the literature reviews centred on research areas of recruitment, problem definition, and RE, the first problem was defined. This is stated in as Problem No. 1 "*The difficulty of scoping, representing, and systematically transforming recruitment problem knowledge towards e-recruitment solution specification impedes the realisation of the value of e-recruitment*", see Chapter 1. To tackle this first problem, it was divided into three sub-problems, and design science processes are carried out to create new artefacts that solve these sub-problems. Given the strong interrelatedness between the first two sub-problems (i.e. (1) the ill-defined scope of recruitment problem space and (2) the ill-representation and understanding of recruitment problem), they were concurrently tackled by one separate design process. The resulting artefacts are the POCM and Onto-RPD. For the third sub-problem (i.e. the lack of an integrative RE process) being dependent on the two artefacts designed (POCM and Onto-RPD), these two artefacts can be used as an input for another design process to develop the POCM-RAA. Similarly, the three resulting artefacts

(POCM, Onto-RPD, and POCM-RAA) are used for developing the ERM artefact to solve Problem No. 2. In the next subsections, the design science processes including the various research methods used for developing the POCM and Onto-RPD artefacts are presented.

3.4 Design Process and Methods for the POCM and Onto-RPD Artefacts

The section describes the research process and methods for designing POCM (Problem-Oriented Conceptual Model) and Onto-RPD (Ontology for recruitment Problem Definition), see Figure 3.3.
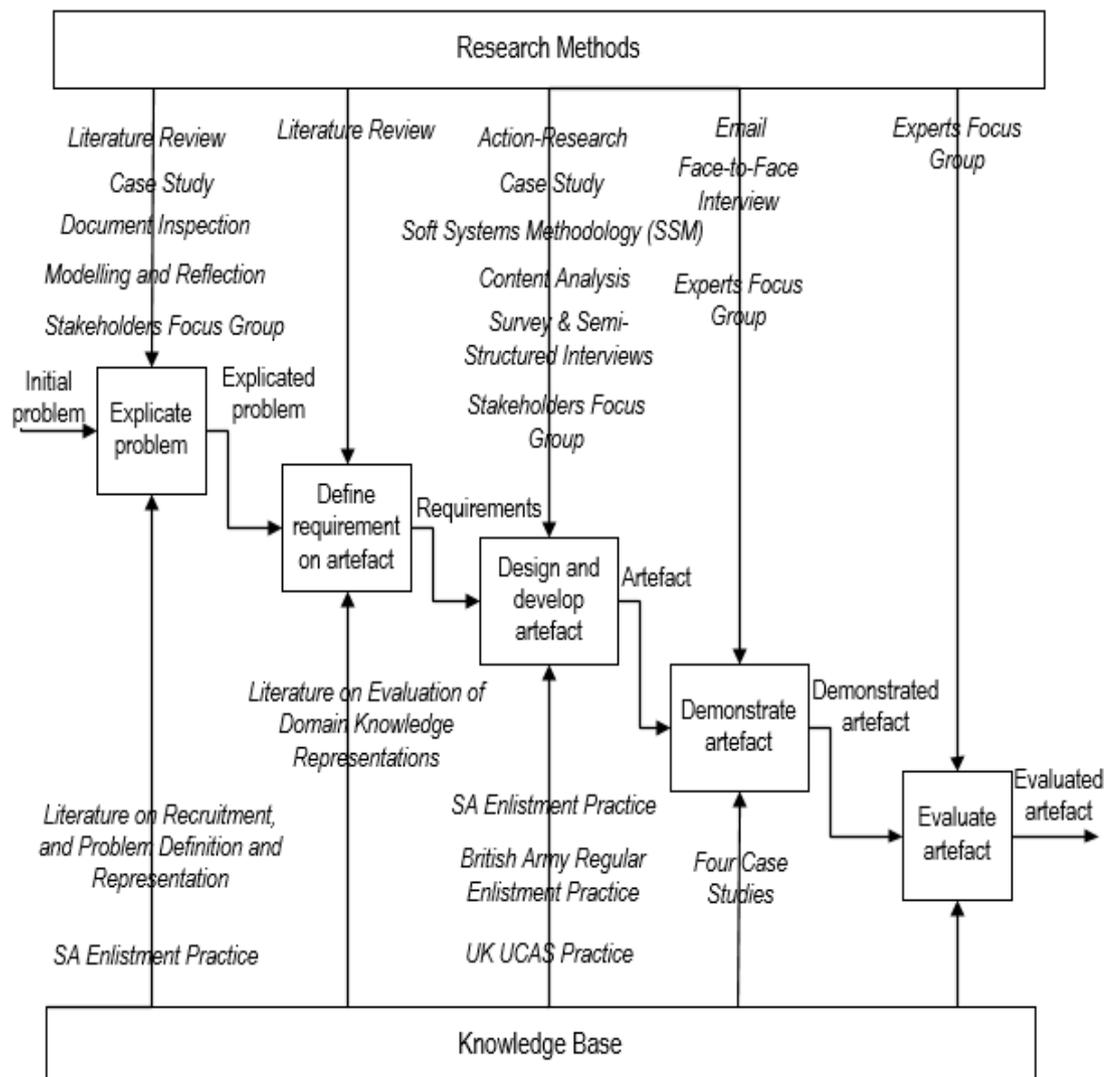
Figure 3.3 Design Process and Methods for the POCM and Onto-RPD

3.4.1 Explicate Problem

In Figure 3.3, the first activity in the design science process is to explicate the practical problem that motivates why the artefacts (i.e. in this case, the POCM (Problem-Oriented Conceptual

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Model) and Onto-RPD (Ontology for Recruitment Problem Definition) need to be designed and developed. To explicate this, a number of research activities and methods are used. First is the extensive review of the SA e-enlistment project using document inspection to identify the various challenges that led to the failure of that project, see Chapter 4. Second, in relation to those challenges, the literature related to recruitment, e-recruitment, problem definition and representation approaches are reviewed to identify the central issues and knowledge gaps in recruitment research, see Chapter 2. Third, a number of problem representation approaches are applied in practice to the SA enlistment case study to reflect and validate those issues and gaps, see Chapter 5. After the extensive analysis, two sub-problems, among others, are defined as root causes of the failure in the SA e-enlistment project. These are titled as *Sub-Problem No. 1.1* and *Sub-Problem No. 1.2,* see Chapter 1. The first sub-problem is *"the ill-defined scope of recruitment problem space*." The related knowledge gap that motivates the research to fill that *"there is a lack of knowledge about enterprise recruitment problem and the multiple organisational entities involved."* The second sub-problem is *"the ill-representation and understanding of recruitment problem."* The knowledge gap related to this sub-problem is that *"there is a lack of knowledge about how recruitment problem is best represented."*

3.4.2 Define Requirements

The second activity in the design science process is to define the requirements of the POCM and Onto-RPD. These requirements will be used as a basis to evaluate the resulting artefacts and also to guide the construction process of them and any refinement steps. Based on the literature review, this research selected the following requirements on the POCM and Onto-RPD.

Requirement 1 - The artefact(s) should be <u>comprehensive</u>.

Comprehensiveness is the degree to which the artefact(s) offers complete knowledge (Fox et al., 1998; Viller and Sommerville, 2000). According to Burton-Jones et al. (2004), comprehensiveness means the percentage of concepts in the artefact relative to the average for the entire library of concepts in the domain of interest. Osada et al. (2007) refer to this as the amount of suitable information included in the artefact. This amount should be large enough and suitable for complete knowledge. However, too huge amount of knowledge is confusing and hard to deal with (Osada et al., 2007). For this requirement, in the artefact of the POCM, we refer to the knowledge of problems, sub-problems, and relationships. However, in Onto-

RPD, we refer to the knowledge of the various concepts and features related to the problems defined in the POCM.

Requirement 2 – The artefact(s) should be <u>generic</u>.

Genericity is the degree to which the artefact(s) is shared and sector/domain-independent (Fox et al., 1998). The artefact(s) should be shared between diverse stakeholders and activities (Fox et al., 1998). Sector or domain independence means that the artefact is not specific to a sector/domain (Vesely, 2011; Smith et al. 2010). Achieving this requirement facilitates capturing, transfer, and reuse of domain knowledge from different domains (Simard and Rice, 2007). Both the POCM and Onto-RPD shall not require practitioners to be familiar with the sector or domain in which a recruitment practice is applied.

Requirement 3 – The artefact(s) should be <u>consistent.</u>

Consistency is the degree to which the artefact(s) has correct and accurate definitions compared to the existing domain knowledge (Fox et al., 1998; Osada et al., 2007). It can be also defined as the degree to which the artefact(s) constitute a coherent unit, i.e. all parts are clearly related (Smith et al. 2010).

Requirement 4 – The artefact(s) should be <u>abstract / granular.</u>

Abstraction or granularity is the degree to which the artefact(s) represents a core set of primitives that are partitionable in different levels (Fox et al., 1998; Viller and Sommerville, 2000; Osada et al., 2007). Abstraction is one of the most important criteria in evaluating the representations (i.e. artefacts) of domain knowledge (Osada et al., 2007).

Requirement 5 – The artefact(s) should be <u>perspicacious / generative</u>.

Perspicacity or generativity is the degree to which the artefact(s) is easily understood by the practitioners so that it can be consistently applied and interpreted across the enterprise (Fox et al., 1998; Porzel and Malaka, 2004; Burton-Jones et al., 2004). It is also defined as the ability of the artefact to promote effective decision making or judgement towards problem solving (Smith, 1993). From a RE perspective, it is defined as the ability of the artefact to promote effective requirements elicitation (Robertson and Robertson, 2012; Hall et al., 2012).

Requirement 6 – The artefact(s) should be minimal.

Minimality is the degree to which the artefact(s) contains the minimum number of objects (i.e. terms or vocabulary) necessary (Gruber, 1993; Fox et al., 1998).

3.4.3 Design and Development

This section describes how the POCM and Onto-RPD are developed. The POCM and Onto-RPD are jointly produced using Action-Research (A-R) (Baskerville and Wood-Harper, 1996) through the *plan, act, observe, and reflect* activities in Figure 3.4.

PLAN
- Select a case study
- Find resources for a case study
- Find a working definition of recruitment problem
- Consider the theories relevant to the working definition of recruitment
- Consider the methods, techniques, and tools to be used for the analysis of each case study selected

Final Tentative POCM and Onto-RPD

ACT
- Find out about the case study
- Use problem analysis techniques to enrich root problem definitions
- Capture the various problem worldviews
- Use encapsulation guidelines to abstract and synthesise root recruitment problem concepts, properties and relationships.
- (Re)create tentative POCM and Onto-RPD artefacts based on the working definition adopted.
- Produce new definitions of recruitment problem concepts

REFLECT
- Analyse and propose improvements in the artefacts
- Evaluate the implications of changing on the artefacts
- Run an A-R cycle if necessary (e.g. apply the artefacts to a new case study or refine them with the existing one)

SA Enlistment Case Study
BA Enlistment Case Study
UK UCAS Case Study

OBSERVE
- Evaluate the artefacts based on the requirements specified
- Compare the artefacts with the existing taxonomies in the literature
- Publish and seek expert opinion and feedback

Figure 3.4 The Action-Research Activities in the Development of the POCM and Onto-RPD

The development of POCM and Onto-RPD artefacts undergoes through three A-R cycles. In each A-R cycle, a specific case study is used with a set of research methods for analysis, see

Figure 3.4. The 1st A-R cycle is initiated by the analysis of the SA enlistment case study using the Checkland's Soft Systems Methodology (SSM) (Checkland and Scholes, 1990) as an approach (i.e. research framework): (1) to capture the different worldviews of enterprise recruitment problem, (2) to develop the root problem definitions and the multiple entities (i.e. participating roles) in enterprise recruitment, and finally (3) to develop the first tentative POCM and Onto-RPD artefacts. In the 2nd A-R cycle, the BA enlistment case study is analysed using content/text analysis to capture the various root recruitment problem concepts. These resulting concepts are used to refine the first tentative POCM and Onto-RPD artefacts. Similarly, the 3rd A-R cycle is to analyse and extract the concepts from the UCAS case study to refine the 2nd tentative POCM and Onto-RPD created in the 2nd A-R cycle. To extract recruitment problem concepts during all A-R cycles, different problem analysis techniques and encapsulation guidelines are used. The A-R cycles, the research methods used, and their results are all explained in detail in chapter 6.

3.4.4 Demonstration and Evaluation

This section describes how the POCM and Onto-RPD are demonstrated and evaluated. In the demonstration activity, the POCM and its corresponding Onto-RPD artefacts are used in real-life cases to prove their feasibility. In the evaluation activity, the POCM and Onto-RPD are investigated whether they solved the problem of research identified and fulfilled the defined requirements. The two phases, demonstration and evaluation, were conducted using one focus group over two sessions, one session for each phase.

 The two artefacts were demonstrated and evaluated by a number of Bournemouth University staff (academic and practitioner) selected with different recruitment-related experiences (e.g. HR, management, marketing, psychology, sociology, etc.). After a careful survey of Bournemouth staff database as well as a poster used for invitation, potential participants were selected according to the expertise in recruitment. After the selection, they were invited using email to participate in research with a chance of winning a 20 Pound voucher from Amazon. A group of 16 people accepted the invitation. The participants were then requested, as an assignment, to write a short description of a recruitment problem case they faced. Only four problem cases were collected. These cases were then revised and circulated to others being asked to comment on them and define the potential problems with each case from their perspectives. The answers were collected and prepared for use in the demonstration and evaluation sessions.

For the demonstration session, the 16 participants were invited to a focus group meeting. At the time of invitation, a package including the POCM and Onto-RPD artefact, a list of the recruitment problem cases and the problems defined by participant for each case, a list of defined terminologies, and a questionnaire with instructions of use were sent to the participants. Only 10 participants accepted the invitation. At the beginning of session, the four recruitment cases and the list of related problems defined by participants were presented. The participants were then asked to apply and map the recruitment problems pre-defined for each recruitment case and related concepts into the POCM and Onto-RPD artefacts, and discuss and elaborate on these problems (i.e. define the other related problems). Based on this applications, the participants were given a set of questions and specific templates for answers.

In the evaluation session, the 10 participants were asked to evaluate the POCM and Onto-RPD artefacts against a set of requirements keying on the results of applications in the demonstration session as well as the new ideas emerging during the focus group discussion. Similar to the demonstration session, the participants were asked to evaluate the artefacts using a number of assisting questions and some templates for answers. The data of the two sessions were analysed, and the results of evaluation were then outlined. The detailed process of POCM and Onto-RPD demonstration and evaluation including the various material used and results are provided in section 6.4 in Chapter 6.

3.4.5 The Key Research Methods Used for POCM and Onto-RPD Development

This section describes the various research methods selected for developing the POCM and Onto-RPD artefacts and the rationale behind this selection.

3.4.5.1 Action-Research Method

A-R is a spiral process that allows action (change and improvement) and research (understanding and knowledge) to be achieved at the same time (Baskerville and Wood-Harper, 1996). It emphasises collaboration between researchers and practitioners, and supports the practical problem solving as well as the theoretical knowledge generation (Baskerville and Wood-Harper, 1996). It has much potential for the information systems field being a useful qualitative research method (Avison et al. 2001). In regard to using it within the design science framework adopted in this thesis, there is a growing consensus relates to the similarity between A-R and design science (DS) (Järvinen, 2007; Wieringa and Morali, 2012). Järvinen (2007) compared the two methods and found that they are similar along a string of important

parameters. He suggested A-R being more closely combined with DS rather than necessarily seeing it as qualitative research per se. He argued that although DS may be seen as a research method that has been practiced within engineering and natural science, the combination would improve the quality of research by combining between relevance and rigor (Järvinen, 2007). According to Wieringa and Morali (2012), DS research has established itself as an acceptable approach to information systems research being combining a problem-solving cycle with a theory-building cycle. To facilitate such combination, Baskerville et al. (2009) integrated both A-R and DS with Checkland's Soft Systems Methodology (SMM) and developed a new approach called soft design science research. Inspired by the work of Baskerville et al. (2009), the thesis integrate A-R, DS, and SSM in building the POCM and Onto-RPD artefacts.

The way how these methods are integrated for developing the POCM and Onto-RPD are explained in Chapter 6. Informed by the defined requirements for artefacts in "define requirements" phase of DS, the A-R cycles for "design and develop artefact" are based on SSM and iterated until the defined requirements of DS are met.

3.4.5.2 Case Study

The research was established upon the case study of SA enlistment practice and developed by using two other case studies: BA enlistment case study from military domain, and UK UCAS case study from education domain. As shown earlier in Figure 3.3 and Figure 3.4. The study was driven by the failure in realising the value of the SA's e-enlistment project with the objective of investigating the various recruitment problem concepts faced in that project and refine them with the concepts derived from the other two case studies. The type of case studies is exploratory which is particularly suited to the type of qualitative knowledge available with regards to this research (Yin, 2008). This type of case study is also used to explore those situations in which the intervention being evaluated has no clear, single set of outcomes (Yin, 2008).

According to Yin (2008), a case study method should be considered when: the focus of the study is to answer "how" and "why" questions; no or little control over the behaviour of those involved in the study; various contextual conditions are relevant to the phenomenon under study; or the boundaries are not clear between the phenomenon and context. Likewise, the objective of this research is to understand *why* it is challenging to realise the value of SA's e-enlistment project and *how* these challenges can be confronted. In addition, little control over those involved in the study and related events is available, and various contextual issues and

less clear boundaries between the phenomenon and context exist. A hallmark of case study research method is the use of multiple data sources (Patton, 1990; Yin, 2003; 2008). This ensures that a phenomenon is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood. Another advantage of this method is the close collaboration between the Author and the participants, thereby enabling participants to tell their stories (Patton, 1990). When the method is applied correctly, it becomes a valuable method to develop a grounded theory (Lubbe, 2003). This comes in line with the research strategy adopted in this thesis. In addition, a list of features that makes the case studies appropriate are derived to guide the decision on case study selection, see chapter 6, section 6.2.1.

3.4.5.3 Literature Review

The literature review is an essential part of an academic research project. The review is a careful examination of a body of literature pointing toward the answer to the research question. The purpose of the literature review is to test the research question against what already is known about a certain subject. A good literature review will look at the research that has been done and synthesize or pull together those elements that are similar or most pertinent to the theme that has been chosen. For the purpose of this research, the literature reviewed assisted in investigating the research gaps and central issues in recruitment domain in relation to the failure in SA e-enlistment. In this context, the literature related to problem definition, problem representation, enterprise architecture, requirement engineering, and best practices documentation and reuse was all reviewed, see Chapter 2. Another use of literature review method was to define the various requirements based on which the POCM and Onto-RPD were designed, i.e. see section 3.4.2.

3.4.5.4 Survey: Questionaire and Semi-Structured Interviews

The essence of survey method is explained by Jackson (2011) as "*questioning individuals on a topic or topics and then describing their responses.*" In business studies, the survey method is used to test concepts, reflect attitudes of people, collect their responses, conduct segmentation research and a set of other purposes (Jackson, 2011). Hence, the purpose of using survey method in this thesis was: (1) to test the various recruitment problem concepts that derived from the recruitment-related literature (Chapter 2) or discovered though the analysis of SA e-enlistment project (Chapter 5) with the stakeholders of SA enterprise recruitment practice; (2) to capture the various stakeholders' perceptions and attitudes on these problem concepts; (3)

to elaborate with the stakeholders on these perceptions and attitudes using open-ended questions such as why, what, how and so on; and (4) to investigate the potential trends and dominant perceptions among stakeholders. Given the purpose of survey, the definition and elaboration on real-world problems, such as the SA enlistment problem, require a qualitative analysis (Zakarian, 2001; Avison et al. 2001). Therefore, the survey method in this thesis was intensively directed to a qualitative analysis. However, some quantitative data were useful and used for rating the importance of recruitment problem concepts within the SA enlistment practice.

The survey was a questionnaire intended for different categories of the SA enlistment's stakeholders: applicants (potential, current, previous), enlistment-related staff in both military schools and units, and relevant stakeholders from CRA, CAA, and MH. The questionnaire was designed using SurveyMonkey and consisted of 13 questions taking approximately 20 minutes to answer. The questions were mixed of Likert scale questions, multiple choices, ranking, and open-ended questions. After the questionnaire was first designed in English, an Arabic version was produced according to the official language in Secureland and printed out for distribution. See Appendix 1 and Appendix 2.

The distribution of questionnaire and research was planned to be on time with enlistment job openings in the SA. Hence, an official letter along with the questionnaire Arabic sample were sent to the SA in order to get permission for distribution over three military schools located in different military regions. After a long process in which the questionnaire sample was reviewed and approved for distribution, the permission was obtained. Accordingly, some arrangements with the enlistment staff of the target schools in regard to the research as well as travel and accommodation bookings were carried out to ensure the success of research process.

On the site visits, the enlistment job openings were running. Based on the pre-planned arrangements, the questionnaire samples were distributed to the target respondents in each military school. The number of samples distributed over all target schools was around 600 samples. The way in which the questionnaire samples were answered was: self-administrated and a face-to-face interview. For a self-administrated mode, the purpose was to extend the number of respondents with the objective to collect as much as possible information. However, a face-to-face interview was intended: to ensure a greater depth of data, a greater focus and elaboration on recruitment problem concepts and their relationships, and to reflect perceptions, feelings and experiences. A number of 36 respondents were carefully selected for a face-to-

face interview. The careful selection was to ensure a representation of all categories of SA enlistment stakeholders and motivate them to join an existing WhatsApp stakeholder focus group that was earlier created at the time of explicating the SA enlistment problem, refer to section 3.4.5.7. In a face-to-face interview, respondents were helped filling their questionnaires and encouraged reasoning on many recruitment problems faced in the SA enlistment practices.

A total of 188 samples were collected. After these samples were reviewed, a number of 169 samples being relatively complete were selected and re-entered to SurveyMonkey for quantitative analysis. The 188 samples were all considered for qualitative analysis. The qualitative analysis of questionnaire data served in different ways. It served in drawing the rich picture that used within the SSM in the 1st A-R cycle, see Chapter 6 section 6.2.2, and showing the various concerns with the problem owners on that picture. It also served enriching the CATWOE templates used for capturing the various root problem definitions from different problem owners' perspectives, see Chapter 6, section 6.2.2. The quantitative analysis of data using SurveyMonkey was used to rate the importance of the various problem concepts for inclusion in the POCM and Onto-RPD artefacts.

3.4.5.5 Document Inspection

In most cases, a significant amount of data that helps locating the problem is embedded in documents. Furthermore, the initial information captured by document inspection method often form the basis on which further research methods are selected. This method was intensively used to capture knowledge about the SA e-enlistment project, see Chapter 4, including the mission and functions of SA, the SA's organisational structure and recruitment types, the e-government vision and strategic goals of Secureland and the SA, previous work conducted on the SA e-enlistment project, and the challenges faced in that project. It was also the main data source for building the models for the SA enlistment practices (pre-2008 and post-2008) in pursuit of explicating the research problem, see Chapter 5.

3.4.5.6 Observation

Incidental or planned observation can provide a valuable means of recognising how people perform tasks, how they interact with each other, or even how they interact with a system if exists. Combined with other elicitation techniques, observation can help overcoming the mismatch between the documented and real-world situation. For example, observation and interviewing share the same aspects of considerations when they are to be conducted. For the

purpose of this thesis, observations were carried out during the school site visits when distributing the questionnaire samples or conducting face-to-face interviews. These observations served the research in many ways. First, they gave the Author a clear view of how the SA enlistment practices being carried out in different school sites. Second, they helped the Author to closely see the problems faced and suffered by different stakeholders. Third, they made the Author aware of the actual problems faced on the ground when conducting face-to-face interviews or doing subsequent analysis. Finally, the observations of the SA real-world enlistment practice helped largely in drawing the rich picture in Chapter 6.

3.4.5.7 Focus Group

Focus group is a research method used for idea generation or validation where several informed participants share their point of view on a specific topic or problem (Business Dictionary, 2013). It can generate a broader range of information, and deepen understanding of the topic under discussion. It can be also used for validating and verifying the results gained from other research methods. The usefulness of this method lies in: the ability of interviewing a large number of participants at one specific time thereby saving much time and cost; and the elicitation of information and data from different people perspectives.

In this thesis, two focus groups were used. One was called *WhatsApp stakeholder focus group.* The use of WhatsApp stakeholder focus group was in two phases. The first one was in the "explicate problem" phase see Figure 3.3 in this chapter. In this phase, the Author created this focus group to help explicating the problems of the SA enlistment practice. It consisted of 11 participants from the Local e-Committee (LeC), see section 4.3.4, and members from HR in SA who were previously part of the SA e-enlistment project. Their roles at that phase were to help in: (1) eliciting information about the SA enlistment practice; (2) building relevant representation models of problem domain knowledge for evaluation; and (3) analysis and assessment of these problem domain knowledge models, see Figure 5.2 in Chapter 5. Later, this focus group was enlarged and used at the phase of "design and develop artefact" of POCM and Onto-RPD artefacts, see Figure 3.3 in this chapter. At that phase, it was dedicated for: (1) generating new ideas about root recruitment problem concepts using the rich picture of the SA enlistment problematic situation, see Chapter 6; and (2) elaborating on the concepts derived from the survey conducted on the SA enlistment practice, see section 3.4.5.4. The enlargement of the WhatsApp stakeholder focus group was during the face-to-face interviews, see section 3.4.5.4. Interviewees were added to the focus group being actual stakeholders of the SA enlistment

practice representing the SA as a whole. Some considerations were taken into account on adding, e.g. the enlistment-related experience of added member, the type of role played in such experience, and confidentiality and security. The total number of participants in the WhatsApp stakeholder focus group after enlarging was 33. For the composition of the WhatsApp stakeholder focus group as well as their roles and experiences in both phases, refer to Appendix 3.

The second focus group was used during the phases of "demonstrate artefact" and "evaluate artefact" to demonstrate and evaluate the POCM and Onto-RPD against the set of requirements defined in the "define requirements". The focus group was called *experts focus group* and consisted of 10 experts from different recruitment-related disciplines. The members were mixed of academics and practitioners from Bournemouth University. The focus group meeting was run in two sessions at the same day. The first meeting session was for "demonstrate artefact" phase to: (1) present the recruitment case studies described earlier by participants see 3.4.4; (2) discuss and elaborate on the various problems defined for them; (3) ask participants to map the various problem definitions and their related concepts and relationships to the POCM and Onto-RPD; and (4) consequently answer the set of questions prepared for evaluation. The second meeting session was for "evaluate artefact" phase to: (1) reflect on the work conducted during the "demonstrate artefact" phase; (2) loudly discuss and evaluate POCM and Onto-RPD based on the set of requirements predefined; and (3) write down the answers of evaluation to the templates provided. The various activities and materials used in this focus group meetings are provided in section 6.4 in Chapter 6.

3.5 Summary

In this chapter, the philosophical foundation of research is identified. The inductive paradigm is adopted. The comparison between the two main research paradigms and the reasons of adopting an inductive research paradigm are provided. The design science approach adopted in this thesis, its phases, and the variety of qualitative and quantitative research methods used within these phases are all explained.

Chapter 4: Secureland Army E-Enlistment Project

4.1 Introduction

This chapter provides the following: (1) an overview of the SA including its mission, the core functional areas, the organisational structure, and the types of non-officer recruitment practices and their integration with other HRM processes; and (2) an overview of the failed SA's e-enlistment project conducted in Secureland.

4.2 An Overview of the Secureland Army (SA)

4.2.1 The Mission and Functions of SA

Secureland is the name given to the country from which this real case study is brought for discussion in this thesis. The Secureland Army (SA) is responsible for protecting the national lands from all external threats (Secureland Army, 2013a). To achieve the military readiness required, the SA maintains four pillars: personnel, equipment, training, and infrastructure (Secureland Army, 2010). For this reason, the SA sets up its strategic goals to enhance its capabilities and functions for the development of these pillars. In fact, there are five core functional areas that are carried out by the SA and all its divisions: supply, operations, intelligence, human resources, and IT. Figure 4.1 shows the five core functional areas in the SA as well as the management levels of these functions. The SA invests heavily in human resources as they are the most important pillar for achieving the military readiness and effectiveness in combating operations. Thus, ensuring a reliable recruitment process that provides the best inputs of qualified people is of high importance to the SA (Secureland Army, 2013b).
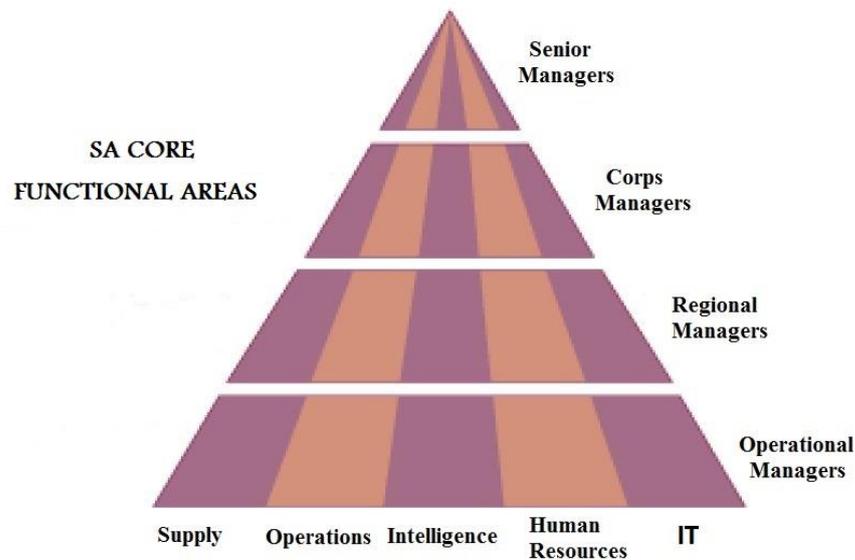
Figure 4.1 SA Core Functional Areas (Created From: Secureland Army (2013a))

4.2.2 The Organisational Structure of SA

In Secureland, there are four major governmental components that represent the military sector. These are Ministry of Defence, Ministry of Interior, National Guards and Royal Guards (Secureland, 1976). They are all intended to maintain national security, however, with discrete missions. They are organisationally divided into sub-components based on their allocated missions. Ministry of Defence includes the Secureland Army (SA) (renamed as Land Forces), Air Forces (AFs), Navy Forces (NFs), and Air Defence Forces (ADFs). Figure 4.2 depicts the organisational structure of the military sector in Secureland and the SA in depth. The SA is divided into a central headquarters and a set of *supporting* and *operational* formations. The central headquarters represents the Commander and Chiefs of Staff for SA. The central headquarters is responsible for setting up the general strategies that ensure the achievement of the SA' mission. Supporting formations consist of 16 Corps such infantry, armours, artillery, signal, aviation, airborne, IT, etc. These Corps are often called technical components of SA. Each Corps has a military school allocated for recruitment and training purposes. Hence, each Corps owns its rights to plan and support technical aspects that are relevant to its mission in alignment with the SA's corporate mission and in cooperation with its dedicated military school. Operational formations are strategically distributed amongst seven-independent military regions covering the whole country. These formations are also called field units. Each region has a

regional headquarters and a number of military units such as divisions, brigades, battalions, companies, etc.
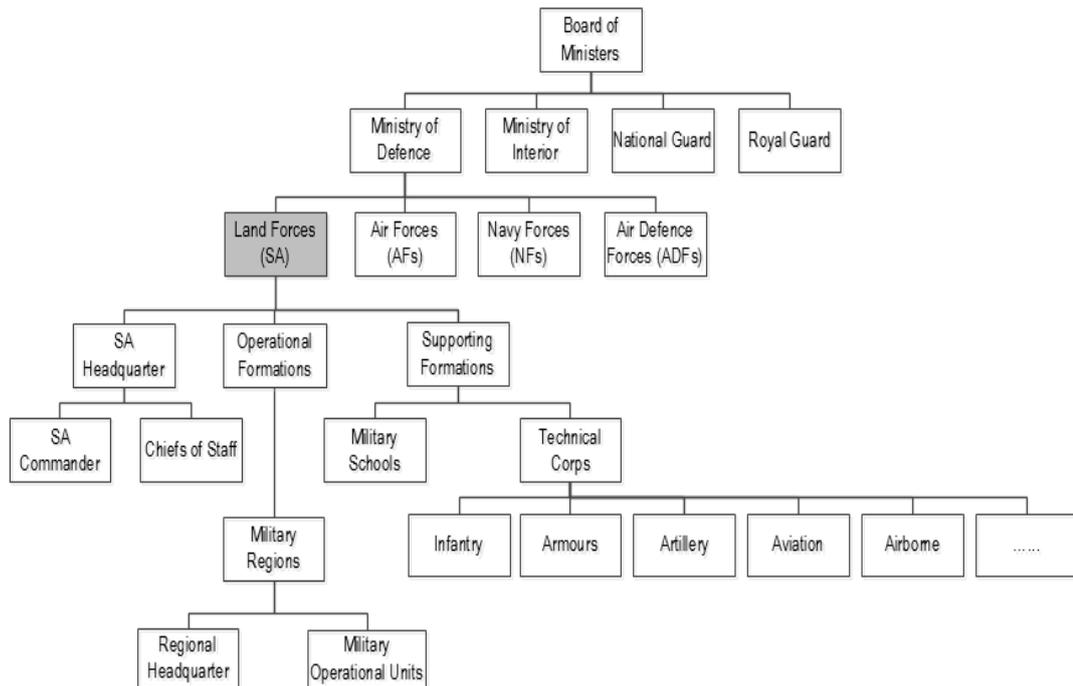
Figure 4.2 Organisational Structure of SA (Created from: Secureland Army (2013a))

The role of the regional headquarters is to ensure the right application of the SA's operational plans within the scope of that region and in coordination with the technical corps. Other operational units are responsible for the execution of the plans drawn by the corresponding regional headquarters. The military schools are intentionally located in some regions where the topography of land suits the type of training provided by the school. Given recruitment is the focus of this thesis, the recruitment practices in SA are planned by the SA's Human Resources Manager in coordination with the other HR managers in the technical Corps and military regions, and executed by the military schools. In the SA, military jobs are owned by corps. Each job has a rank and name. For each rank, there is a specific educational qualification required. A job name refers to the corps it belongs to and the type of specialisation required in performing the corresponding job. Military jobs are relatively distributed equally over the seven military regions. This is to enable equal opportunities for citizens over the whole country which is clearly articulated in the corporate strategies of Secureland (Secureland, 1976). Nevertheless, the number of jobs allocated for each corps differ from one region to another.

4.2.3   The Types of Recruitment in SA

The military sector in Secureland generally carries out two types of military recruitments: officer and non-officer. In the Ministry of Defence (MOD) of Secureland, the officer recruitment practice is centralised and run by one authorised department called Military Personnel Department (MPD) with no authority given to the MOD's constituent forces. This is due to the limited number of jobs allocated for officers compared to non-officer ones, and the rigidity in that practice. The officer recruitment is not a focus of this thesis. In contrast, non-officer recruitment is very complex so that it is decentralised and run by the lower levels of MOD, i.e. downwards to corps level in the SA. There are two types of the non-officer recruitment: direct and indirect (Secureland, 1976). These types are depicted in Figure 4.3.
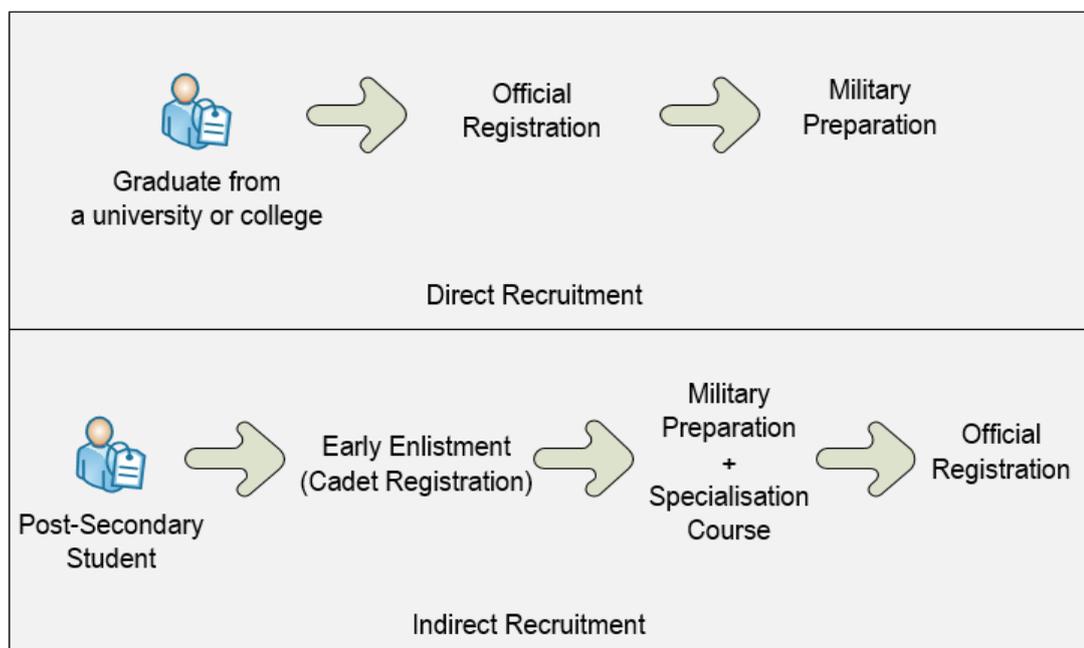
Figure 4.3 Types of Non-Officer Recruitment in the SA

Direct recruitment practice, sometimes called graduate recruitment, is allocated for recruiting those who have a degree from a university or college. In this type of recruitment, candidates will be assigned to jobs based on both the degree they have (e.g. diploma or bachelor), and the specialisation (e.g. engineering, computing, etc.). Candidates of direct recruitment are seen as being relatively ready for the work environment since they have a required specialisation enabling them to carry out the technical jobs which are not linked directly to the military work. Therefore, they can be recruited directly without being having completed the compulsory training

course for military preparation. In this case, this type of training can be scheduled later whenever military training seats are available. Job openings for direct recruitment are currently held at many times over the year. This non-officer direct recruitment is not a focus of this thesis.

On the other hand, the indirect recruitment practice is intended for those who have recently finished their basic education, i.e. post-secondary students. In this type, the state of a potential applicant changes as he goes forward in this indirect recruitment practice from being an applicant to candidate, to cadet, and finally to recruit. Thus, the official recruitment is dependent on the completion of two training courses: a military preparation course and a specialisation course. The indirect recruitment is sometimes called enlistment. However, the recruitment activities before training courses (e.g. announcement, reception, documents screening, selection and the registration of cadets) are called early enlistment. The indirect recruitment practice is mainly meant to fill the lowest level of military jobs since the minimum qualification required for recruitment in the military sector is a secondary certificate. Given the inputs of indirect recruitment practice are post-secondary students, job openings of this type of recruitment are concurrently conducted with the graduation of secondary students.

The indirect recruitment practice (i.e. enlistment) is the major focus of this thesis. The enlistment activities will be discussed in detail later, see section 4.3.4. The indirect recruitment practice in general is considered the main source of non-officer soldiers in the SA. It differs from the direct recruitment practice in many aspects. It is intended for filling a large set of jobs in the SA compared to the direct recruitment which is regarded an exceptional case in some corps. It also targets a segment of population (i.e. post-secondary students) for which competition is very high. The official recruitment in the indirect recruitment heavily relies on post-enlistment training since the required military skills cannot be provided by the public education institutes. Moreover, the indirect recruitment practice is timed with the graduation of secondary students. In next section, the nature of integration between the non-officer recruitment practices and the other major SA's HRM activities is explained.

4.2.4   Non-Officer Recruitment and Other HRM Processes

In Figure 4.4, the location of a job vacancy in the SA's hierarchical structure determines the type of non-officer recruitment practice by which this vacancy is filled. Thus, the vacancies at the lower level of hierarchy will be filled by the indirect recruitment practice. On the other hand, the direct recruitment practice is intended to fill vacancies at the higher levels. For the jobs at the top of hierarchy, there is no recruitment practice occurs since there is no educational degree

that can qualify to these jobs. Any non-officer recruitment practice (direct or indirect) starts with determining the number of vacancies to be filled. A job vacancy results from one of four cases: retirement, promotion, dismissal, or new job creation. This often occurs in every level of the hierarchy. The resulting vacancies will be collected and prepared for recruitment.
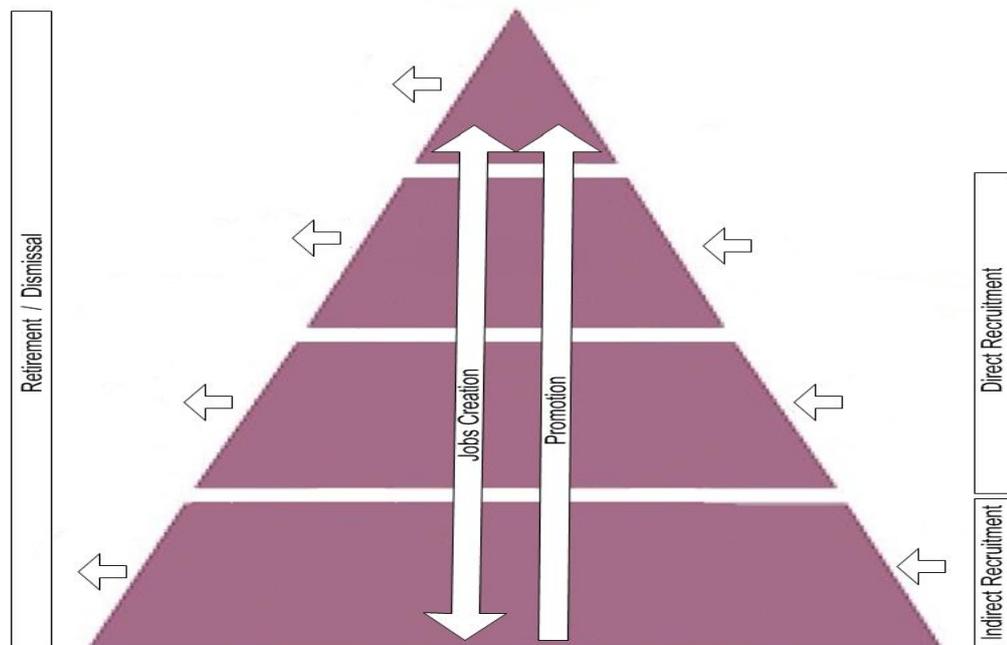
Figure 4.4 Integration between Non-Officer Recruitment Practices and Other HRM Activities in SA (created from: Secureland (1976))

In Figure 4.4, there is interdependency between the SA's HRM processes. It seems that each process almost serves as a prerequisite of the other. In every year, the number of potential soldiers for retirement is firstly determined. The compulsory retirement is actioned when a soldier completes a specific age at a specific rank. However, the early retirement is also possible subject to the approval of a submitted request by an eligible soldier in a specific time. A soldier's service might be extended in some circumstances (e.g. in case of war or a shortage of skilful soldiers). In any case, the number of potential retired soldiers is predicted at early time and scheduled over two periods allocated for retirement. This early prediction allows the process of promotion to be carried out simultaneously to fill the resulting vacancies from the retirement process as well as from the dismissal cases and new job creations. However, the promotion process is not straightforward but subject to passing specific exams. This makes the output of the promotion process (i.e. vacancies) that serves as the input of the recruitment process hard to predict. As a result, the recruitment process (direct and indirect) will not be carried out until

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the completion of the promotion process. This requires the recruitment process to be carried out in less time to rapidly fill the resulting vacancies. However, ensuring a timely recruitment process is a difficult task. One reason is the difficulty in capturing all current vacancies resulting from different HRM processes to be filled by the recruitment process. Another reason is the length of recruitment process and the need to shorten it. Moreover, the indirect recruitment process is timed with the graduation of secondary students at the end of school year. This, in turn, points up a difficulty in aligning all SA's HRM processes (i.e. retirement, promotion, new job creation, and recruitment) with the graduation of secondary students as well as with all other external processes conducted by the other governmental agencies (e.g. the identity and health checks for applicants). Such alignment is very important for the achievement of the SA' strategic goals described in Section 4.2.1. However, such alignment is not the case on the ground. This sheds light on the challenges that the SA needs to confront when improving its recruitment processes. In the next section, an overview of the failed SA e-enlistment project and the various challenges that led to the failure are explained.

4.3 An Overview of the SA E-Enlistment Project

This section will present the following: (1) a brief description of the overall e-government program in Secureland; (2) the reasons of choosing the SA's enlistment as being a promising e-transformation project; (3) the description of the e-transformation framework proposed by Secureland; (4) an overview of the application of the framework proposed upon the SA's enlistment for transforming it into the e-space; and (5) the various challenges faced which finally resulted in the failure of the project.

4.3.1   An Overview of the E-Government Program in Secureland

The e-government program in Secureland is citizen-centric (Secureland, 2013a). The first e-government initiative of Secureland was launched in 2005 (Secureland, 2005). In line with this initiative, an organisational entity, called Central e-Government Program (CeGP), was established and entitled by the government of Secureland to develop and implement e-government strategies in cooperation with the government agencies. To date, the development of national e-government strategies has undergone two stages (Secureland, 2013a): 2006-2010 and 2012-2016. The first stage of e-government focused on e-enabling customer-facing services, i.e. enabling online presence and online transaction services. However, the second stage of e-government is driven towards more IT-led transformational change in public sector agencies.

4.3.1.1 The First Stage of E-Government

In the first stage (2006-2010), the vision was "*enabling everyone to use effective government services, in a secure integrated and easy way, through multiple electronic channels*" (Secureland, 2011a, p.46). To achieve this vision, the CeGP had to lead the e-initiatives of Secureland centrally and disseminate the concepts of e-services among various government agencies. The key challenges accounted for this centrality were the actual absence of adequate reference models which cover the various requirements of e-government, in addition to the lack of control and coordination mechanisms with government agencies (Secureland, 2005). To overcome these challenges, a number of frameworks and models necessary for e-service enablement were developed, e.g. e-government guidelines manual, e-vision and goals framework, e-readiness assessment, business process reengineering, website development, change management, risk management, etc. (Secureland, 2013b). Moreover, the close coordination between the CeGP and government agencies was facilitated. A central coordination unit represented by the CeGP along with more than twenty local e-nodes at the governmental level were created. The local e-nodes worked in close cooperation with the members of the central staff to establish and plan all the local e-activities as well as to ensure the alignment with the national vision and predefined policies.

The implementation of the first stage of e-government was seen successful based on the outcomes achieved (Secureland, 2011a). For instance, the ranking of Secureland moved up 22 places between 2005 and 2010 according to UN e-government survey (Secureland, 2011a). Several international e-government awards were granted. The Secureland's portal was enriched by more than 700 e-services representing more than 99 governmental agencies. This success has pushed the CeGP towards the second stage of e-government for achieving more mature and seamless e-services rather than the limited provision of light-weight e-services.

4.3.1.2 The Second Stage of E-Government

The second stage of e-government (2012-2016) declared that "*it is time to move from e-enabling customer-facing services to more IT-led transformational change in public sector agencies*" (Secureland, 2013a). The second stage places IT at the heart of the transformation initiatives to improve public service delivery, and to increase effectiveness and efficiency of government performance (Secureland, 2013a). According to the stage, the success in the transformational change led by IT incrementally or radically depends on the role played by the Secureland's governmental agencies in challenging all difficulties and constraints that impede the public

service delivery (Secureland, 2012). Hence, the role of CeGP witnessed a real shift from being a leader as in the first stage to an enabler or facilitator. Each government agency represented by its local e-node had to carry out its own e-transformation projects in a well-coordinated approach with the CeGP. Thus, a centralised CeGP's policy for selecting and funding the e-transformation projects was set. According to this policy, each governmental agency has to conduct a stock taking of all business processes potential for e-transformation, and prepare a rough report to be later sent to the CeGP. Once a business process is selected for fund by the CeGP, the corresponding agency has to follow a predefined e-transformation framework proposed by the CeGP (Secureland, 2012). The application of framework results in producing an e-transformation proposal (i.e. specification) for the intended project. This proposal is escalated back to the CeGP for validation and approval (Secureland, 2013c). The reasons of selecting the SA's non-officer enlistment process as a promising e-transformation project and the description of the e-transformation framework proposed by the CeGP are all explained below.

4.3.2   The Selection of the SA's Enlistment Process

As explained above, the CeGP in Secureland targets the most ambitious, potential e-transformation projects to maintain and subsidise. Secureland often prioritises these projects based on their potential returns on investment obtained from e-transforming of the corresponding business processes. These returns are economic, strategic, social, individual etc. One of the highly ranked e-transformation projects at the board of Secureland's Central e-Government Program (CeGP) was the non-officer enlistment process in the military sector (Secureland, 2013a). The reason why the enlistment practice in the military sector in general was targeted by the CeGP can be deduced from many aspects. From an economic aspect, the practice is similarly applied in more than 40 departments of the military sector and is bound with unified policies and regulations. If this practice is improved and successfully implemented, the reusability of it would lead to many savings in costs and efforts. This would also create chances for the integration and interoperability between these discrete enlistment practices in the military sector. Another reason is that recruitments in military jobs annually constitute about 22% of the overall rate of recruitments in the public sector, and this percentage is also expected to go up to 27% by 2020 in response to the future plans in military sector (Secureland Army, 2011). Thus, any initiative that aims to fill up such a large number of jobs in an efficient and effective manner, which, in turn, results in increased productivity and employment, is of the high importance to Secureland. From a strategic aspect, the achievement of Secureland's national security relies

heavily on the timely provision of a sufficient number of qualified soldiers. This critical demand necessitates an agile, reliable recruitment practices. From a social aspect, it is crucial for the military sector of Secureland to appear in a good picture in the citizens' eyes. This would enhance the patriotism and proudness of the country and its military units. One channel through which the military sector can market itself and have a good picture is recruitment. Given the e-government program in Secureland is citizen-centric, an enlistment practice is oriented to a large segment of citizens (i.e. post-secondary students) so that it is at the core of Secureland's e-government program. When improved, it would enhance the image of the military sector, and create positive impressions with the potential applicants in specific and with the society as a whole.

The enlistment in the SA was specifically selected as a pilot project. This selection can be easily justified. The SA is the biggest contributor to the national security of Secureland. It is the leading recruiter in the military sector due to its large size and the spread of its units. Therefore, the return on investment is expected to be large. Moreover, the diversity of its departments and jobs makes them pursued by a large range of citizens and from different regions of Secureland. For this reason, such a large-scale transformation project requires close coordination and cooperation between the CeGP and the SA local e-node. Hence, the SA took serious steps towards the application of the e-transformation framework proposed by the CeGP for deriving requirements and producing the e-enlistment proposal (i.e. specification). In the next section, this e-transformation framework and methodology are explained.

4.3.3   The CeGP's E-Transformation Framework and Methodology

The E-Transformation Framework (ETF) proposed by the CeGP is depicted in Figure 4.5. The ETF is also supported by a methodology for transformation depicted in Figure 4.6. According to the CeGP (Secureland, 2013b), the framework and its methodology were established in reference to many standard approaches of e-transformation and RE.
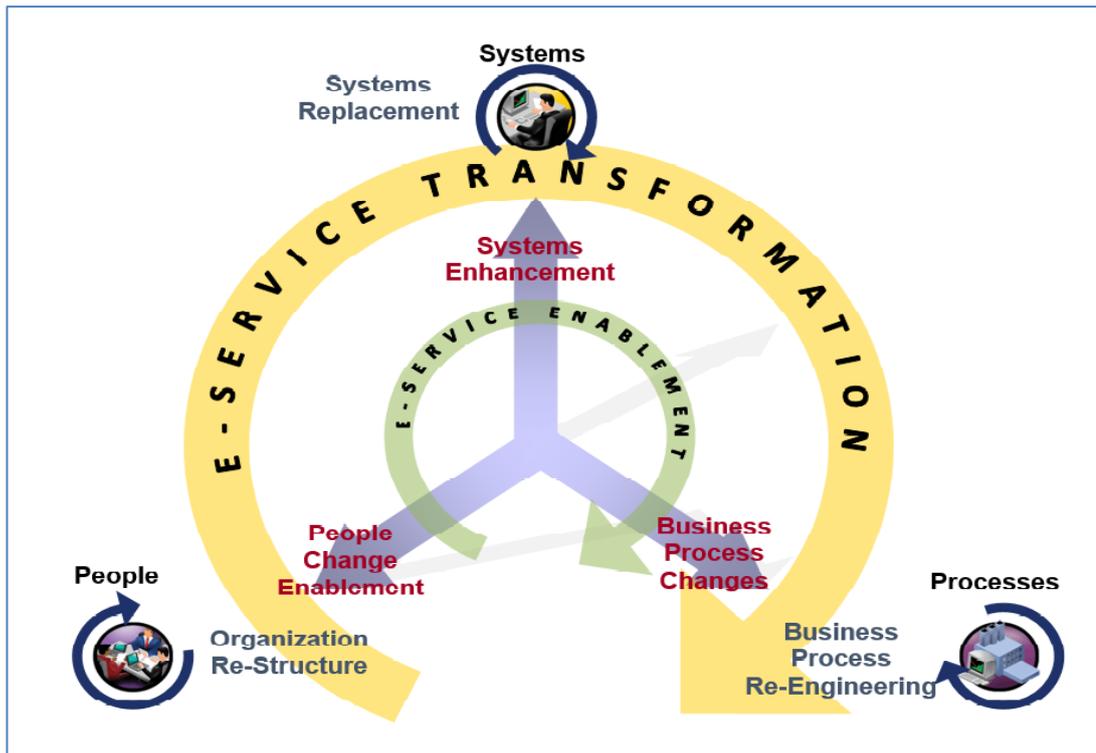
Figure 4.5 The CeGP's E-Transformation Framework (source: SecureLand (2012))
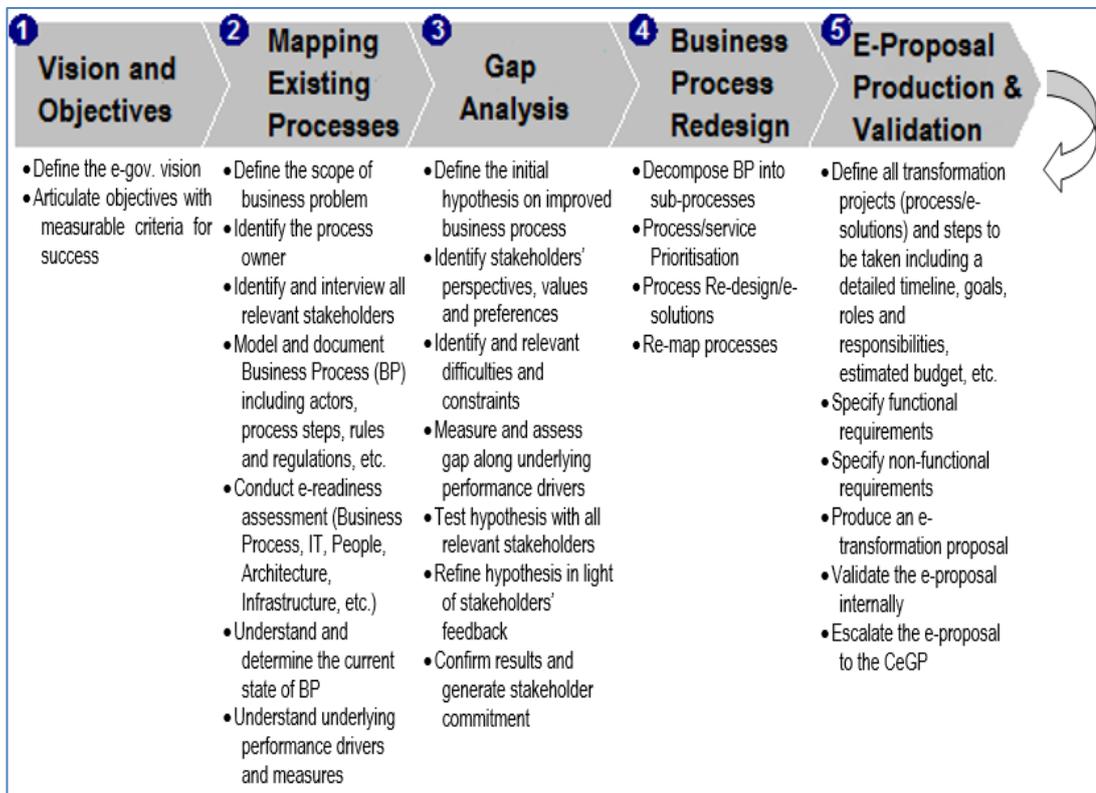
Figure 4.6 The CeGP's E-Transformation Methodology (source: SecureLand (2012))

The philosophy of the ETF was that governments should be willing to change the three major components (business processes, organisational structure and legacy systems) in order to reap the full potential of an e-initiative (Kim et al., 2007; O'Donnell et al., 2003; Swedberg and Douglas, 2003). However, this change is strategy-driven (Kettinger and Grover, 1995; Kettinger et al., 1997; Pourshahid, 2008; Glavan, 2011). Therefore, the success of a government in e-government initiatives is based on its ability to align these three components with the proposed e-government model (Ferlie et al., 2003; Joia, 2004; Davison et al., 2005; Glavan, 2011). The ETF is built on the concept of Business Process Management (BPM) described as "*making a business process the platform for organisational structure and strategic planning*" (Glavan, 2011, p.27), and uses it as a basis for the analysis and specifications of solution systems. Hence, the E-Transformation Methodology (ETM) serves in this regard, and provides a roadmap for the Secureland's agencies to understand their business processes, and capture and analyse requirements for their e-transformation projects. Hence, the ultimate output of applying the ETM is an e-transformation proposal that includes and specifies the various requirements of the transformation project. From the CeGP's point of view, the application of the ETF and the resulting e-proposal lead to a number of advantages (Secureland, 2013c). Government agencies was guided by the ETF to align their e-transformation initiatives with the e-vision of the CeGP, and carry out practical steps towards transformation and capturing requirements of improvement projects. The e-proposals escalated would allow the CeGP to assign a portfolio for each agency as guidance to the past, current and future e-projects. This, in turn, would give the CeGP insights into the future plans and needs for supporting such e-transformation projects as well as the reusability of best practices among government agencies.

In Figure 4.6, the ETM consists of five phases to be undertaken, such as e-transformation vision and objectives, process mapping, gap analysis, business process redesign, and finally e-proposal development and validation. The sequencing of the phases is strong while the sequencing of activities within each phase is flexible. However, the backtracking of phases is also possible. Building on the initial selection of a business process, such as the SA's enlistment, to be transformed, the first phase – vision and objectives – takes place. In close cooperation between the CeGP and the local e-node as well as the relevant stakeholders in the corresponding government agency, the e-vision and goals of the transformation project are determined. Once these goals are agreed on and confirmed by the principal stakeholders, the existing business process is modelled. The as-is model is then used for understanding the current state of business process. The third phase – gap analysis – involves assessing and

comparing the existing state-desired state, defining the problems to be solved towards the desired end-state, and goal state specification. The fourth phase – business process redesign – involves decomposing the business process into sub-processes. These sub-processes are prioritised based a set of criteria such as the impact of change, the readiness to change, and other external factors. When these sub-processes are prioritised, a set of alternative business and IT solutions are proposed. After the negotiation with all relevant stakeholders upon these possible solutions, the optimal business solution is selected and accordingly the to-be process model is designed. The final phase – e-proposal production and validation – involves the documentation of all major projects (business and IT) and the steps to be taken within the transformation initiative including all functional and non-functional requirements, roles and responsibilities, timelines with well-defined milestones, and so on. Consequently, the e-proposal is produced and validated. Once the e-proposal is agreed on, it is escalated to the CeGP for validation and funding.

4.3.4   Previous Work Conducted on the SA's Enlistment Using ETM

In 2011, the Local e-Committee (LeC), i.e. e-node, in the SA was established. The LeC was managed by the Head of the IT Directorate, and consisted of a number of business and IT analysts, including the Author of thesis. In line with the selection of the SA's enlistment, the responsibility of the LeC, in cooperation with a leading consultancy company in the field of e-government and the participation of the relevant stakeholders of both SA and CeGP, was to: (1) apply the predefined ETF; (2) to analyse the requirements of the e-transformation of the SA's enlistment and produce the e-transformation proposal; and (3) to validate the proposal with the relevant stakeholders of the SA and report to the CeGP. In the next sections, the phases of the ETM that were conducted and the outcomes are presented.

4.3.4.1 Vision and Objectives

At the beginning of applying the ETM, the CeGP was asserting that the SA should have a vision for transforming the enlistment process that aligns with the e-vision of the second stage of national e-government program and its major e-goals (i.e. improved service delivery, improved effectiveness and improved efficiency (Secureland, 2013a)). Following the ETM, several meetings, including the SA's Head of HR, the all HR managers at the corps level, and members of the CeGP and LeC, were conducted to set up the SA's enlistment e-vision and objectives. Given the alignment with the three major e-goals aforementioned was unclear, the e-vision of

the SA's enlistment process reflected the SA perspective as: "*a reliable e-enlistment solution that enables the SA in filling its vacancies on a timely basis by highly qualified and regionally diversified recruits is needed*" (Secureland Army, 2013b). Following on this, the e-enlistment objectives were informally identified and mapped to the three major e-goals, see Table 4.1. These e-enlistment objectives of the SA will be briefly explained in the next sub-sections.

Major Goals	Relevant Objectives
Improved Service Delivery	▪ Providing better service for job seekers
Improved Effectiveness	▪ Filling vacancies ▪ Timely filling of vacancies ▪ A higher level of Knowledge, Skills, and Abilities (KSAs) with recruits (enlistees) ▪ A higher level of regional diversity of recruits (enlistees)
Improved Efficiency	▪ Elimination of inefficiency in work ▪ Accurate assessment of the numbers of candidates needed in each stage of enlistment process

Table 4.1 The SA Enlistment Process Model (source: Secureland Army (2013b))

Providing Better Service for Job Seekers

Articulating this objective as one of the e-transformation needs of the enlistment process in the SA was seen of the high importance towards the shift to a citizen-oriented paradigm adopted by the CeGP. From the SA's point of view, the requirements of *what (to do) and how* to achieve this objective was vague in contrast to the other objectives. The reason was that the SA is not a direct service provider so the lack of experience and knowledge in dealing with public exists. Hence, the achievement of this objective acts as a challenge of the ability of the SA to satisfy job applicants and meet their expectations. The improved service is a key driver for attracting and influencing the perception of applicants towards a job opening and job choice (Rynes, 1991). This entails the need to provide a reliable service delivery through which applicant satisfaction can be obtained.

Filling Vacancies

From the SA's perspective, key components of military personnel readiness are the quantity and quality of soldiers at a specific time (Secureland Army Statistics Agency, 2000). Thus, filling

vacancies is a major factor that influences the quantity of soldiers required. The role of the enlistment process is to fill up a specific number of predetermined vacancies by enlistees. Any failure to secure this specific number will result in that a job will remain vacant which negatively influences military readiness.

Timely Filling of Vacancies

This major objective relates to the speed in filling vacancies. The element of *time* is highly important when measuring military readiness. That is, a security threat can happen at any time so that the SA takes into account the importance of filling vacancies in a timely manner, therefore, achieving a higher level of military readiness.

Improved level of the Knowledge, Skills, and Abilities of Recruits

The level of performance of personnel is a major driver of any military force to obtain victory in its battles. Thus, influencing the performance of soldiers, i.e. the quality element of military readiness, is a strategic objective of the SA. In fact, there are two ways through which the SA ensures this influence: recruitment and training. Recruitment, in general, secures the minimum level of Knowledge, Skills, and Abilities (KSA) necessary to guarantee the effective performance of enlistees. Training subsequently develops these KSAs, or even teaches new ones. In the case of the enlistment process, the SA asserts that any cadet should have the KSAs required for training purposes so that training develops these KSAs owned and qualifies enlistees to become ready for work environment.

Improved level of Regional Diversity of Recruits

The population of Secureland consists of ethnically related communities. Ethnic communities often spread over large areas of Secureland. These may also stretch across borders to the neighbouring countries. This pays the SA's attention into the importance that these ethnical relationships must not influence either the loyalty of soldiers to the country or the performance of their duties. Therefore, the SA adopts a policy that imposes a balanced regional diversity of soldiers working in each military region. Each corps of the SA in cooperation with its dedicated school is responsible for applying this policy over their owned jobs in each military region. In regard to the SA enlistment process, the policy currently places a large burden on the military schools to ensure a balanced set of regionally diversified recruits at the end of enlistment processes.

Elimination of Inefficiency in Work

This objective is intended to reduce the total cost spent on carrying out the enlistment process. For this purpose, those tasks which entail large costs and are not truly value-added would be targeted. Despite the importance of this objective, the SA pays less attention to such objective. Likewise, government sector does not always take into account the element of *cost* when doing their work. This becomes more evident in the military sector because of the national security considerations. Aligning with the national e-goals, this requires the SA to capture the non-value-added activities, undesirable features, and all other sources of waste and then eliminate them. Redundancy, rework, turnover, supervisory activities are all seen as sources of waste. Thus, the elimination of these sources is likely to cut costs as well as saving time and effort.

Accurate Assessment of the number of Candidates needed

The large number of candidates in each stage of the enlistment process will cause extra time and effort. This, in turn, will cause extra costs. Each candidate is linked with a cost when processing so that keeping a realistic number of candidates entering each stage of the enlistment process will be of value. The SA currently imposes a fixed percentage of candidates entering its enlistment processes in all military schools. This percentage equals to 150% of the number of vacancies. Although this percentage has been long adopted, the SA suggests that this percentage must be re-evaluated because of many problems related, such as the cost incurred, the increases in the number of registered cadets, the length of process, etc. Thus, having an accurate assessment of the number of candidates needed in each stage is a strategic objective of the SA. However, this requires investigating all problems that impose the need for obtaining additional number of candidates and trying to solve them.

4.3.4.2 Mapping the Existing Enlistment Business Process

In line with the ETM, the purpose of this phase was to scope the enlistment business problem, identify the stakeholders, model the enlistment process, assess and define the existing state of the enlistment process. Firstly, the major owner of the SA's enlistment process, i.e. the SA's Head of HR, was determined and interviewed. Secondly, the scope of the enlistment problem was set around the indirect recruitment process, i.e. the whole enlistment process, conducted by the military schools starting from announcement until the official registration of recruits. With close cooperation with the Head Department of HR in the SA, a number of sketches, forms, files, reports, other official documents relevant to the enlistment process were collected and

reviewed. Based on these reviews, a number of relevant stakeholders were defined, and a rough flowchart of the enlistment process was designed. This rough flowchart was based on Chapin, 1971). The flowchart, combined with a predefined template (see Appendix 4) prepared for capturing the various activities of the enlistment process, was distributed to the all relevant stakeholders for information collection. In line with this, a questionnaire proposed by the CeGP for assessing the e-transformation readiness across the three major components of the ETF was also distributed. After the reception of the samples of templates and questionnaires, the information collected were analysed for understanding the current state of enlistment process. Consequently, the rough flowchart of the enlistment process was revised, and a list of underlying performance measures were defined and prepared for discussion. Building on that flowchart and all project-related documents that were inspected in this thesis, the Author created a high-level business process model of the whole enlistment process using Business Process Modelling Notation (BPMN). This BPMN is presented in Figure 4.7. This model was basically created for the purpose of explicating the SA enlistment problems in Chapter 5, but it is brought here for a clear explanation of the activities involved in the SA enlistment business process.
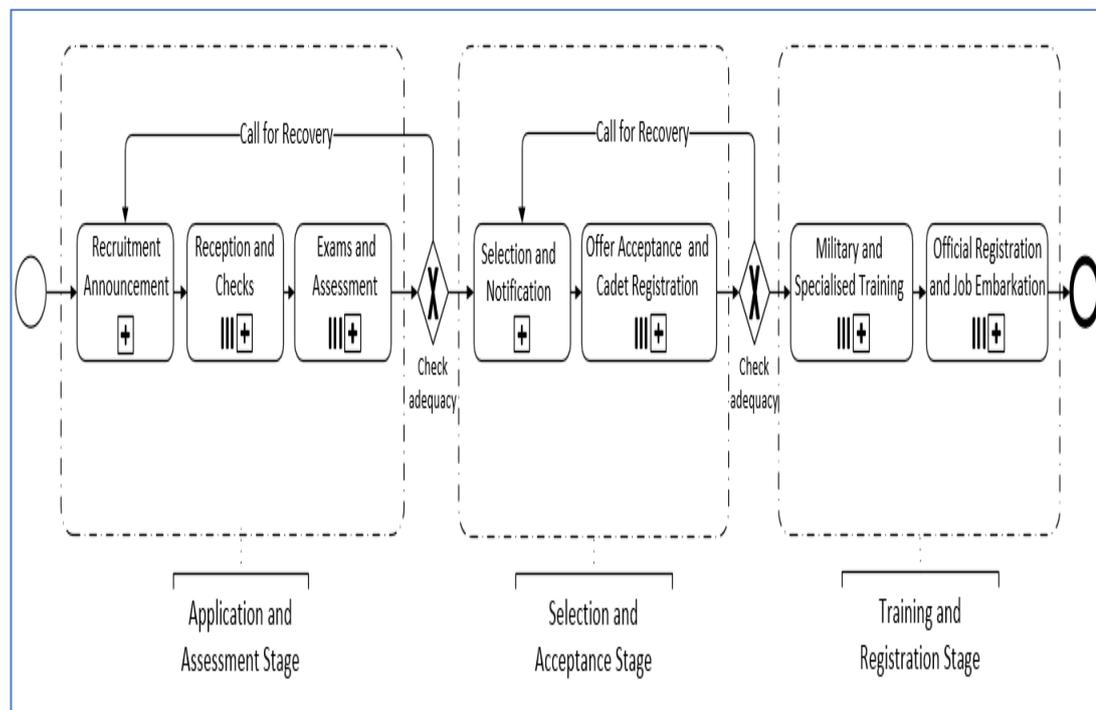
Figure 4.7 The SA Enlistment Process BPMN Model

In the Figure 4.7 presented above, the activities of the enlistment process were divided into three stages: application and assessment stage; selection and acceptance stage; and training

and registration stage. The first two stages are followed by checking the adequacy of applicants. If the number of applicants/candidates obtained at the end of each stage is insufficient, a recovery call will be carried out and, hence, the activities of that stage will be repeated. However, the third stage has no recovery call carried out. The following is a detailed description of each activity in the high level enlistment process model.

Recruitment Announcement Activity:

This is the first activity in the enlistment process performed by a military school. The activity is triggered by a military school when receiving a job opening order issued by the relevant corps. A recruitment message will be then prepared and sent to the announcement officer to be approved. Here, the recruitment message is checked against correctness and compliance with the SA's information disclosure policies. When approved, a number of news agencies will be selected for announcement. The selection of an agent is subject to the availability for announcement in a specific region at specific time as well as the cost of announcement. For each agent selected, an announcement order will be sent. One order might have more than one request for announcement with different prices according to the size of message and the time of announcement selected. Finally, recruitment messages are announced to the public. After that, potential applicants will then have one-week time to move to the announcing school for application.

Reception and Checks Activity:

When an applicant arrives at the military school, an application form has to be filled in, documents required are screened, and a number of checks are then conducted. These sub-activities are all held at the host military school. For an application form, it consists of three sections. In the personal information section, an applicant has to type his name, the address of location, the date and place of birth, nationality, health issues, etc. In the qualifications section, the various academic and practical qualifications are given. In the last section, the commitments and instructions are informed. Once the application form is filled and signed, the relevant documents required are combined with it and given to the receptionist. The application form is checked for completeness. In case of that some documents required are missing, an application will be kept on hold until these missing documents get completed within a specific time. After that, an applicant will be subject to three types of check: the check of general recruitment requirements, e.g. nationality and age; the check of qualifications, e.g. certificate, specialisation,

grade, and graduation year; and finally the check of initial physical fitness, e.g. length, weight, and height. If the three checks are passed, an appointment will be booked for the next activity, i.e. exams and assessment activity, otherwise an applicant will get rejected. Bookings are dependent on the capacity of exam halls available with the host school and staff allocated. Finally, the slip of an application form showing the application number and the appointment booked for next session is cut off and given to an applicant.

Exam and Assessment Activity:

This activity starts when receiving an applicant who has passed the previous activity. An applicant will be firstly checked against the booked appointment. If it is on time, an applicant will proceed directly to the exam and assessment. However, if not, an exemption might be given subject to the availability. When given, a seat for the exam and assessment on the same day will be looked for; otherwise an applicant will be booked another day. In this activity, four types of assessment are conducted and the total score of assessment is calculated out of 50 points as follows: paper exam (20 points); interview (10 points); and physical test (20 points). Paper exam is one-hour long and designed to assess the applicant's general knowledge. A minimum score of exam must be obtained. Interview is conducted to assess some skills needed, e.g. confidence, intelligence, communication, etc. Physical test is conducted through some exercises, e.g. running, push-ups, etc. At the end of the day of assessment, the assessment scores obtained are calculated out of 50 points and then added to the GPA score obtained out of 50 points. Finally, the total score out of 100 points is written down in a list.

Check Adequacy and Call for Recovery Activity:

The SA imposes a policy of having a number of applicants entering each stage that equals or bigger than (150%) of the actual number of vacancies. This number is needed to cover the potential withdrawals of applicants happening in next stages. In case of less number of applicants obtained, a call for recovery is needed and the previous activities are repeated. A call for recovery might occur more than one time. In such case, the currently obtained applicants are put on hold until the target number is completed, and the rest of enlistment activities will be rescheduled. However, in some cases, the military school might decide to proceed to the second stage with the less number of applicants obtained for time savings.

Selection and Notification Activity:

Once the first stage of enlistment is completed, the selection activity starts. Applicants will be divided into groups based on the military region where they live, and then each group is sorted independently based on the total score collected in the exam and assessment activity. The selection is carried out alternately between these groups until the actual number of vacancies is reached. Those selectees are called *essential candidates* while the rest of applicants are kept as a backup. The list of *essential candidates* is approved and then announced. The announcement message informs an applicant that he has been selected as a candidate for the school he applied for.

Acceptance and Cadets Registration Activity:

This is the final activity of the early enlistment through which the essential candidates are checked before they get officially registered as *cadets*. There are a number of inquiries that are carried out within this activity. All of which are informed by external governmental entities spread in each region of Secureland. These inquiries are crime record check, employment status check, and nationality record check, and medical fitness check. The check of crime record is against whether a candidate has committed a predefined set of crimes or not, and this is informed by the Crime Records Agency (CRA). For employment and nationality, the checks are against whether a candidate is employed or naturalised, and these are informed by the Civil Affairs Agency (CAA). However, the medical fitness check is against whether a candidate medically fits military work or not. This check includes speaking, hearing, seeing, and internal and external health, and is done and informed by the military hospitals in each region. However, the required level of medical fitness is varied according to the type of military school. For each check, an official letter is printed out and sent to the local entities in the regions where the corresponding applicant lives. Responses to these letters are expected to be received within a timeframe. When a candidate's checks are positive, a cadet registration form has to be filled in and signed. After that, a candidate will be informed about the commencement of military preparation course. In case of the number of candidates being less than the target (i.e. the number of vacancies), a recovery call of the backup is performed.

Military and Specialisation Training Activity:

After candidates get registered as *cadets*, they start the military preparation course in the same school where they applied. This course is three-month long and intended for general military

training. In this course, all cadets are expected to pass this training. The grades obtained in this course are of high consideration for the job allocation later. After finishing the preparation course, the specialisation course takes place. This course is very specific and designed to match the mission of the corresponding corps that the school belongs to. Unlike the military preparation course, completing this course is subject to passing the exams related to specialisation course. The grades obtained in this course as well as those obtained in military preparation course are calculated in points. During the specialisation course, the cadets' preferences of the military regions where they wish to be recruited are collected. At the end of specialisation course, the list of graduates including their grades obtained and their preferences is escalated for completing official registration. This occurs before the graduation ceremony.

Official Registration and Job Embarkation Activity:

Once the list of graduates is received, the official registration is carried out. Matching the graduates' preferences is based on their total points obtained over the two training courses taking into account the regional diversity imposed on the military schools over each region. After allocation, the hiring documents are printed out and signed by the Head of military school. Based on this registration, a cadet becomes officially a member of the SA, called *enlistee*. Each hiring document indicates the name of enlistee, the name of job, rank, location, the name of military unit, the date of embarkation and so on. These hiring documents are given to enlistees on the day of graduation ceremony, hence, an enlistee has to move to the military unit where he is allocated for job embarkation.

4.3.4.3 Gap Analysis of the SA's Enlistment Process

Based on the ETM, this phase builds on that what the business currently does is understood so it starts thinking and agreeing on where it wants to go in the future. Following to the results of analysis conducted in the previous phase, the relevant stakeholders, including the SA's Head of HR, all corps' HR managers, and members of the SA's military schools, were invited for a focus group meeting for discussing and understanding the existing state, and eliciting requirements for the aspired end-state of the enlistment process in light the predefined e-vision and goals. The flowchart that built for mapping the existing SA enlistment earlier was used as a basis for discussion and exploring requirements with stakeholders. Following a basic question was asked for the stakeholders ""*what state do you want to be in*?" in reference to the predefined e-vision and goals. Using the flowchart and assistance with the LeC, the stakeholders were encouraged to participate in defining their requirements and discussing different transformation

scenarios. The negotiation exhibited a remarkable range of disagreement on the feasibility of the e-transformation project and the value that the e-enlistment solution can provide. At one extreme were those who questioned the value of e-enlistment in attracting highly qualified applicants. For instance, the SA's Head of HR raised an issue saying *"we recruit in a different environment and attract different categories of people compared to the other sectors"* (Secureland Army, 2011b*)*. He added *"the assumption that the SA can get a competitive advantage from e-enlistment is doubtful".* In sharp contrast are some military schools who claim that competing for highly qualified applicants is possible. However, they raised an issue saying *"it is the regional diversity imposed by the SA that impedes enlistment of highly qualified applicants"*. The two accounts always referred their claims to the enlistment outcomes experienced through the two key enlistment practices conducted in the SA (pre-2008 practice and post-2008 practice). These two practices will be reviewed in Chapter 5.

To solve this disagreement towards the determination of the end state of improved enlistment process, a number of meetings were conducted. However, the LeC was unable to resolve the conflicts and establish a complete and accurate account of stakeholder requirements. This failure led ultimately to the cancellation of the project by the CeGP. This past experience motivated the Author of this thesis to start the journey towards defining the root causes that led to the failure in the SA e-enlistment project. At the beginning, the thesis started identifying the various challenges faced in the failed SA's e-enlistment project using extensive document inspections. Some of these challenges were clearly reported by the CeGP and LeC. These challenges are presented in the next section. Later, these challenges will be investigated in reference to the related literature to explicate the problem of research (see Chapter 5).

4.3.5   Challenges and Requirements for Improved Enlistment Transformation

The application of the ETM on the SA enlistment process faced many challenges which led to the failure in producing the e-transformation proposal. The key challenges were:

- The lack of experience with requirements engineers in the military recruitment.
- The difficulty in scoping the enlistment problem to be solved which led to the difficulty in the identification of relevant stakeholders, goals, tasks, etc.
- The multiplicity of stakeholders and their national and cultural distribution (e.g. regions, corps, schools, applicants, etc.)
- The lack of communication between the requirements engineers and business stakeholders.

- Difficulty with business stakeholders in explicitly describing and articulating their needs.

- The absence of reference models for defining the recruitment problem, its constituents, and their relationships, and solving conflicts between different stakeholders.

- The difficulty in mapping the impact of e-enlistment solution into the real-world recruitment problem (cognitive, social, political, cultural, etc.) and vice versa.

- Inability of business process flowcharts to represent the various aspects of a real-world recruitment problem and enable analysis and communication.

- The lack of properly documented recruitment best practices that can be reused for such a large-scale project.

4.4 Summary

This chapter provided an outline the SA including its mission, the core functional areas, the organisational structure, and the types of non-officer recruitment practices and their integration with other HRM processes. It also provided an outline of the failed SA's e-enlistment project conducted in Secureland including the description of the overall e-government program in Secureland, the reasons of selecting the SA's enlistment as being a promising e-transformation project, the description of the e-transformation framework and methodology proposed by Secureland, an overview of the application of the framework proposed upon the SA's enlistment for transforming it into the e-space, and finally the various challenges faced which finally resulted in the failure of the project.

Chapter 5: Explicating the Problems in SA E-Enlistment Project

5.1   Introduction

In reference to the overall research method explained in chapter 3 (section 3.4), this chapter will particularly focus on *phase (1) "explicate problem"*. As depicted in Figure 5.1, this chapter will explicate the problems (i.e. knowledge gaps in the research literature) which contributed to the practice (i.e. the difficulty of realising the value of e-recruitment) which, in turn, led to the failure in the SA's e-enlistment project. Given the various challenges identified in chapter 4, the research will investigate the major problems that are the root causes of the failure. The chapter also presents the framework through which these problems are explicated.
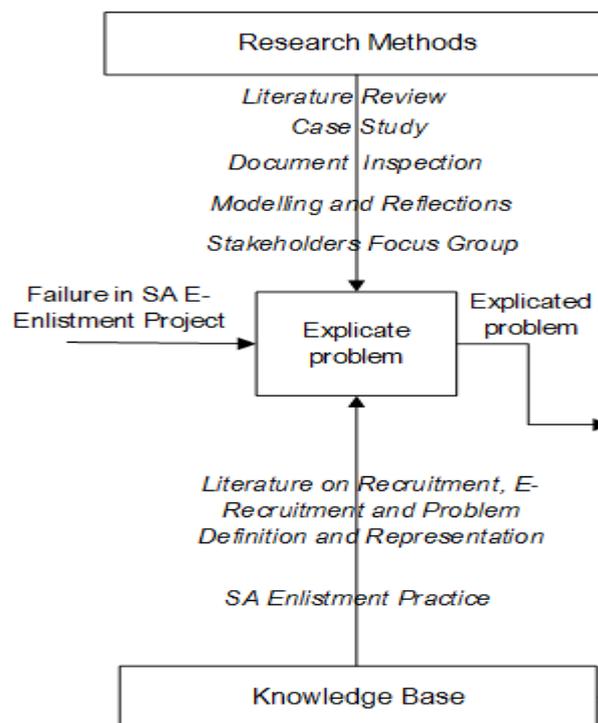

Figure 5.1 Phase One: Explicate Problem

5.2   The Role of Problem Domain Knowledge in RE Projects

Organisations that operate in a multi-disciplinary, multi-agent, trans-national, and trans-cultural environment normally face numerous challenges when developing their information systems

(Nuseibah and Easterbrook, 2000; Kossmann and Odeh, 2010). The knowledge about this environment, that is problem domain knowledge, is crucially important in the requirements analysis for such systems (Osada et al., 2007; Hull et al., 2010; Neetu and Pillai; 2013). Hence, the literature has started a shift in the way RE is practiced from being completely process-oriented RE towards more knowledge-oriented RE in an attempt to tackle some of the challenges faced (Kossmann and Odeh, 2010; Siegemund, 2014). Process-oriented RE is when all RE activities and related deliverables are guided by a process-driven approach. However, knowledge-oriented RE is when RE is guided not only by a process but also by the knowledge about the problem domain. In a knowledge-oriented RE approach, the structure and evolution of knowledge (i.e. emerging concepts and relationships between them) is the driver for RE activities (i.e. iterations or steps of RE process). The key to a knowledge-oriented RE appears to relate to capturing, linking, and managing reference knowledge and concepts in the problem domain of RE so as to develop high quality requirements for the related domain (Kossmann and Odeh, 2010; Siegemund, 2014).

Back to the case of the SA e-enlistment project and the challenges identified in chapter 4, it is promising to approach these challenges faced in the SA e-enlistment project from a knowledge-oriented RE perspective in a way to define the root causes of the problem. In other words, the extent to which the current recruitment domain knowledge has contributed to the overall problem of research (i.e. difficulty in realising the value of e-enlistment in the SA) will be investigated. Having recognised that problem domain knowledge is a critical element in RE, domain knowledge representation also plays an equally important role. Knowledge is necessarily represented in a medium or language, ranging from the symbols used in formal models to the natural language of laypeople. Such representations are often created for structuring problem domain knowledge and orienting it towards RE in a systematic manner (Kossmann and Odeh, 2010). Given that the quality of such representations vary according to some aspects such as the type of business or product, or the type of project (Nuseibah and Easterbrook, 2000; Osada et al., 2007; Neetu and Pillai; 2013). In next section, a number of problem domain knowledge representations (i.e. models) will be evaluated against their contributions to the definition of the SA e-enlistment problem.

5.3   A Framework for Explicating the Problems of SA E-Enlistment Project

It has been widely stressed that RE is not simply collecting requirements by asking the right questions or writing requirements documents, however, it is about the discovery of the real

problem to solve (Nuseibah and Easterbrook, 2000; Robertson and Robertson, 2012; Hall et al., 2012). Given that some e-solution system is useful for a specific business or activities in an organisation, such a solution system will change this business that it supports. Thus, an RE process must be aware of the potential change in the business domain, that is the problem domain (i.e. the domain in which a problem exists). This presupposes a complete knowledge about the problem domain exits. Taking the complexity of a real-world recruitment problem into account, a framework, see Figure 5.2, is adopted to investigate the role of a number of domain knowledge representations from different disciplines (e.g. recruitment, RE, problem definition and representations, and enterprise system) in understanding and defining the problem domain of the SA enlistment practice. Most of the investigation results are presented in chapter 2 during the literature review. To confirm this role, an empirical study is conducted and the results will be reported.
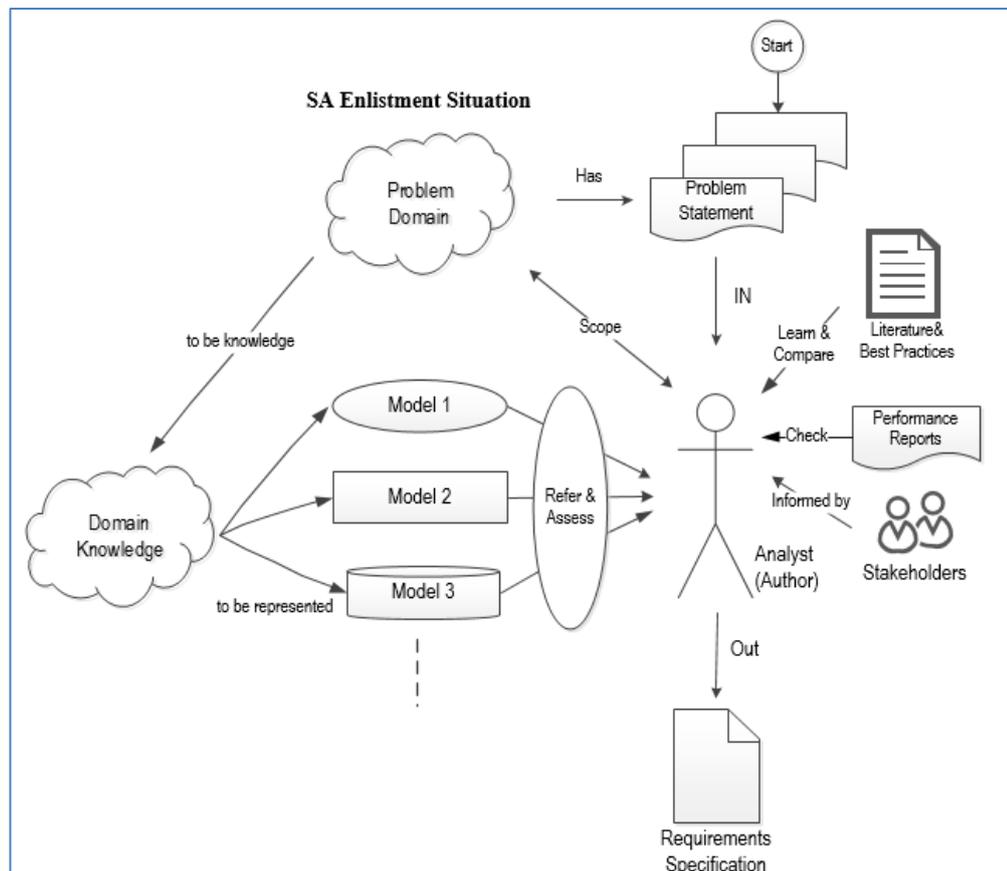

Figure 5.2 A Framework for Explicating the Problems of SA E-Enlistment Project

In Figure 5.2, the relationship between a problem domain, knowledge representations, and RE is presented. The author will refer to different domain knowledge models during the requirements elicitation to assess their contributions in scoping and defining the presenting

problems reported in the target business (i.e. the SA enlistment practice). First of all, the author will specify the concrete problems that were reported and assumed to be tackled by the previous SA e-enlistment project, called problem statements. Following on this specification, the author will try a fail-safe way of setting the enlistment problem domain. Changing the boundary of problem domain might influence other related problems to be stated. During this setting, different domain knowledge models will be referred to and their effects in creating a deep problem-related knowledge structure for SA enlistment practice that would be a basis for the RE elicitation will be investigated. For investigation purposes, the author will also rely on the discussion with a WhatsApp stakeholder focus group representing the actual stakeholders, performance reports inspection, and the comparison with the recruitment literature and similar enlistment practices for recruitment problem definitions.

5.3.1   Problem Statements in the SA Enlistment Practice

In this section, the author will find out the presenting issues that arouse the initial interest in the SA e-enlistment project. The evidence that indicates the existence of these issues will be collected. The shift to the SA e-enlistment project was driven by the tendency to solve a number of problems and improve the performance of enlistment practice. The problem statements revolve around six concerns: the error rate (i.e. the difference between job vacancies and the number of the candidates, i.e. graduates, to fill these vacancies); withdrawals, the required level of KSAs; the regional diversity of candidates; the length of enlistment process; and the cost. Table 5.1 illustrates the key concerns stated and some statistics of the SA enlistment outcomes in 2012. These statistics are derived and calculated from the reports of the Central Inspection Committee in SA (SA Statistics Agency, 2012). See Appendix 5 for more details about these statistics.

As seen in Table 5.1, a number of problems are identified. The first problem was the less number of cadets graduated (5291) compared to the job vacancies (5500). This error rate (decrease) averaged at (3.80%). Secondly, the high rate of withdrawal during the enlistment practice amounted to (54.43%). Thirdly, the level of KSAs obtained by the graduates recorded a moderate rate (72.34%). Fourthly, the rate of regional diversity among the allocated enlistees in military regions was low recording (53.45%). This regional diversity rate was measured by the variation ratio in the data of the element "origin region" of the recently allocated enlistees in a specific region. Both the level of KSAs and diversity are measured at the graduation time (i.e.

the end of specialised training). Fifthly, the cycle time of enlistment was extended to (45) weeks. Finally, the cost of enlistment practice was high.

Problem Statements:
▪ Error rate (decrease) between job vacancies and graduated cadets.
▪ High rate of withdrawals of applicants during the enlistment process.
▪ A moderate level of knowledge, skills and abilities of graduates.
▪ Low rate of the regional diversity of recently recruited enlistees within a specific military region.
▪ A longer time enlistment process takes around 45 weeks.
▪ Much cost and effort spent on receiving and assessing a large number of applications.

Statistics:

No. of applications submitted	No. of job vacancies	No. of cadets graduated	Error rate	Withdrawal rate	Avg. of KSAs	Regional diversity rate	Process time in weeks
11298	5500	5291	(-) 3.80 (%)	54.43 (%)	72.34 (%)	53.45 (%)	52

Table 5.1 Problems Reported and Statistical Data of the SA Enlistment Practice (Source: derived from (SA Statistics Agency, 2012))

5.3.2 Model, Analyse, Compare and Assess

The abovementioned problem statements are used to guide the inquiry process and analysis of the problem domain of the SA enlistment practice (i.e. defining the part of domain knowledge related to the problems stated). Given that most of the models related to the domain knowledge representation have been generally assessed in chapter 2, in next sections the research will present an empirical assessment of two domain knowledge representations for their adequacy in analysing and learning about the problem domain of the SA enlistment practice. To assess, there are many criteria that have been proposed for such assessments. However, the current assessment will be reduced to the criteria that comprise: comprehensiveness (Burton-Jones et al., 2004); genericity (Vesely, 2011; Smith et al. 2010); abstraction (Fox et al., 1998; Osada et al., 2007); perspicacity or generativity (Fox et al., 1998; Robertson and Robertson, 2012; Hall et al., 2012). For more details about the definitions of these criteria see chapter 3, section 3.4.2 in particular. During the assessment, the relevant literature will be referred to in an action-research mode to learn about the potential recruitment problems suffered from, and the central issues (i.e. knowledge gaps) involved in representing recruitment problem situations. In addition, the performance reports will be inspected, and a WhatsApp-based focus group of stakeholders of the SA enlistment practices will be involved during the analysis and assessment.

The WhatsApp stakeholder focus group is made of members of the Local e-Committee (LeC), see 4.3.4, and HR managers from the SA who were previously part of the SA e-enlistment project. The members will act as representatives of the actual stakeholders in the SA enlistment practice. The results of the assessment will address the limitations in representing the recruitment-related domain knowledge that may account for the failure in the SA e-enlistment project, and hence explicate the research problem to be tackled in this thesis.

5.4   The BPMN Model for the SA Enlistment Practice

BPMN is a graphical process representation supported by a formal language for enactment support (Vergidis et al., 2008). This makes it capable for both the subjective analysis (i.e. being diagrammatic, communicative, and descriptive for learning); and the objective analysis (i.e. being structured, formal, and amenable for quantitative analysis) for the behavioural aspects of the real-world problem. For the SA enlistment practice, the BPMN model is presented in Figure 5.3.
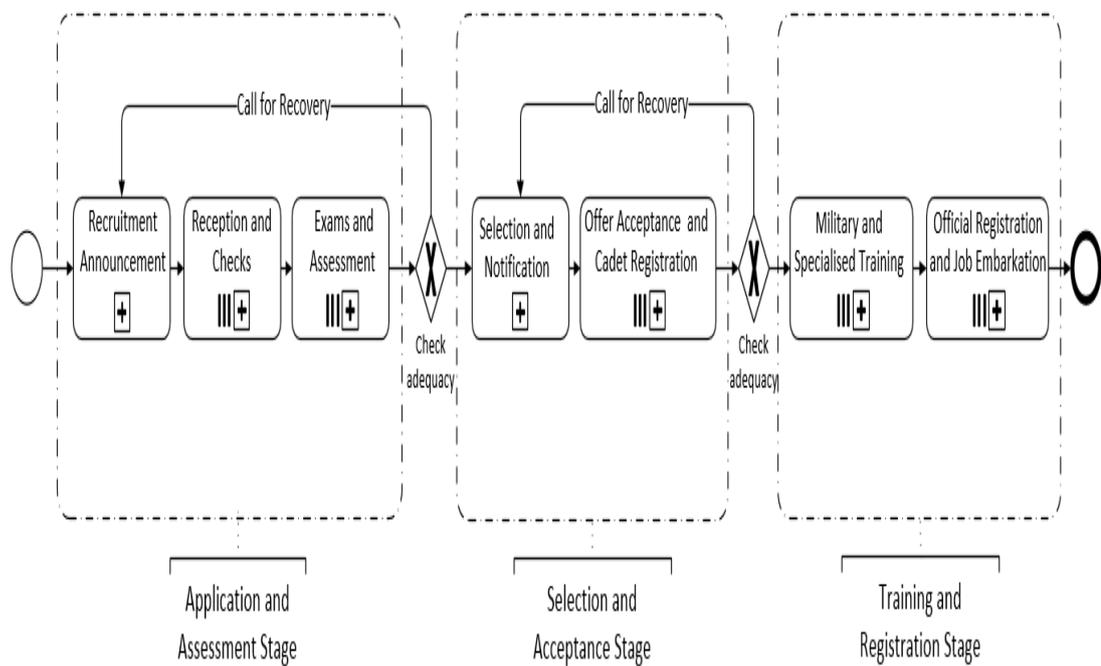
Figure 5.3 The SA Enlistment BPMN Model

Given the problem statements in the SA enlistment practice presented in 5.3.1, the BPMN model can support the discovery and analysis of some of the problems related to these statements from a *subjective sense*. Table 5.2 shows a number of the problems discovered in each stage and activity of the SA enlistment model.

Stage	Activity	Description of Problems Observed
Announcement and assessment	Recruitment announcement	▪ Incomplete recruitment message ▪ A single method used for announcement
	Reception and checks	▪ Inspection on the entry to the campus ▪ Much time, cost, and effort spent screening documents and checking applications of a large number of applicants
	Exams and assessment	▪ Ineffective criteria of assessment ▪ Time spent on correcting essay-based exams ▪ Inability to remove failed applicants until the end of the assessment process
	Call for recovery	▪ Long-time retention of already assessed /selected applicants during recovery ▪ The lack of communication ▪ Time, cost, and effort spent for rescheduling new timetables and running recovery sessions
Selection and acceptance	Selection and notification	▪ The large pool of candidates ▪ Human intervention in selection ▪ Time spent on the approval of the list of candidates ▪ Ineffective ways of communication
	Offer acceptance and cadets registration	▪ Long-time retention of candidates when recovery ▪ Lack of communication ▪ High cost spent on medical test ▪ Manual interaction with external agents ▪ Time spent on the approval of the list of cadets
Training and registration	Military and specialised training	▪ Delay in receiving cadets for training ▪ Lack of applicants' awareness about training ▪ No information about jobs until the end of training
	Official registration and job embarkation	▪ Complicated job allocation process ▪ Difficulty in meeting a cadet's job preferences (e.g. region) ▪ Time spent on the approval of the list of enlistees

Table 5.2 Problems Perceived in the SA Recruitment Process

The Problems of Recruitment Announcement Activity:

The analysis of the BPMN has shown a number of problems related to this activity. One major problem is that the content of recruitment message is very short and succinct. It only shows the general job requirements, and time and location of a job opening. It provides no information about the employer (the corps and its related activities), neither about the detailed specifications of vacancies available, such as job name, rank, location, salary, etc. Hence, it might be difficult for such a recruitment message to attract the potential applicants, especially the high qualified ones. Another problem is that announcement is limited to one announcement method, i.e. newspapers. Hence, it is less likely to convey a recruitment message to a large segment of population such as the case of the SA recruitment. For announcement, there might be a number of newspaper agents to be selected. The selection is subject to the availability for announcement in a specific region at specific time as well as the cost of announcement. This routine might influence the reginal diversity of applicants and is prone to delay and cost. This becomes more difficult in the case of the call of recovery where the available time is very short.

The Problems of Reception and Checks Activity:

There have been a number of problems arisen from the analysis of this activity. The inability to deal with applicants immediately upon their arrivals leads to the long retention of applicants. There are some restrictions on the entry to the military schools (e.g. security), therefore, applicants are subject to inspection and arrangement in groups for access. These arrangements are conducted upon the arrival of applicants to the school campus. Given the large number of documents screened and checked, this spends much time and cost. This, in turn, leads to the withdrawal of applicants.

The Problems of Exam and Assessment Activity:

One key problem is the inability to unify one sample of the paper exam for all applicants. Target applicants have different specialisations, i.e. applied and theoretical science, which need different assessment devices. Another related problem is that the lack of resources (e.g. exam halls) limits all applicants from being tested on one sample at once. These different devices affect fair assessment. Another problem is that the exam does not examine the level of job-related knowledge but the general knowledge that can be rather assessed by qualifications obtained. Time and cost spent on running assessment activities, correcting exam papers, and collecting scores obtained, as well as the burden lies on recruitment staff in carrying out these

activities are all problems suffered. In terms of assessment activities, there is no way to exclude a failed applicant from conducting all assessment activities until the end of the assessment. The unpredictable withdrawals of applicants in this activity influence the full utilisation of exam halls.

The Problems of Call for Recovery Activity:

The call for recovery activity has many problems. One is the long-time retention of applicants who already assessed or selected until the end of recovery sessions. This, in turn, causes many withdrawals. This becomes more evident with the absence of effective communications ways through which an applicant can be informed about delay. Another problem is that making a decision whether to proceed to the next activities or to call for recovery requires a number of arrangements, e.g. rescheduling. These take long time to be carried out. Moreover, time and cost spent on the repetition of activities are present.

The Problems of Selection and Notification Activity:

Comparing to the large number of applicants received, there is no way to exploit those who have had no chance to be selected. This incurs a large amount of time and cost that need to be justified. Another problem is the preferential selection of candidates for regional diversity purposes. Although this selection is illegal, the SA is temporarily exempted for national security issues. Another problem is that the notification of acceptance requires fast ways of communication than newspapers. The time needed for the approval of applicants and announcement is very lengthy. The high cost incurred from the instant search for newspaper agents for announcing is another problem.

The Problems of Offer Acceptance and Cadets Registration Activity:

The key outcome of this activity is the high rate of withdrawals. This may be due to an applicant being long retained during previous activities, or being not aware of acceptance announcement. Another problem is that the cost spent on carrying out one medical check is high. Thus, the less number of applicants medically tested, the less money spent on medical check The manual handling of official letters between enlistment partners and reports pertaining to registration are prone to delay and loss.

The Problems of Military and Specialised Training Activity:

There have been a number of problems emerged from the analysis of this activity. One is the difficulty to recover withdrawals during the training courses. Another problem is the failure in meeting cadets' expectations. Cadets are uncertain about the job for which they will be allocated until the end of training. They are also concerned about their job preferences being matched based the grades obtained during the training courses while neglecting their previous academic qualifications. The lack of applicants' awareness about the nature of military training and the selection mechanisms makes this concern much worse. Another problem is the need for rescheduling training courses when call for recovery is conducted.

The Problems of Official Registration and Job Embarkation:

The most notable problem is the difficulty to match cadets' region preferences due to the regional diversity of recruits imposed on each region. Each military school has to ensure a balanced set of regionally diverse recruits allocated to each region. This policy imposed restricts the job allocation of recruits and makes it very complicated. The problem gets worse when the pool of selection is not regionally balanced at origin. Given that cadets have no information about this allocation mechanism until the time of allocation, the unpleased cadet about region allocation might withdraw, or at least post-hire performance is negatively influenced. Another problem is the time spent on getting the official documents escalated and signed by the Head of school.

From an *objective sense*, the formality of BMPN model makes it amenable for the structured analysis (i.e. performance evaluation) of the SA enlistment process. Back to the problem statements in the SA enlistment practice presented in 5.3.1 and the BPMN model presented in Figure 5.3, Figure 5.4 provides a sound basis for setting performance indicators that can measure the impact of some problems of the core processes on the problem statements.

Stage #1		
	No. of applications submitted (A)	11298
	No. of job vacancies needed (B)	5500
	Withdrawal rate in stage #1 (C)	21.18%
	No. of Applicants expected in stage # 1 (D=B*150%)	8250
	No. of Applicants accepted in stage # 1 (E)	7904
	Error rate in stage #1 (F=(D-E)/D) = 346/8250	(-) 4.19%
	Avg. of KSAs	77.90%
	Avg. of regional diversity	60.34%
	Avg. of process time	9.5 weeks

Stage #2		
	No. of cadets registered (G)	5482
	Error rate in stage # 2 (H=(B-G) /B) = 18/5500	(-) 0.3%
	Withdrawal rate in stage # 2 (I=(E-G) /E)	30.65%
	Avg. of KSAs	72.99%
	Avg. of regional diversity	53.53%
	Avg. of process time	8.5 weeks

Stage #3		
	Actual withdrawal in stage # 3 (J)	143
	Withdrawal rate in stage # 3 (K=J/G*100)	2.60%
	Failed cadets in stage # 3 (L)	48
	Failed cadets rate in stage # 3 (M=L/G*100))	0.87%
	Graduated cadets (N)	5291
	Error rate in stage # 3 (O= (G-N) /G) = 191/5482	(-) 3.4%
	Avg. of KSAs	72.34%
	Avg. of regional diversity	53.45%
	Avg. of process time	34 weeks

Overall Results		
(-) 3.8%	Error rate (P= (B-N) /B)	
54.43%	Total withdrawal rate	
72.34	Avg. of KSAs	
53.45	Avg. of regional diversity	
52	Avg. of process time	

Figure 5.4 The Performance Evaluation of the SA Enlistment Process Based on BPMN Model

From Figure 5.4, the total error rate (- 3.8%: the less number of graduates (5291) compared to the job vacancies (5500)) resulted from the errors rates (decreases) occurred over the three stages of the SA enlistment process (- 4.19%, - 0.3%, and - 3.4% respectively). These error rates can be readily attributed to the percentages of withdrawals occurred in each stage (21.18%, 30.66%, and 2.60% respectively) as well as the failing cases occurred in stage #3 (48). Similarly, the average of the KSAs, the regional diversity, and the process time can be traced back in the same way.

In stage #1, it is notable that the SA targets a number of applicants larger than the number of vacancies (150%: 8250). Based on the past experience of SA, this was to cover the expected withdrawals during the overall enlistment process. However, the SA was unable to secure this number (8250). The number was only 7904 forming an error rate amounted to (-) 4.19%. This less number of applicants accepted (7904) may have resulted in a number of recovery calls carried out which, in turn, caused a longer time of process (9.5 weeks) than the average. Furthermore, the resulting large pool of applications received (11298) brought much time and cost when processed. The averages of KSAs and regional diversity of applicants accepted (77.90% and 60.43% respectively) were high at stage #1 compared to the final results. However, they started decreasing during the next stages.

In stage #2, the number of cadet officially registered was 5482 which less than the number of vacancies (5500) by 18. This formed an error rate of (-) 0.03%. However, the percentage of the applicants who withdrew or rejected the offers given was high (30.65%). This reflected the large number of the cadet offers extended and the number of the recovery calls from the backup that were carried out. The average of the cadets' KSAs decreased to 72.99% compared to the same average in stage #2 (77.90%), which denotes that the majority of withdrawals was from those who obtain a higher level of KSAs. Likewise, the average of regional diversity decreased to 53.53 % compared to the same average in stage #1 (60.43%). Given the pool of selection (7904) was somewhat regionally diverse (60.43%) and the SA enforces regional diversity, the decrease denotes that most of those who withdrew were from specific regions or, in other words, the rate of offer acceptance differs according to the differences between regions. The long process time (8.5 weeks) in stage #2 resulted from the number of recovery calls conducted.

In stage #3, the number of graduated cadets who were officially recruited was 5291. This was less than the number of registered cadets (5482) at the beginning of stage #3. This formed an error rate of (-) 3.4%. This error rate resulted from the number of withdrawals (143) and the failing cases (48) during the training. The averages of the KSAs and regional diversity of graduates were slightly less than the averages in stage #2 recording 72.34% and 53.45% respectively. The average of process time was long because of the length of training courses recording 34 weeks.

In conclusion, it can be noted that the error rates existed in each stage of the SA enlistment. The withdrawal rates increasingly go up as the enlistment goes to the offer acceptance. The pool of the cadets registered or graduated gets influenced by this rate of withdrawal. This impact can be observed on the quality of pool (i.e. the level of KSAs) or the regional diversity. This gives insights into the fact that the decisions of applicants (to withdraw or accept) differ according to the personal differences of applicants. The rate of withdrawal also influences the process time becoming longer because of the recovery calls carried out.

Based on the foregoing analysis, the BPMN model can be assessed according to the criteria proposed in section 5.3.2. The BPMN model has shown a strong support for both the subjective and objective analysis. Being a diagrammatic model, it supports a descriptive power for learning and communication. However, being formal as well as supported by a formal language such as BPEL (Vergidis et al., 2008), it is amenable to automated and structured reasoning and analysis. Thus, the BPMN model provides a generative power for enabling requirements elicitation and

execution. Nevertheless, it lacks encompassing the richness of real-world situations. It addresses who, how and when, however, many problems aspects (e.g. conceptual ones) may not possess the kinds of underlying structure that the BPMN supports. For example, it lacks support for learning about '*why do applicants withdraw or accept offer*?', '*what is the relationship between the quality (KSAs) and diversity of applicants*?' or '*what are the implications of such relationship?*' This makes it unable to present a comprehensive account of recruitment problem domain knowledge. Moreover, being devoted to *the process problems (i.e. the behavioural aspects of a situation),* the BPMN model fails to provide an abstract of the recruitment problem (i.e. providing a core set of primitives (problem viewpoints) that can be partitionable in different levels).

For the genericity (i.e. sector/domain interdependency), there are a number of limitations with the BPMN model for the SA enlistment. One is that the terms and concepts used are domain-specific and need the practitioners to be familiar with the military sector. Second, the model addresses the enlistment problem from one perspective (i.e. the SA perspective) and ignores the other perspectives. Third, in reference to the recruitment research, the BPMN model shows a variety of problem definitions that are routinely proposed by researchers for particular recruitment problems and fails to abstract from those definitions a generic recruitment problem definition. Figure 5.5 depicts many problem definitions that are proposed for *withdrawal problem*.
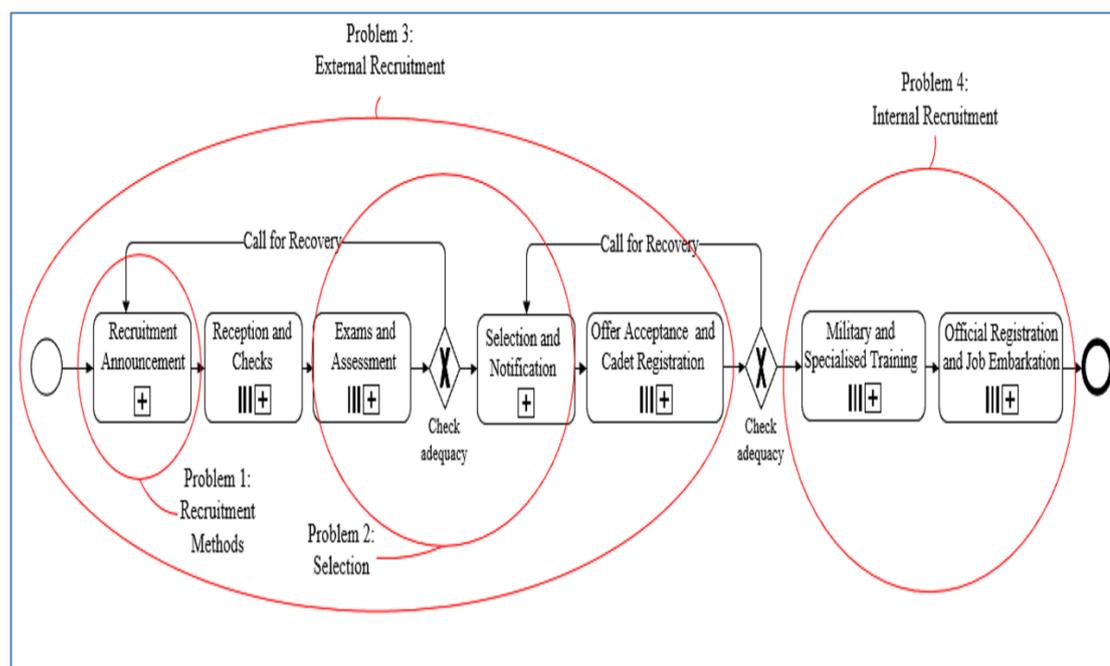

Figure 5.5 The Alternative Scopes of the Withdrawal Problem in SA Enlistment

The withdrawal problem can be defined as: a problem of the recruitment methods by which an applicant gets attracted to a job opening, a problem of the selection method that fails to satisfy applicants, a problem of the whole external recruitment in which an external person applies for an organisation, or a problem of the internal recruitment in which a member of organisation gets promoted or moved. Taking into account the fragmentation in recruitment research, the BPMN model for the SA enlistment fails to abstract from many problem definitions a generic recruitment problem definition (i.e. representation) that can be tailored to many recruitment contexts.

5.5   The Low-Fidelity Prototypes for the SA Enlistment Practice

Reacting to the limitations of the BPMN model and its underlying structure, low-fidelity prototypes will be used for representing the SA enlistment problem. Low-fidelity prototypes (sometimes called sketches) make the hard-to fathom issues visible and help the stakeholders concentrate on the subject matter (Robertson and Robertson, 2012). They encompass the richness of real situation by representing something real, or at least something corresponds to the reality, thereby giving everyone the opportunity to understand, discuss, and decide. Looking to the problem statements of the SA enlistment practice in section 5.3.1, a sketch of the SA enlistment situation that addresses these statements in general will be drawn. Recalling the trade-off between the regional diversity and quality (KSAs) of graduates was considered one of the key challenges that led to the failure in the SA e-enlistment project, this sketch will try to address this issue in particular. In addition to the sketch of the SA enlistment practice, another sketch of an old enlistment practice, called pre-2008 enlistment practice, will be also drawn and compared to the current SA enlistment. The representation and analysis of the pre-2008 enlistment practice came out of some reasons. Firstly, there were many claims for the return to the pre-2008 enlistment practice as a resolution of the diversity problem. Secondly, the outcomes of the pre-2008 enlistment practice were the driver to the shift to the current enlistment practice, hence sometimes called post-2008 enlistment. Thirdly, the sketch of the current enlistment practice (post-2008) was inadequate for analysis thereby drawing and comparing the two sketches and analysing the changes conducted on both and the results of these changes might enable a better understanding of the recruitment problem on hand; and the quality-diversity trade-off from another hand.

5.5.1   The Current SA Enlistment Practice (Post-2008 Practice)

An Overview of the Key Stakeholders in Post-2008 Practice

The sketch in Figure 5.6 presents the multiple stakeholders and their geographical structure in the current enlistment practice. However, Figure 5.7 shows the abstraction of the enlistment actors in one region.
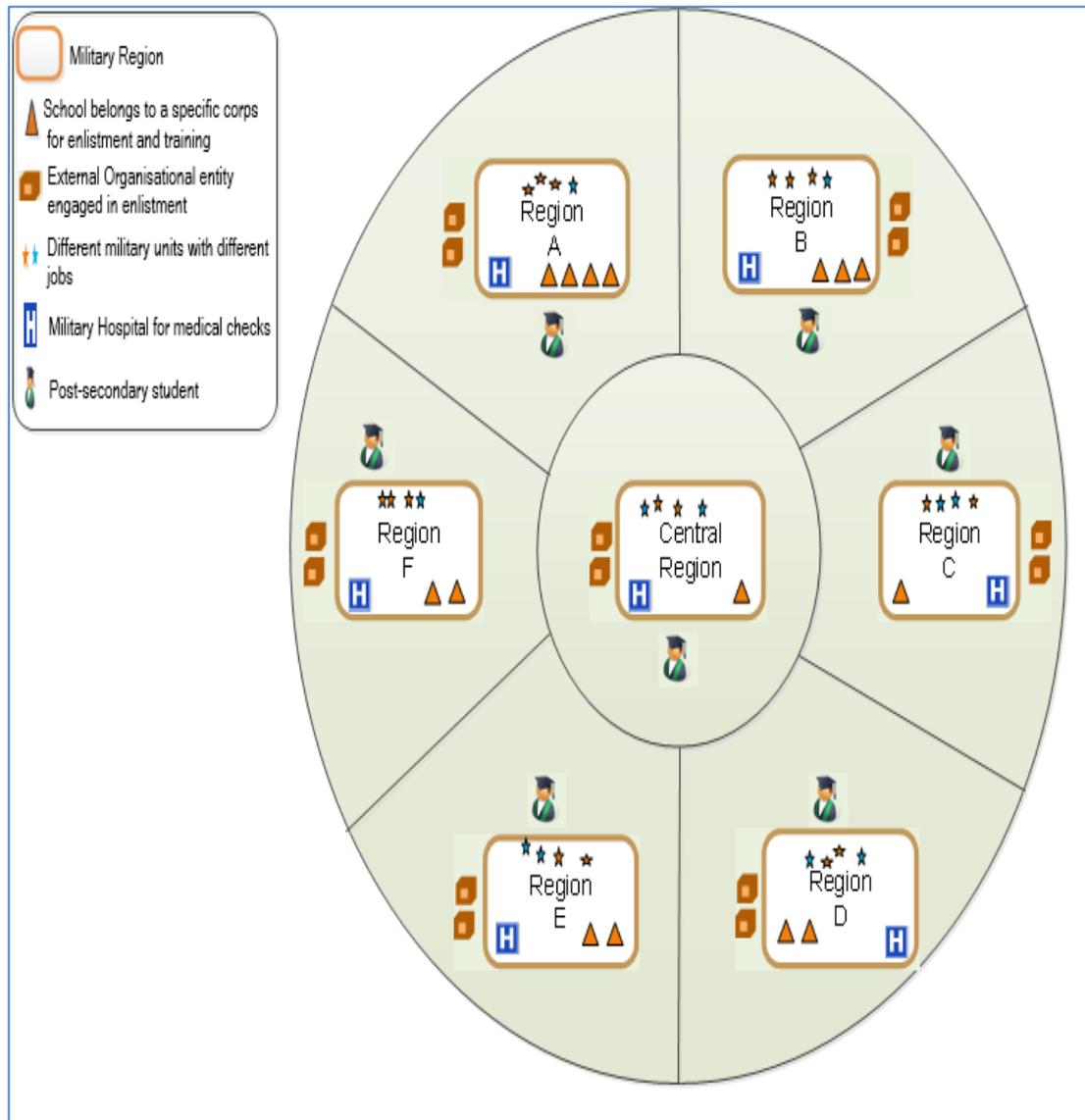

Figure 5.6 A Representation of the Whole Spectrum of the Stakeholders in the Current SA Enlistment Practice (Post-2008)
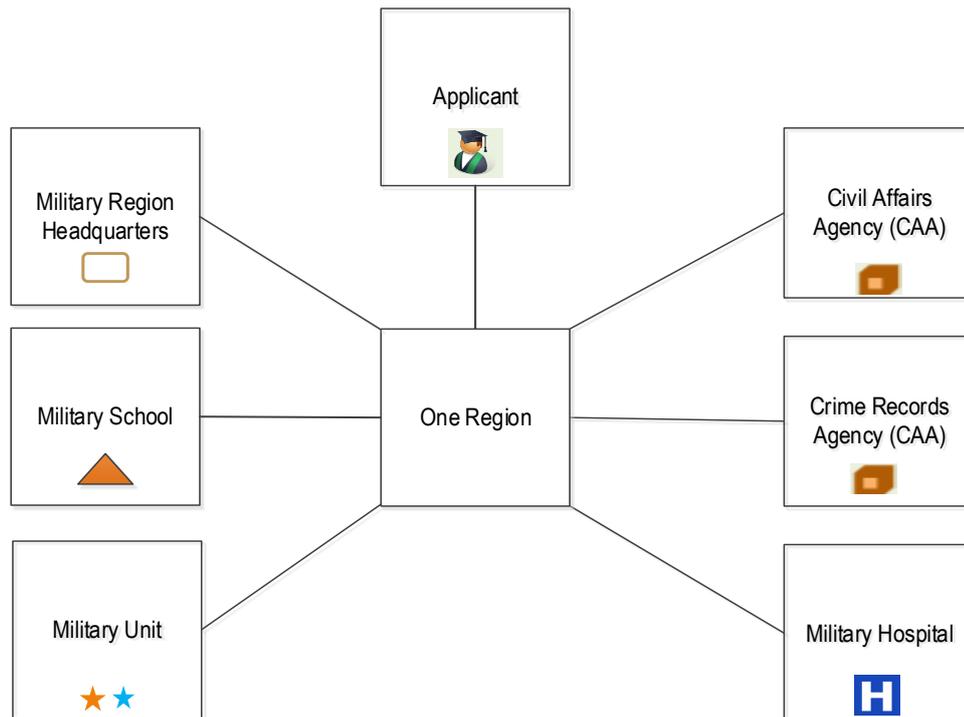
Figure 5.7 The Abstract of the Actors in One Region (Post-2008 Practice)

- <u>Military Region Headquarters:</u> It has been mentioned earlier that the SA relies in achieving its mission on seven military regions. These regions cover the whole land of Secureland. For each region, there is a headquarters that command all military units within the region including military hospitals, military schools, operational units, etc. The central headquarters is located in the central region and represents the Commander and Chiefs of Staff for SA. A military region is not self-independent therefore the regional headquarters needs to coordinate with the civil organisations located within the same region for enlistment needs, and with the military schools located outside the region for diversity purposes.

- <u>Military Schools:</u> A military school relates to a specific technical corps. For each corps, there is only one military school. This school is located in a certain region based on some considerations. Most important is the compatibility between the type of training provided by a school and the topography of that region. Hence, the distribution of schools over military regions is not equal. For example, Region (A) in Figure 5.5 includes four military schools whereas the central region has only one school. The role of a military school is to conduct enlistment (including training) to fill vacancies that are scattered over all military regions and owned by the corresponding corps.

- ▪ Military Units: These units are spread over military regions. These units are military formations such as divisions, brigades, battalions, companies and so on. These formations have different technical jobs whose ownership refers to specific corps. The total number of jobs allocated for each region is almost equal. However, the percentage of jobs allocated for each corps differs. The job of a military units in regard to enlistment is to report the job vacancies and the embarkation of new enlistees.

- ▪ Applicant: Applicants from all military regions are targeted by a military school. An applicant has a choice to apply to all military schools irrespective of location. The state of the applicant changes during enlistment. The first state is *applicant*. An applicant is a post-secondary student who has just finished the basic education. The second state is *candidate*. This state starts after an applicant is selected and invited for the final checks. Once a candidate passes those checks, the state will change to *cadet*. The state of cadet continues until the graduation ceremony in the corresponding military school. After the graduation, an applicant becomes *recruit* or *enlistee* in the SA.

- ▪ External Civil Organisations: There are two external civil agencies participating in the current enlistment practice: Civil Affairs Agency (CAA) and Crime Records Agency (CRA). The CAA is responsible for the verification of an applicant's nationality and employment status, and reporting to the inquiring school. An applicant being not employed or naturalised is a key requirement of the enlistment in the SA. The CRA is responsible for providing evidence that an applicant has a free-crime record. The connection between an applicant and these agencies is based on a letter given from/to the inquiring school. Finally, the results of checks are sent to the military school.

- ▪ Military Hospital: A military hospital is commanded by the military region headquarters. For each region, there is only one hospital. The job of a hospital is to check the medical fitness of an applicant against a predefined set of requirements pertaining to body, speaking, hearing, and eyes check. The results of these checks are sent to the inquiring military school.

An Overview of the Applicant Journey in the Post-2008 Practice

Post-2008 enlistment practice depends on the major role played by the military schools in running all enlistment activities including enrolment, military preparation, specialisation training, and the allocation of cadets to jobs available. Figure 5.8 presents the sketch of the applicant journey in the SA current enlistment practice (post-2008). The sketch depicts a number of

interactions through which an eligible applicant becomes officially recruited and the organisational structure in which these interactions occur. Given that most of these interactions have been explained in detail in chapter 4, section 4.3.4.2, some illustrations are needed. Firstly, only one enlistment instance has been depicted in the sketch while all other schools carry out the same thing. The notation that shows three connected triangles refers to that the three key stages of enlistment (application and assessment, selection and acceptance, and training and registration) held at the same school. Secondly, the notation showing an applicant/enlistee with multiple arrows refers to that he has the choice to apply to any school of the SA or he can be allocated into different job location. Thirdly, a two-direction interaction between two actors may accomplished through a number of sessions (e.g. many site visits at different times).
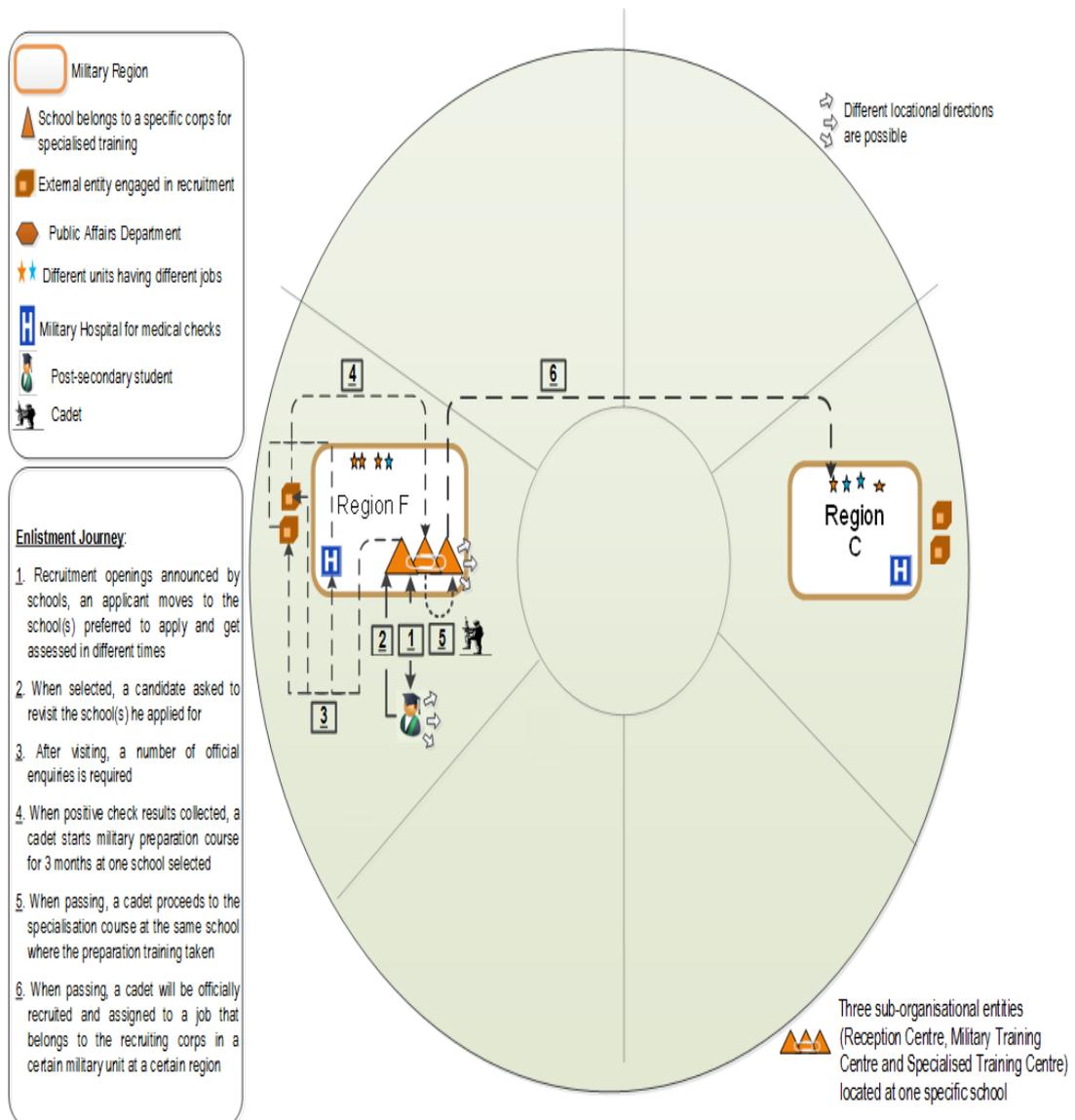

Figure 5.8 The Journey of Applicant in the Post-2008 Enlistment practice

As demonstrated in Figure 5.8, the post-2008 enlistment practice starts with the announcement of enlistment opening by the school. The announcement is often carried out in concurrency with the graduation of secondary students. Announcements is performed based on a enlistment order prepared and sent by the Chief of Military Personnel (CMP) in each school. After announcement, a potential applicant selects which school(s) to apply. After selecting, an applicat has to move the place where the school(s) selected is. When arrival, an application form needs to be filled in, documents are screened, and finally enlistment requirements and conditions are checked. Specific enlistment requirements might be tailored based on the actual needs of a specific school. After that, an applicant who passes this check will be assessed. The assessment criteria might be also adjusted for the same purpose aforementioned. After an applicant gets selected, the results are approved by the CMP of that school and then announced. Candiate have to move back to the school(s) to complete their registration and training. Offical registration is based on obtaining positive results over the three official enquiries required from three organisational entites. If the results of these enquiries are positive, then a candidate will be registered as cadet and notified with the start date of the military preparation course. When passing, a cadet will proceed to the specialisation course at the same school. At the end of the specialisation course, a cadet will be allocated to one specific region where the job is located. The allocation of jobs is subject to the regional diversity of enlistees throughout the jobs related to a specific region and the results obtained in both the military preparation and specialisation course. Finally, a cadet is officially registered as an enlistee and asked to embark upon the job allocated.

5.5.2   The SA Pre-2008 Enlistment Practice

An Overview of the Key Stakeholders in Pre-2008 Enlistment Practice

The sketch in Figure 5.9 presents the multiple stakeholders and their geographical structure of the previous pre-2008 enlistment practice. Compared to the structure of the current post-2008 practice, the structure of the pre-2008 enlistment practice was similar. However, two organisational entities were added: the Military Preparation Centres (MPCs) and Public Affairs Department (PAD).

- Military Preparation Centres (MPCs): These centres are responsible for carrying out the majority of enlistment activities starting from application until the end of military preparation training. The MPCs are centred between the military regions. Hence, each

region has only one dedicated MPC through which the potential applicants of that region can apply. One MPC can serve more than one region up to three. These MPCs are intentionally located in a place with a relatively equal distance of military regions intended.
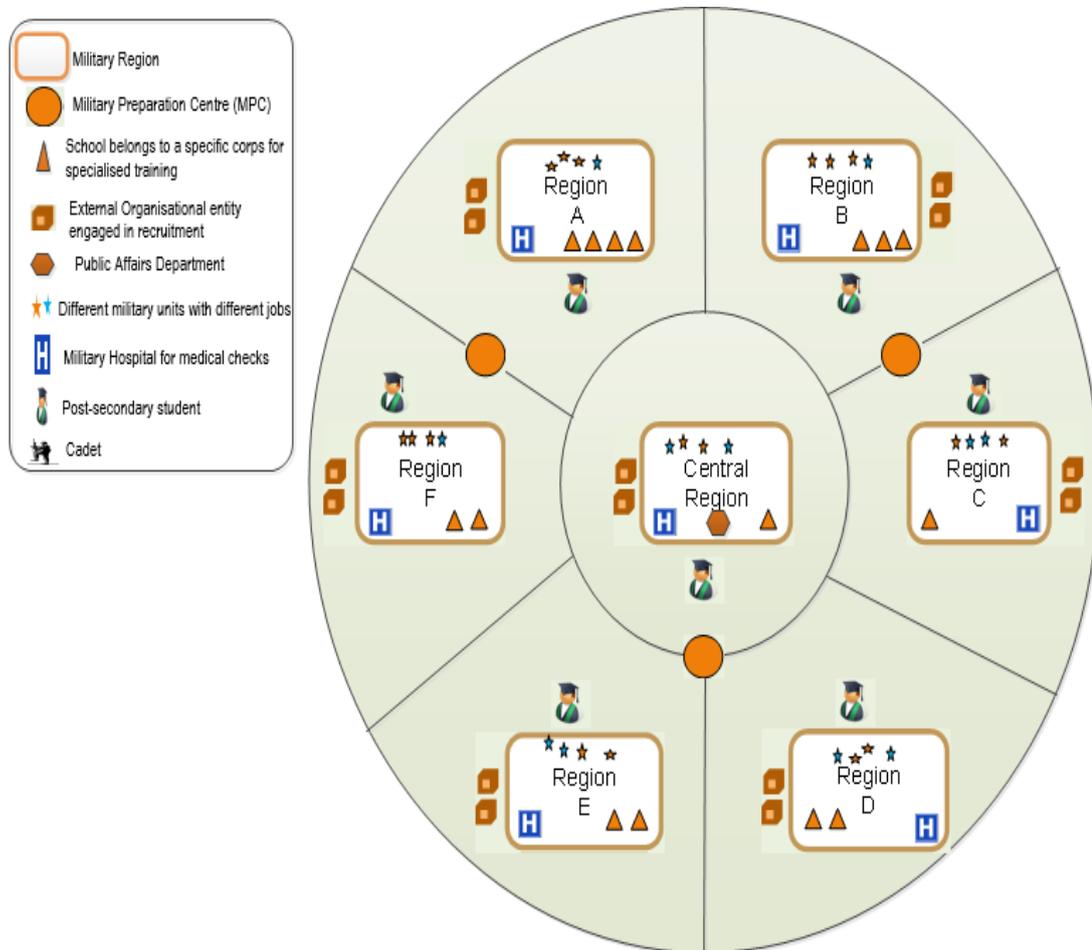
Figure 5.9 A Representation of the Whole Spectrum of the Stakeholders in the Old SA Enlistment Practice (Pre-2008)

- **Public Affairs Department (PAD):** This department exists in the central region. Its role is to arrange job opening announcements such as receiving recruitment requests, preparing recruitment messages, validating it, finding announcement agents, and finally issuing announcement orders.

An Overview of the Applicant Journey in the Pre-2008 Practice

Pre-2008 enlistment practice depends on the major role played by Military Preparation Centres (MPCs) in running most of recruitment activities except the announcement, uptake of

specialisation course and the allocation of graduates to jobs available. Figure 5.10 presents the sketch of the applicant journey in the SA old enlistment practice (pre-2008). The sketch depicts the enlistment interactions and the organisational structure in which these interactions occur. However, some clarifications are needed. Firstly, the sketch depicts only one enlistment instance while all other MPCs and schools carry out the same thing. The notation that shows two connected circles refers to that the two key stages of enlistment (cadet registration and basic military training) held at the same MPC. Secondly, the notation showing an entity with multiple arrows refers to that a cadet/enlistee might be allocated into different schools or jobs in different locations. Thirdly, a dotted interaction between two actors may be completed in a number of sessions (e.g. many site visits at different times).
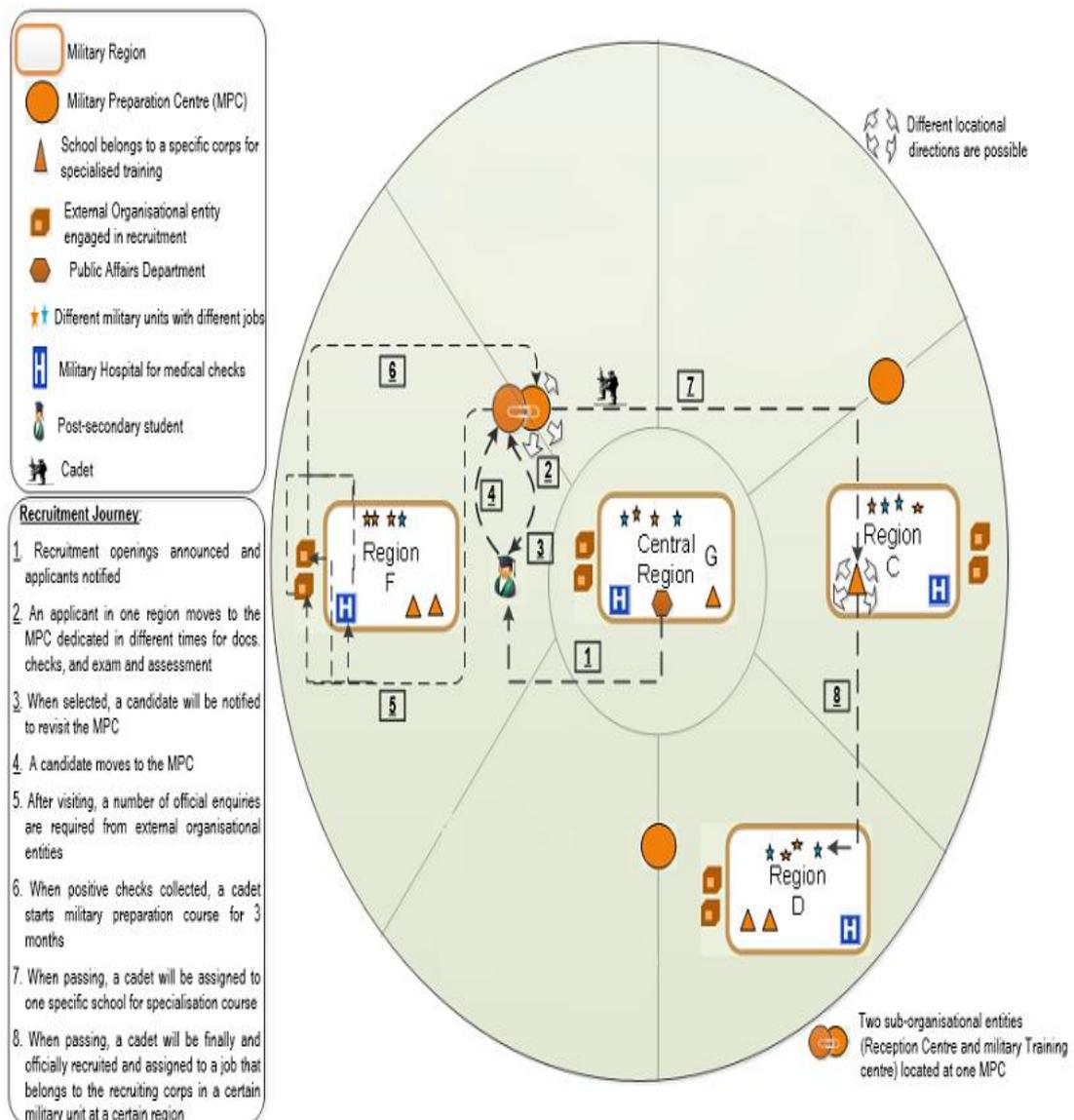

Figure 5.10 The Journey of Applicant in the Pre-2008 Enlistment practice

As illiustrated in Figure 5.9, the pre-2008 enlistment practice starts with the announcement of recruitment openings in the MPCs. This announcement is performed centrally by the Public Affairs Department (PAD) based on a recruitment order issued by the Chief of Military Personnel (CMP) of the SA. Once a potential applicant gets notified and interested, he has to move to the MPC dedicated for the region where he lives. When arriving, an application form needs to be filled in, documents are screened, and finally recruitemnt requirements and conditions are checked. After that, an applicant who passes this check will be booked an appointment at the MPC for a paper exam and other assessment activities such as interview and physical fitness. A paper exam must be passed. An applicant is selected as candidate based on the assessment points collected through the paper exam, interview, and physical test. After selection, the results are approved and announced by the corresponding MPC. A candiate has to move back to the MPC to complete his registration and then basic military training. When passing, a cadet will be allocated to a specific school that is located in a specific region for specialisation training course. This allocation is subject to two key considerations, e.g. the regional diversity of cadets allocated to each school and the results obtained in the military preparation course. At the end of the specialisation course, the cadet will be again allocated to a job which is located in a specific region. Similar to the allocation of schools, this is also subject to the regional diversity of cadets and the results obtained in the specialisation course. In fact, the former allocation serves as a regionally diverse pool of cadets through which the latter allocation can be successfully achieved. Finally, a cadet is officially registered as an enlistee and asked to embark upon the job allocated.

5.5.3   The Comparison Between the Two SA Enlistment Practices

The activities of the two SA enlistment practices (post-2008 and pre-2008) were unified and prescribed by the law. The change in both practices was structure-driven (i.e. different actors and roles). Hence, the performance indicators of both practices were process-oriented following almost the same performance model. The problem statements and some statistics of both enlistment practices have been brought for comparison, see Figure 5.11.

The comparison between the two SA enlistment practices has been illustrated in Table 5.3. As stated, the major enlistment activities of both practices are restricted by the same legal framework, called Law of Non-Commissioned Officer Service (LNCOS). This framework bases the policies pertaining to the enlistment activities not only for the SA but for all the armed forces

in Secureland. This restriction has left the SA with less flexibility to improve the outcome of pre-2008 enlistment practice by directly influencing the operational model. Hence, the change in the post-2008 practice was oriented to influencing the structural aspects such as organisational structure, i.e. cancelling the MPCs and distributing control over schools. From the perspective of the SA, this would improve process performance from different aspects. Schools would enjoy a space of freedom to manage their own enlistment processes, and to tailor the selection devices based on the type of training given thereby ensuring a minimum level of the KSAs needed. This, in turn, would enforce a higher accountability with schools to achieve enlistment objectives. Likewise, an applicant would be given a space of freedom to select any school he wishes to apply at the start of enlistment rather than influencing his choices at the end of military preparation course. Another improvement is that the movements of an applicant from the MPC dedicated to the school for which he is assigned later would be eliminated. This might result in reducing the number of withdrawals. School-based enlistment (i.e. post-2008) will result in the specialisation and the full utilisation of resources owned by schools.

Problem Statements in the SA Post-2008 Enlistment Practice:
- Error rate (decrease) between job vacancies and graduated cadets.
- High rate of withdrawals of applicants during the enlistment process.
- A moderate level of knowledge, skills and abilities of graduates.
- Low rate of the regional diversity of recently recruited enlistees within a specific military region.
- A longer time enlistment process takes around 45 weeks.
- Much cost and effort spent on receiving and assessing a large number of applications.

Statistics:

No. of applications submitted	No. of job vacancies	No. of cadets graduated	Error rate	Withdrawal rate	Avg. of KSAs	Regional diversity rate	Process time in weeks
11298	5500	5291	(-) 3.80 (%)	54.43 (%)	72.34 (%)	53.45 (%)	52

Problem Statements in the SA Pre-2008 Enlistment Practice:
- Error rate is increased number of graduates compared to the job vacancies.
- A high rate of withdrawals of applicants during the enlistment process.
- A low level of Knowledge, Skills and Abilities of graduates.
- A good rate of the regional diversity of recently recruited enlistees within a specific military region.
- A longer time enlistment process takes around 45 weeks.
- Much cost and effort spent on receiving and assessing a large number of applications.

Statistics:

No. of applications submitted	No. of job vacancies (real)	No. of cadets graduated	Error rate	Withdrawal rate	Avg. of KSAs	Regional diversity rate	Process time in weeks
7416	3875	4187	(+) 7.77 (%)	49.99 (%)	66.22 (%)	81.15 (%)	45

Figure 5.11 Problems Statements and Statistical Data of the both SA Enlistment Practice (Pre-2008 and Post-2008) (Source: derived from (SA Statistics Agency, 2007; 2012))

Looking to the outcomes of both enlistment practices in Figure 5.11, the number of graduated cadets at the end of pre-2008 practice showed an increase compared to jobs available (i.e. error rate (+) 7.77%). In contrast, this number decreased in the post-2008 practice (i.e. error rate (-) 3.80%). The withdrawal rates remained high in both pre-2008 and post-2008 practices recording 49.99 (%) and 54.43(%) respectively. The rate of the KSAs of graduates at the end of the pre-2008 practice (66.22%) was less than the one in the post-2008 (72.34%). In regard to the regional diversity among graduates, the case was the opposite where the rate at the end of pre-2008 (81.15%) was higher than the one in post-2008 (53.45%). It seems that the improvement in the KSAs of graduates lies at the expense of the regional diversity and vice versa. The process cycle time in both practices was large. However, the process time in the pre-2008 (45 weeks) was less than the time in post-2008 practice (52). The cost spent in both practices was high.

	Pre-2008 Practice Vs.	Post-2008 Practice
Recruitment activities	▪ Bound by rigid policies, i.e. LNCOS	▪ Bound by the same LNCOS
Enlistment requirements	▪ Customised by MPCs to match all schools requirements	▪ Customised by each school based on its own needs
Control	▪ Highly centralised by the MPCs at first ▪ Decentralised over schools after completing military preparation course	▪ Fully decentralised over schools
Key aspects of performance	▪ Increased number of graduates ▪ High rate of withdrawals ▪ Low level of KSAs ▪ High regional diversity ▪ A long time process ▪ Very costly	▪ Less number of graduates ▪ High level of KSAs ▪ A higher rate of withdrawals ▪ Low regional diversity ▪ A longer time process ▪ Very costly
Choices of application	▪ One time at the MPC dedicated	▪ For many schools
Driver for change	▪ Improving the outcome of training courses by targeting the high qualification applicants through the full control given to schools ▪ Reducing the number of an applicant's moves thereby reducing withdrawals ▪ Full utilisation of resources, i.e. exam halls, staff, etc. available with different schools	▪ Intent to adopt IT solutions to achieve the strategic goals: filling vacancies, improved KSAs, improved diversity, less process time, and less cost.
Focus of change	▪ Intensively structure-based	▪ Transformational change led by e-government

Table 5.3 Comparison between Pre-2008 and Post-2008 Enlistment Practices

5.5.4 The Assessment of the SA Enlistment Prototypes

Back to the framework adopted in 5.1, the low-fidelity prototypes for the SA enlistment support the discovery and analysis of many problems related to the problem statements presented in that framework. They also enable communication from different perspectives and capturing the recruitment domain knowledge by comparing the two enlistment practices and provide a better understanding of quality-diversity trade-offs. The analysis of the two prototypes of the SA enlistments (pre-2008 and post-2008) gives insights into many structural aspects of enlistment problem. In regard to the error rate in the number of graduates, the analysis of prototypes shows that the determination of vacancies in the pre-2008 practice was carried out by prediction. The reason was that the SA was unable to align the HR activities that produce real vacancies (e.g. retirement, dismissal, promotion, etc.) with the time of graduation in basic education schools. This is faced later by the fact that the real number of vacancies at the end of enlistment is different of the predicated one. In post-2008 practice, this issue was resolved and the determination of the number of vacancies was real.

Another structure-related problem, the misalignment between the organisational structure of the SA and the target market (whom to recruit?) is evident. The target market of applicants in both enlistment practices was characterised by two segments: educational qualification (for the purpose of KSAs) and region (for the purpose of regional diversity). Each segment has specific needs to be met. In the pre-2008 practice, the needs of applicants in regard to the region where to apply were met by the MPCs being well-located and close to applicants' locations. This resulted in a regionally balanced pool of applicants from which the MPCs can ensure the regional diversity among graduated cadets being achieved. This accounted for the high rate of diversity in the pre-2008 practice. However, the SA failed to meet these needs in the post-2008 practice due to that military schools were locally located in specific regions that remote from the potential applicants from different regions. This, in turn, accounted for the low rate of regional diversity of applicants in each school. Although a remote applicant had to move to a specific military school in both practices, the SA relied on the rehabilitation of cadets during the basic military training in pre-2008 practice towards the acceptance of school allocation.

In terms of the KSAs, the needs of high qualification applicants were met in the post-2008 practice by the decentralisation of enlistment over schools which enabled an applicant to apply for any school chosen. This choice was not available in the pre-2008 practice due to the role of the centralised MPCs. Hence, the level of KSAs in post-2008 practice was higher than that of

pre-2008 practice. The failure of the SA in matching the needs of applicants from both segments and making necessary balances was the major cause of the high rate of withdrawals in both practices. This rate of withdrawals reflects the length of enlistment process in both practices. The higher rate of withdrawal is obtained, the longer time is needed for recovery. Moreover, the number of applications submitted in post-2008 was bigger than the number in pre-2008 which needed much time as well as cost for conducting enlistment activities.

Given the results of analysis aforementioned, the prototypes of the SA enlistment practice can be assessed according to the criteria proposed in section 5.3.2. Far from the formality of structured models (e.g. BPMN), low-fidelity sketches try to encompass the richness of recruitment real situations that the formal models cannot address while retaining generative power. In addition to the problem dimensions *who*, *how*, and *when* addressed by the BPMN, the sketches of the SA enlistment practices also address the '*where'* dimension of enlistment problem. They also support a better interpretation of the questions: '*why do applicants withdraw or accept offer*?', '*what is the relationship between the quality (KSAs) and diversity of applicants*?' or '*what are the implications of such relationship?'* They also represent a wider range of enlistment stakeholders than the BPMN, which enables the communication and analysis of enlistment problem from different perspectives. However, the interpretations and problem definitions are subjective and heavily dependent upon the skills of the analyst. They lack the inclusion of subtle features and concerns (e.g. social and psychological) and their relationships that implicitly cause recruitment problem (e.g. withdrawal).

Given the loose structure of the low-fidelity sketches, some modellers argue that such sketches are amenable to formal analysis (Smith, 1993), which supports generative power. However, if that is possible, the analysis would much weaker than that of well-structured models. From generativity, the sketches enable analogical reasoning by comparing similar recruitment problem types that can be used by recruitment stakeholders to define the quality-diversity issue. A problem can be defined by matching the features of the situation to the characteristics of the problem type thereby promoting effective decision making or judgement towards problem solving or requirements elicitation.

For the genericity (i.e. sector/domain interdependency), the concepts and notations used in the sketches are still enlistment-oriented and only understood by military stakeholders. The sketches represent the organisational structure and the functioning perspectives of a

recruitment problem and fail to encompass a coherent account that acknowledges multiple perspectives of a real-world problem.

5.6 Formulation of the Research Problems From the SA E-Enlistment Project

The investigation conducted on the SA e-enlistment project has demonstrated a number of problems that led to the failure of that project (i.e. the difficulty of realising the value of e-enlistment). These problems are related to some knowledge gaps in the research literature. Hence, the research will explicate the major problems that are root causes of the failure and attempt to fill the corresponding gaps.

5.6.1   Problem No. 1:

The difficulty of scoping, representing, and systematically transforming recruitment problem knowledge towards e-recruitment solution specification impedes the realisation of the value of e-recruitment.

This problem can be divided into three interrelated sub-problems: (1) the ill-defined scope of recruitment problem space; (2) the ill-representation of recruitment problem domain knowledge; and (3) the lack of an integrative RE process that systematically transforms the problem domain knowledge into the specification of e-recruitment. These three sub-problems and the accompanying knowledge gaps are explained below:

Sub-Problem No. 1.1: Defined Scope of Recruitment Problem Space

The analysis of the SA enlistment problem has shown that the recruitment literature failed to provide a complete recruitment problem definition that can be used in different contexts. The recruitment research has been widely criticised as being: limited to piecemeal and fragmented recruitment problems (Barber, 1998; Breaugh and Starke, 2000; Saks, 2005; Breaugh, 2012); lacking multiple perspectives (Saks, 2005); and lacking contextual and strategic focus (Gully et al., 2014). This is caused by the fact that real-world situations often contain many interrelated problems, constituting what Ackoff (1979) termed a "mess." This raises a major concern in regard to how a real-world recruitment problem can be bounded. An unneglectable conflict is between the need to focus attention and the desire to include all important recruitment considerations that must not be ignored (Smith, 1993). Extending the focus of research into the

enterprise level will give insights into a better definition of recruitment problem and its constituents from multi-entity enterprise perspective thereby promoting completeness.

Knowledge Gap No. 1.1:

There is a lack of knowledge about enterprise recruitment problem and the multiple organisational entities involved.

Sub-Problem No. 1.2: Representation of Recruitment Problem Domain Knowledge

The analysis of the recruitment problem representations has exhibited a remarkable range. At one side are accounts that advocate that a representation must reflect the objective aspects of a recruitment problem, more or less using formal models (e.g. mathematical models, business process languages, problem frames, etc.). Proponents rely on the structural characteristics of such models and their capabilities for analysis (e.g. validation, verification, performance evaluation, and simulation (Vergidis et al., 2008)). In sharp contrast are theorists who claim that a representation must address the subjective aspects of a recruitment problem that reflect different perspectives/views of a situation. Disagreement on this issue is caused by the fact that problem representations vary according to many aspects such as the complexity of a real-world problem, the type of business or product, the type of project, the feature of analysis (Kettinger, 1997; Nuseibah and Easterbrook, 2000; Aquilar-Saven, 2004; Osada et al., 2007; Neetu and Pillai; 2013). Hence, there is a need to create a holistic reference model of a recruitment problem by which the various characteristics that constitute a recruitment problem can be comprehensively represented so that many recruitment models can be compared and evaluated. In appreciation of the challenge of this task (Vergidis et al., 2008; Pedell et al., 2014), a knowledge gap can be described as:

Knowledge Gap No. 1.2:

There is a lack of knowledge about how recruitment problem can be best represented.

The thesis will respond to the aforementioned need by developing a problem-oriented conceptual model (POCM) for conceptualising the recruitment problem domain knowledge from an enterprise recruitment level. The POCM will structure recruitment problem domain knowledge into problem viewpoints that support a deeper and more comprehensive account of recruitment problems, and enable systematic problem-driven RE for requirement elicitation and analysis. Relying on the definition of recruitment by Randall (1987) being as "*the set of activities*

(i.e. interactions) through which the people and the organisations can select each other based on their own best short and long term interest." The Author claims that it is the concept of interest that plays a key role in recruitment problem. Therefore, the POCM will be mediated by the concept of interest and the study will be turned to analyse recruitment problem from the lens of interest by investigating the various interest-related problem aspects and how these aspects influence a stakeholder's recruitment interactions. This will give insights into a better understanding of recruitment problem. By extending the research focus into the enterprise level of recruitment, the recruitment problem is seen as multi-dimensional complex interests embodied in multi-entity enterprise system. Identifying and representing these dimensions as well as the organisational entities involved will offer a fruitful contribution to understanding recruitment problem and enabling effective and efficient RE.

Sub-Problem No. 1.3: Lack of Integrative RE Process

The requirements elicitation and analysis techniques are driven by the choice of problem representation, and vice versa (Nuseibah and Easterbrook, 2000; Vergidis et al., 2008). In reference to the sub-problem 1.2, this problem relates to how recruitment problem representation can be used in concert with other established approaches of RE to systematically enable a complete understanding of recruitment problem and derive requirements. This challenge results in a knowledge gap as described below:

Knowledge Gap No. 1.3:

> There is a lack of knowledge about how recruitment problem representation can be systematically used to enable problem domain knowledge in order to derive requirements.

The thesis will fill the above gap by developing a POCM-driven Requirements Analysis Approach (POCM-RAA) for deriving and analysing requirements towards specifying an e-recruitment solution.

5.6.2   Problem No. 2:

> The difficulty of documenting e-recruitment best practices in an enterprise recruitment environment hinders the realisation of the value of existing e-recruitment practices.

The analysis of the SA enlistment problem points up the need for well-documented recruitment best practices that can be reused in large-scale projects. However, documentation and reuse of Best Practices (BPs) have been widely addressed as a difficult task (Mansar and Reijers, 2007; Simard and Rice, 2007; Hanafizadeh et al. 2009; Abd Rahman et al., 2011; Vesely, 2011). The challenge is to capture knowledge of the problem domain in which BPs are 'best' (Dani et al., 2006; Alwazae, 2015). The ill-definition and representation of the recruitment problem abovementioned in *Problem No.1*, impose improper documentation that impedes realising the value of the RBPs and therefore reusing. According to Dani et al. (2006), modelling and structuring the knowledge of BPs are critically important for the successful documentation and reuse of best practice knowledge. Hence, the knowledge gap to be filled is that:

Knowledge Gap No. 2:

There is a lack of knowledge about how enterprise RBPs can be successfully modelled.

The thesis responds to this gap by developing an Enterprise Recruitment Metamodel (ERM) that enables the value of e-recruitment best practices to be realised and successfully shared and reused. Aligned with the Enterprise Architecture (EA), the metamodel will incorporate the all elements (i.e. artefacts) produced for filling the gaps in *Problem No.1* with the elements of a proposed template for documentation. The metamodel will offer routes for the exploitation of the outcome of this research towards further research.

5.7   Summary

The chapter formulated the major problems (i.e. knowledge gaps in the research literature) which contributed to the practice (i.e. the failure in the SA's e-enlistment project) in reference to the research method adopted. In this regard, the chapter presented the framework by which these problems are explicated and the suggestions of how these problems can be solved.

Chapter 6: Development and Validation of Problem-Oriented Conceptual Model and Ontology for Recruitment Problem Definition

6.1 Introduction

In reference to the design science method framework explained in chapter 3 (section 3.4), this chapter will focus on: phase (3) "*design and develop artefact*", phase (4) "*demonstrate artefact*", and phase (5) "*evaluate artefact*". As depicted in Figure 6.1, the chapter will describe how the two artefacts (Problem-Oriented Conceptual Model (POCM) and the Ontology for Recruitment Problem Definition (Onto-RPD) were developed, demonstrated and evaluated. For this purpose, a detailed description of the approach and the concepts used for building the two artefacts will be presented. The evaluation of how well these artefacts have contributed to address the corresponding problems (i.e. *Problem No. 1.1 and Problem No. 1.2*) and whether they have achieved the defined requirements in phase (2) will be all provided.
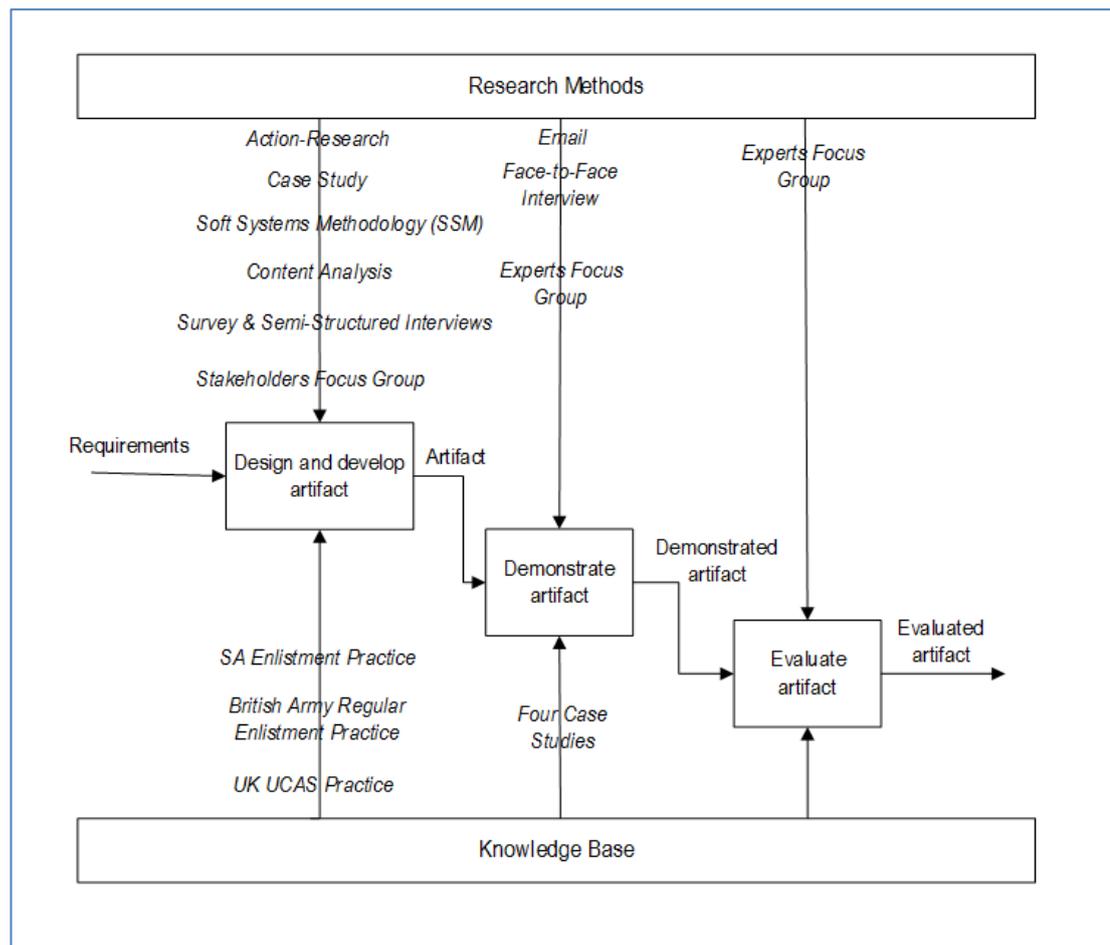

Figure 6.1 The POCM and Onto-RPD Development, Demonstration and Evaluation

6.2 Phase 3: Design and Development of POCM and Onto-RPD Artefacts

The overall process by which the POCM and Onto-RPD were designed is Action-Research (A-R) (Baskerville and Wood-Harper, 1996). The process is presented in Figure 6.2.

PLAN
- Select a case study
- Find resources for a case study
- Find a working definition of recruitment problem
- Consider the theories relevant to the working definition of recruitment
- Consider the methods, techniques, and tools to be used for the analysis of each case study selected

Final Tentative POCM and Onto-RPD

ACT
- Find out about the case study
- Use problem analysis techniques to enrich root problem definitions
- Capture the various problem worldviews
- Use encapsulation guidelines to abstract and synthesise root recruitment problem concepts, properties and relationships.
- (Re)create tentative POCM and Onto-RPD artefacts based on the working definition adopted.
- Produce new definitions of recruitment problem concepts

REFLECT
- Analyse and propose improvements in the artefacts
- Evaluate the implications of changing on the artefacts
- Run an A-R cycle if necessary (e.g. apply the artefacts to a new case study or refine them with the existing one)

SA Enlistment Case Study
BA Enlistment Case Study
UK UCAS Case Study

OBSERVE
- Evaluate the artefacts based on the requirements specified
- Compare the artefacts with the existing taxonomies in the literature
- Publish and seek expert opinion and feedback

Figure 6.2 The A-R Activities in Developing POCM and Onto-RPD Artefacts

As depicted in Figure 6.2, the process is constituted by four phases: plan, act, observe and reflect. It consists of many A-R cycles and hence provides a progressive way to design the POCM and Onto-RPD artefacts. Through these A-R cycles, three case studies are analysed, and the tentative POCM and Onto-RPD artefacts are produced and refined accordingly based on the new problem concepts defined. In next sections, the four phases are described.

6.2.1   Plan Phase

This phase reports on: (1) the plan and the criteria used for the selection of the case studies; (2) the description of each case study and the resources and materials used for analysis; and (3) the key definitions of recruitment problem to be considered, and the working definition of recruitment problem adopted to cope with the complexity of the recruitment problem.

6.2.1.1   The Selection of Case Studies

For building the POCM and Onto-RPD artefacts, three case studies were incrementally selected: the SA enlistment case study, British Army (BA) enlistment case study, and UK Undergraduate Universities and Colleges Admission Service (UCAS) case study. The plan of selecting these case studies and the corresponding incremental process of building the POCM and Onto-RPD is presented in Figure 6.3.
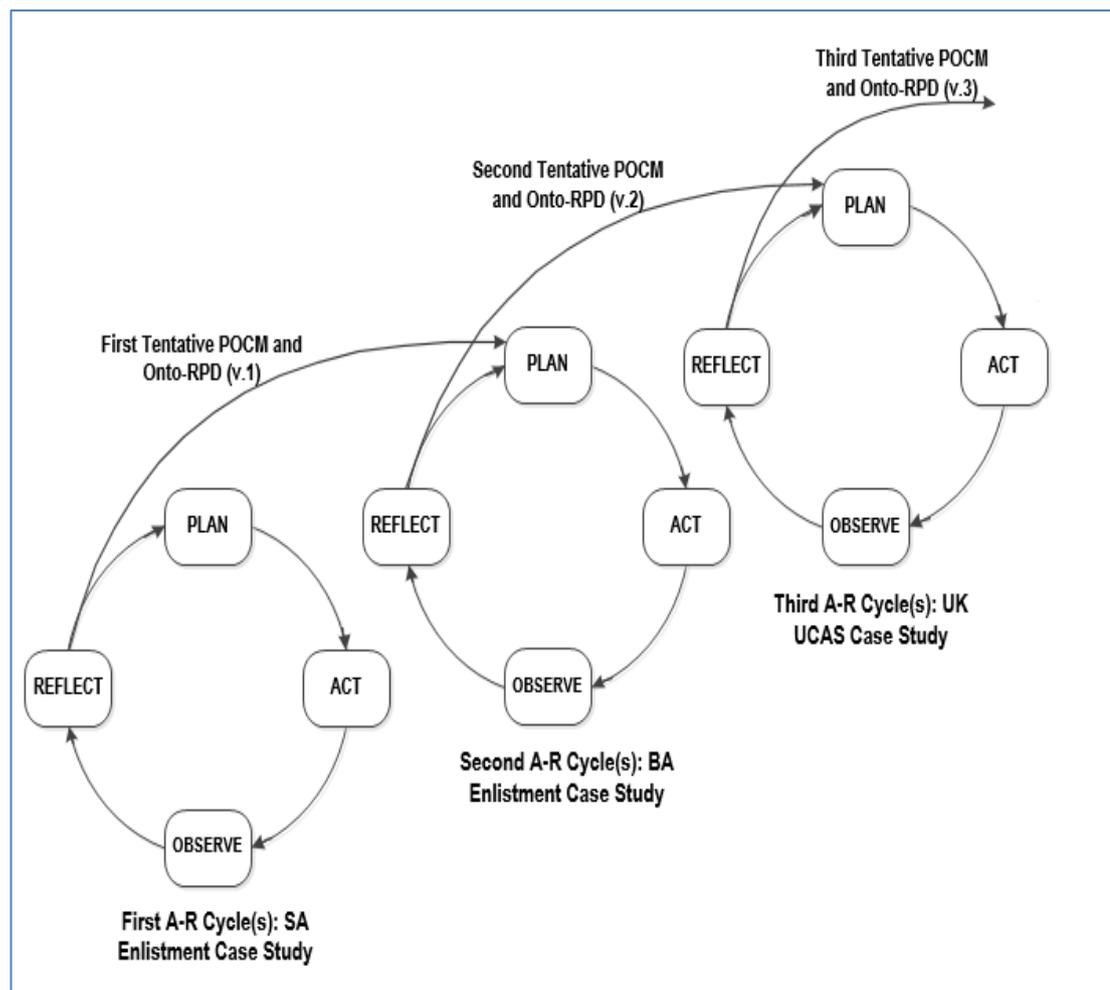
Figure 6.3 The Incremental Process of Selecting Case Studies and Artefacts Development

The rationale behind this selection was first to start with the SA enlistment case study as it is the original driver of research in this thesis. Hence, the SA enlistment were extensively analysed for building the first tentative artefacts. Secondly, to get expert in the same domain of the first case study (i.e. military domain), especially enlistment, and move gradually into different research contexts, the BA enlistment case study was selected. Accordingly, the first tentative artefacts derived from the first case study was compared and refined by the new root problem concepts derived from the BA enlistment case study. As a result, the second tentative version of POCM and Onto-RPD was built. Thirdly, for a more generalised version of the artefacts, the UK UCAS case study was selected from the public domain, and similarly the second tentative version of the artefacts was compared and refined by newly extracted problem concepts until *the final version of artefacts was reached.*

The specific selection of each case study was guided by a list of features and considerations, which makes them appropriate. Some of which are, as follows:

- Does the case study contain sufficient material in relevance to recruitment?
- Which domain does the case study belong to e.g. military, private, or public?
- Which context does the case study belong to e.g. HR recruitment, school enrolment, etc.?
- What is the level of abstraction of the case study material (e.g. enterprise, organisational, individual, etc.)?
- What worldviews of recruitment does the selected case study address?
- What will be the contributions of a particular case study into the quality of the artefact(s)?

In the following sub sections, the three case studies selected are described:

The SA Enlistment Case Study:

For the SA enlistment case study, the reader shall refer to Chapters 4 and 5 for full description of this case study.

The BA Enlistment Case Study:

The British Army is the principal land force of the United Kingdom, a part of British Armed Forces. In 2018, the BA comprises over 81500 trained regular personnel and over 27000 trained reserve (UKAF, 2018). The BA personnel comes primarily from the UK and from Commonwealth citizens (BA, 2017). The BA relies on volunteer applications to join the army, with a minimum

age of 16 years at the end of General Certificate of Secondary Education (GCSE) (BA, 2017). Given the focus in this case study being on enlistment, the enlistment process consists of four phases: online application, army briefing, assessment centre, and post-assessment centre (UK Army, 2015). Figure 6.4 depicts these phases.

In the online application phase, the BA relies heavily on the internet to reach target applicants. In this phase, an applicant will be first asked to register. On registration, some details, such as nationality and age, will be asked. These details will be used to inform the applicant about the potential roles that can be applied for in the BA. Based on these potential roles, an applicant is expected to apply online. Once an application is submitted, an enlistment journey starts and an applicant can follow progress online.
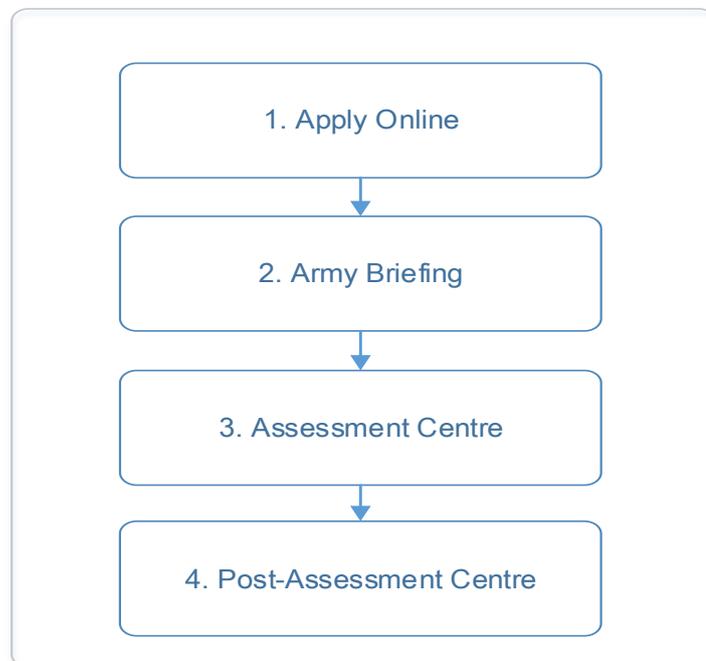
Figure 6.4 The Enlistment Process in the BA Enlistment Case Study

In the army briefing phase, the applicant will be invited to a local career centre and assigned a Candidate Support Manager (CSM). The CSM will help an applicant: to learn more about the BA and the potential chances to join the army; and to develop a personal plan to follow in pursuit of getting ready for the assessment centre. In the assessment centre phase, the applicant will be assessed for the suitability to join the BA. This assessment spends two days and takes place in one of the BA Assessment Centres in the UK. The assessment involves: medical examination, physical and mental tests, teamwork test, and career options discussion. In the

post-assessment centre phase, some paperwork is needed before sending an offer for enlistment. This involves: identity verification and academic references. In case of everything goes well, the applicant will be offered based on the role that has been applied for and the grade obtained through the assessment phase. Once the applicant accepts this offer, he/she will formally join (enlist) the BA and will be given a date to start training.

The UK UCAS Case Study:

The UCAS is a UK-based organisation responsible for operating the application process for British universities (Wikipedia, 2018). The UCAS is best known for its undergraduate application service (the main UCAS scheme) (UCAS, 2017). However, it operates a number of other admission services. For the undergraduate UCAS, potential applicants are from the UK, EU, and non-EU. All applicants must apply through UCAS. This application may undergo a number of phases: apply, track and reply, extra, clearing, and adjustment. Figure 6.5 presents these phases including the timings of opening (green triangles) and closing (red triangles). Apply phase is a pre-result application service in which an applicant submits a single application via UCAS online Apply service before the qualification is obtained (i.e. posting the results from the secondary schools). The Apply service involves registration, giving personal details, writing personal statements, choosing up to five courses from different universities or colleges to apply to, providing references, payment, and submission. The application deadlines vary based on the type of universities, colleges, and courses applied for.

In the Track and Reply phase, the application is forwarded by UCAS to the universities and colleges that the applicants have applied to, who then decide whether to ask for interview, or offer a place for study. In case of offering, two types of offers are possible: conditional where the applicant receives a place subject to the grades being met at the end of school year; and unconditional where the applicant directly receives a place with no conditions. Offers must be replied before the deadlines specified by the university or college.

SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP/OCT

Deadline of Oxford, Cambridge, medicine, dentistry and veterinary.

Deadline of most courses

Deadline of Art and design

Deadline of late applications

Exam Results

Apply Phase

- Applications begin from mid-September
- 5 courses can be applied at the same time
- Applications competitve - the early you apply the more chance to get a place
- Complete the application and wait to hear from the provider

Track and Reply

- A course provider's decision will be either inviting to interview or audition, offering directly, or no offer
- Offers are either unconditional or conditional.
- Replying to a non-conditional offer (i.e accepting it) means a place is confirmed when passing DBS check, medical check, if applicable
- In case of conditional offers provided with later results, a maxiumum of two choices can be selected (firm choice, i.e. essential, and insurance choice, i.e. backup)

Extra

- If all five choices used but no offer accepted or you decide to decline offers received, then you can use Extra choice.
- Extra is a free service open from 25/2 to 2/7.
- Extra allows an aplicant to add only one course at a time.
- Offers through Extra received by 17/7 must be replied by 24/7

Clearing

- Clearing is an option that gives you a chance to see which courses have places remaining You can either apply directly after 30/6 or when your Track status says 'You are in Clearing' or
- 'Clearing has started'.

Adjust

- Available from 14-31 Augest
- Adjustment is a chance to reconsider where and what to study when results are better than expected

Figure 6.5 The Application Service in the UCAS Case Study

Extra phase is a free service when an applicant uses all of his/her five choices and does not receive any offers, or when he/she decide to decline the offers received. In this case, the applicant can apply for additional courses using UCAS Extra service. This allows application for one course at a time until an offer is received. Extra service is available between mid-February and the end of June. In the clearing phase, those who do not meet the conditions of their offers (i.e. by their examination results), or do not have an offer at origin are eligible to use UCAS

Clearing service. This service enables unplaced applicants to apply for vacant places directly to the university using the UCAS search tool and contracting the concerned course provider. The Adjust phase allows the applicant with qualifications exceeding the conditions of his/her offer to search for a place at another course provider while retaining the original offer.

6.2.1.2   Resources and Materials of Case Studies

This section presents the information sources used in each case study used for developing the POCM and Oto-RPD.

The SA Enlistment Case Study:

The resources and materials used for the SA enlistment case study are presented in Figure 6.6. There were various resources used for the analysis of the SA enlistment situation. Finding such resources does not start from an arbitrary point, but heavily builds on the models, analysis and findings from the previous research in Chapters 4 and 5, which were used subsequently as a basis for the design of survey and interviews conducted. The results of the survey and interviews combined with the discussion of the WhatsApp stakeholder focus group (that built during the interviews) were the main sources of building the 1st POCM and Onto-RPD. The way how the survey and interviews were designed and conducted as well as the WhatsApp stakeholder focus group, refer to research methodology Chapter 3, section, 3.4.5. Samples of the survey (questionnaire) in English as well as in Arabic are presented in Appendix 1 and Appendix 2. The quantitative data analysis of survey is presented in Appendix 9. The resources exchanged and discussions carried out through the WhatsApp stakeholder focus group are confidential and not presented in this thesis.
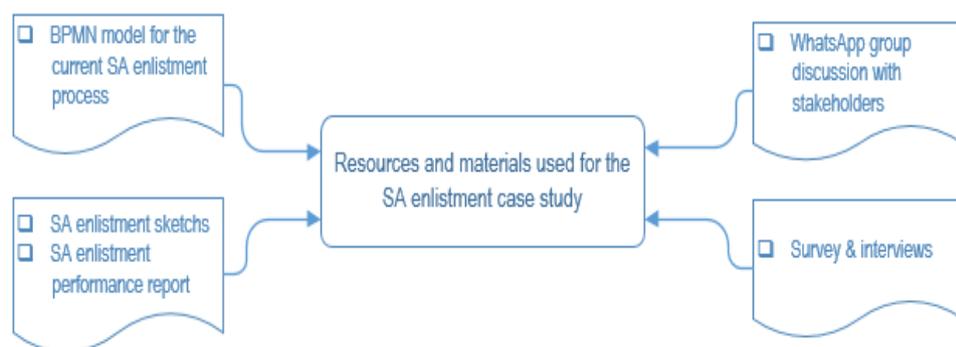
Figure 6.6 Resources used for the SA Enlistment Case Study

The BA Enlistment Case Study:

The resources and materials used for the BA enlistment case study are presented in Figure 6.7. Taking into account the lack of resources available for the BA enlistment analysis, two major information sources were relied on for the analysis of the BA enlistment case study. One is the various textual documents published in regard to the case study including reports, articles, and others. The list of references used for the analysis of the BA enlistment case study are presented in Table 6.1. The second source is an online chat with an Enquiry Advisor (EA) of the BA enlistment. This chat was documented and used for textual analysis.

Figure 6.7 Resources used for the BA Enlistment Case Study

Type of References	References
Reports	NAO (2014); MoD(2013); HoC (2008); MoD (2008); NAO (2007); CSI (2015)
Articles	UKAF (2018); Army Jobs(2015); Gee (2007); Dannatt (2008); UK Army (2015); National Archives (2014); BA (2017); Tanner (2014); Hyman (2015); Books (2010); Zugbach (1999); Louise et al. (2016); Hines (2014); Forces Watch (2015); Bury (2016); Bay (2015); BITC (2016); Jones (2015);

Table 6.1 List of References Used for the BA Enlistment Case Study

The UK UCAS Case Study:

The resources and materials used for the UCAS case study are the textual documents published in regard to the UCAS case study including reports, articles, and others. The list of references used for the analysis of the UCAS case study are presented in Table 6.2.

Type of References	References
Reports	UCAS (2010); UCAS (2012); UCAS (2013); SPA (2013a, 2013b); BIS (2013); Skerrett (2012); UCAS APR (2011); UCAS APR (2012); UCAS (2015); HERB (2016);
Articles	Chowdry et al. (2008); Broecke et al. (2008); Chowdry et al. (2011); Allison (2013); Croxford and Raffe (2013); Crawford et al. (2008); Hesa (2013); Universities Scotland (2012); UCAS (2016a); UCAS (2016b); UCAS (2017); Whitty et al. (2015); Alexander and Arday (2015); Rutter et al. (2016);

Table 6.2 List of References Used for the UCAS Case Study

6.2.1.3   The Working Definition Adopted for Recruitment

The analysis in the 1st and 2nd A-R cycles have shown a great deal of complexity to abstract and represent a real-world recruitment problem, refer to sections 6.3.1 and 6.3.2. This corresponds with the findings of Barber (1998); Breaugh and Starke (2000); and Breaugh (2012) presented in section 2.2.3.2. Due to the many human interactions, which are largely intangible, and the abundant problem concepts and their interrelations, the need of a foundational basis through which a recruitment problem can be defined, represented, and discussed was realised. Hence, a new approach for defining recruitment problem was proposed. Given the fragmentation in recruitment definitions described in chapter 2, two key definitions paved the way towards the new recruitment definition in this thesis. The first definition of recruitment was given by Randall (1987) as:

"*The set of activities (i.e. interactions) through which the people and the organisations can select each other based on their own best short and long term interest.*"

The second definition was given by Breaugh (2008) for external recruitment as:

"*The organisational activities (i.e. interactions) that are intended to: (a) bring a job opening to the attention of potential job candidates who do not currently work for the organisation; (b) influence the number and/or the types of applicants to apply for the job opening; (c)*

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influence their interest in the position to stay until a job offer is extended; and (d) influence their interest to accept a job offer."

Looking to the two definitions abovementioned, the thesis claims that it is the concept of *interest* that plays a key role in defining a recruitment problem. It is the key determinant of interaction relationships among individual entities of the recruitment enterprise, and the macro-level driver of enterprise behaviour. It should be, therefore, considered as one of the main points in defining and modelling recruitment problem. Thus, analysing recruitment problem from the lens of interest of each recruitment member, and studying and abstracting the various shared root problem concepts (i.e. factors) that influence such interest as well as how these concepts influence each other will give insights into a better understanding and modelling of recruitment problem. This will also give insights into the other recruitment problem concepts such as integration, differentiation, and fragmentation of a set of interests in a shared environment, such as an enterprise recruitment (i.e. the focus of this thesis). Hence, the working definition of recruitment that is adopted in this thesis is:

"The holistic interaction among a number of actors, through a set of distinct interest dimensions, that results in filling a job vacancy."

The primary theme throughout this thesis is that in order to analyse and represent a recruitment problem, it must be regarded as a complex, multi-dimensional, multi-agent system. These three aspects are the proposed foundation for defining and representing a recruitment problem and building the POCM and Onto-RPD artefacts. From the proposed definition, recruitment is a system whose components are: (1) the individual entities or a group of entities within that system that are interest-based; (2) the dimensions of interest (i.e. factors or elements) through which the community of entities as a whole (i.e. enterprise) as well as the individual parts are interacting; and (3) the interaction channels as social communication, both verbal (spoken or written) and non-verbal (social or emotional cues, or levels of influence).

6.2.1.4   Recruitment as a System

The proposed definition of recruitment as a system enables the core system ideas or concepts to be used in describing the complexity of real-world recruitment problem, and therefore building strong and useful artefacts for representing and discussing a recruitment problem. The main system concepts are: emergence, evolution, and equilibrium (Von Bertalanffy, 1968).

Emergence is the notion that the whole is more than the sum of parts (Von Bertalanffy, 1968). This means that what is said to be a system must have some properties as a single whole, so-called emergent properties. From the proposed definition of recruitment, the emergent property of recruitment system is its purposefulness or its ultimate outcome, *filling a job vacancy*. Based on the notion of emergence, while each member of the recruitment enterprise may have his/her own particular interest about a specific element that determine his/her behaviour, ultimately there is an overarching interest that becomes dominant in the recruitment that determines its behaviour (i.e. filling a vacancy). *Evolution* can be defined as the advancement in a system over time by adapting to changes in its environment (Von Bertalanffy, 1968). This evolution requires social communication (to know what is going on) and control (to determine possible adaptive responses to the environment). For recruitment, evolution is seen as the global trends of interests changing in both its high-level and low-level elements, across any of its dimensions. Finally, *Equilibrium or stabilisation* is the balance within a system (Von Bertalanffy, 1968). This stems from the interactions within the system but also from the strength of those interactions over time. In terms of recruitment, equilibrium implies sharing a common and balanced set of interests by recruitment members over time towards filling a certain vacancy. In next sections, the methodological framework for exploring, capturing, and abstracting this recruitment system, including the various actors involved (i.e. problem owners) and their interest-related problem worldviews (i.e. interest dimensions), towards building the artefacts will be explained.

6.2.2 Act Phase

The aim of this phase is to build POCM and Onto-RPD artefacts for defining and representing recruitment problem. Taking into account the guidelines prescribed in plan phase, the methodological framework for exploring, capturing, and abstracting recruitment problem, and building the POCM and Onto-RPD artefacts is presented in Figure 6.8.
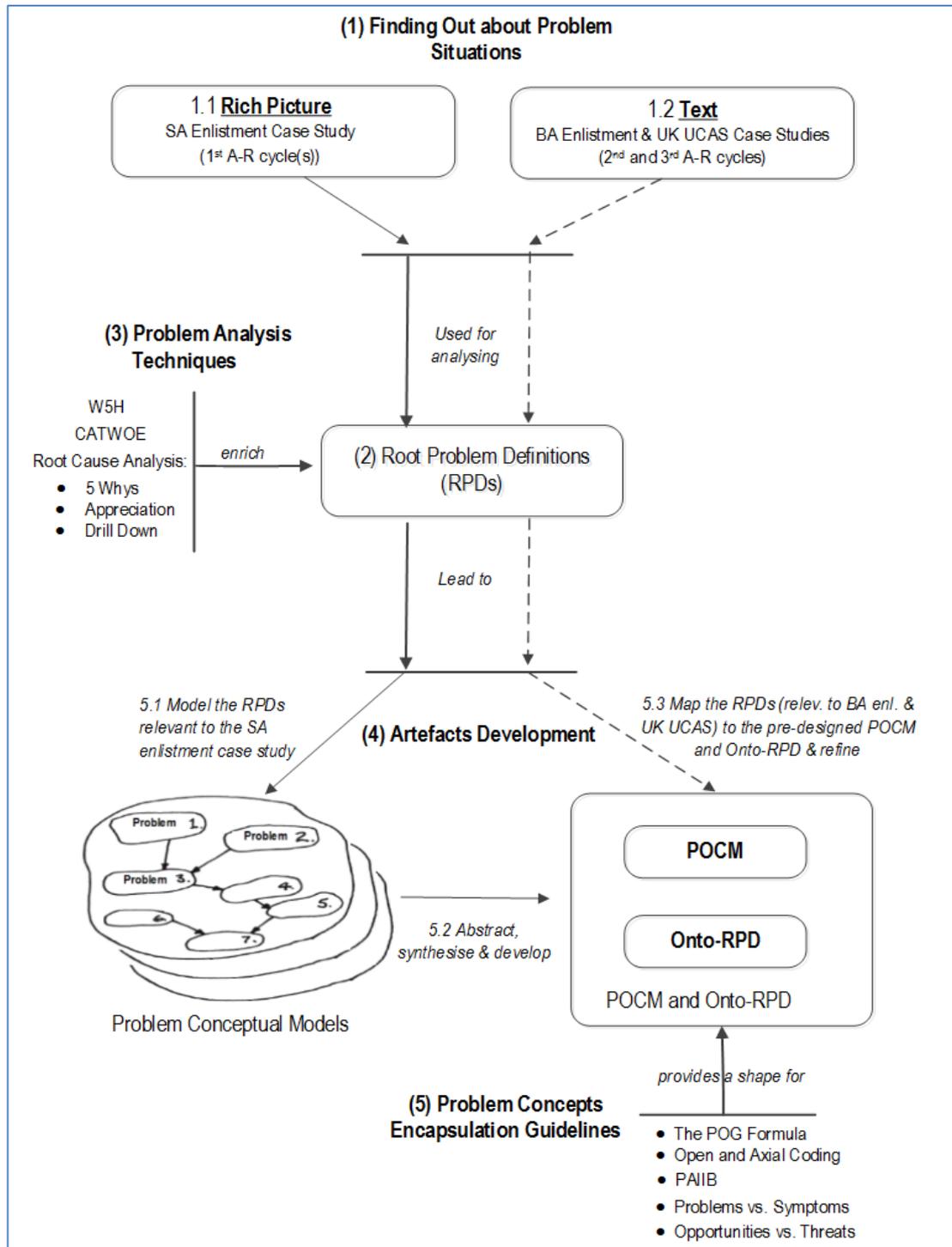
Figure 6.8 The Methodological Framework for Building POCM and Onto-RPD Artefacts

The framework depicted in Figure 6.8 is inspired by Soft Systems Methodology (SSM) as an approach to understand and explore recruitment problem as a learning system (Checkland and Poulter, 2010). SSM, a well-known methodology, provides principles, techniques, and guidelines to capture the various system worldviews in a problematic situation, and then develop

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purposeful activity models (each built to encapsulate a single worldview) as intellectual devices for learning and intervention (Checkland and Scholes, 1990). According to Checkland and Poulter (2010), these principles, techniques, and guidelines of SSM can be both adopted and adapted for use in any real situation. In line with the purpose of this thesis, SSM will be used and adapted to explore an enterprise recruitment system from different perspectives in pursuit of capturing the various recruitment problem owners and their recruitment problem worldviews. Unlike the conventional SSM in which a purposeful action is treated as a system (i.e. action-oriented) thereby developing the corresponding activity model (Checkland and Poulter, 2010), the proposed framework is problem-oriented where a problem is treated as a system and the corresponding conceptual problem model is then developed. The key idea of problem orientation is that actions are implicated within a deep problem structure so that the focus on "*how*" is delayed until the understanding of "what" is obtained. From a cognitive perspective, the quality of action or problem solving stems from the way the problematic concerns are represented (Smith, 1989; Smith, 1993; Jackson, 2001). As such, a logically linked set of problems or concerns constitute a whole system whose emergent property is the goal to be achieved. Hence, the abundant problem models that represent a recruitment problem from different perspectives will allow us to abstract and define interest-related problem concepts (interest dimensions including its elements and relationships) according to the working definition adopted for recruitment.

As depicted in Figure 6.8, the framework consists of five activities to build the artefacts. These are, as follow:

1. Find out about the problematic situation.
2. Define Root Problem Definition (RPDs).
3. Use problem analysis techniques.
4. Build POCM and Onto-RPD artefacts.
5. Use problem concepts encapsulation guidelines

The scenarios of developing the POCM and Onto-RPD within the proposed framework differ according to the A-R cycles presented in Figure 6.3. In Figure 6.8, the solid arrows show the development scenario followed in the 1st A-R cycle(s) that is related to the SA enlistment case study. However, the dotted arrows show the scenario followed in the 2nd and 3rd A-R cycles that are related to the BA enlistment case study and UK UCAS case study respectively. The differences are based on some considerations relevant to the case studies themselves as well

as the progression in A-R cycles and the acquired experience with the author in dealing with recruitment problem. For example, visualising the SA enlistment problem situation in a rich picture in task 1.1 on Figure 6.8 was possible due to the openness to relatively adequate resources related to the SA case study. In contrast, direct text analysis was used in task 1.2 for defining the recruitment problems that related to the other case studies due to the limited resource available. Another example of difference, the tasks 5.1 and 5.2 on Figure 6.8 were crucial to understand and model the different recruitment problem worldviews related to the SA enlistment case study in light of the adequate resources available, and to then facilitate the development of the 1st tentative artefacts. This 1st tentative artefacts built from the 1st A-R cycle (i.e. from the SA enlistment case study) will be used in task 5.3 on Figure 6.8 as a reference to which the new problem concepts related to the BA enlistment case study and UK UCAS case study are mapped in an incremental way. This means that the 2nd tentative artefacts resulting from the refinement of the 1st tentative artefacts will be similarly used in the 3rd A-R cycle.

In next sections, the five numbered elements set out in Figure 6.8 will be described.

1.   Find Out about Problem Situations

This activity is to collect as much as possible information qualitative and quantitative from different sources about the three case study selected. For the 1st A-R cycle (i.e. SA enlistment case study), these information will be represented in a rich picture, while for the other A-R cycles (i.e. BA enlistment and UK UCAS case studies) these information will be immediately analysed as text.

1.1. Rich Picture

In the SSM, a problematic situation needs to be represented in a rich picture (Checkland and Scholes, 1990). The rationale behind a rich picture is that a real-world problem situation is a mess containing multiple linear and non-linear interacting relationships, and a picture is the best means for representing such relationships and so representing the real-world situation (Checkland and Scholes, 1990). Checkland and Scholes (1990) provide some guidelines as to what should be included in this picture to ensure its richness (e.g. structure, processes, climate, people, issues and concerns expressed by people, and conflicts). These guidelines will be considered in the 1st A-R cycle.

2.   Root Problem Definitions (RPDs)

The purpose of this activity is to capture the various recruitment problem worldviews from different recruitment members' perspectives and define them. Using the problem analysis techniques (activity 3), a problem worldview can be viewed and defined from many perspectives. For example, by looking at the rich picture (task 1.1), a problematic issue (i.e. a concern or problem) can be selected from it and a set of relevant issue owners (i.e. problem stakeholders) can be named and listed. From such a list, many problem worldviews can be produced to address this issue. These worldviews, using the same problem analysis techniques, can be extracted from text in the 2nd and 3rd A-R cycles.

3.   Problem Analysis Techniques

A number of problem analysis techniques and tools are used to help enriching the process of enquiry and defining the problem worldviews. Taking into account both the constructivist view of problem and the proposed definition of recruitment adopted in this thesis, these techniques and tools will be used in line with this adoption. The constructivist tradition of problem definition conceptualises the concept of problem as the output of some kind of interaction between the subject and the object (Landry, 1995). As such, a problem emerges when a subject both acknowledges that something has failed, and recognises the interest of inquiry as the reasons of this failure, in order to remedy this situation (Piaget, 1970). Given this view, the proposed problem analysis techniques to be used in capturing recruitment problem definition are, as follows:

3.1.   W5H Model

This model is presented in Figure 6.9. It consists of the fundamentals of communication found in primitive interrogatives: What, When, Who, Where, Why, and How. The answers of these questions form a comprehensive and composite problem definition.
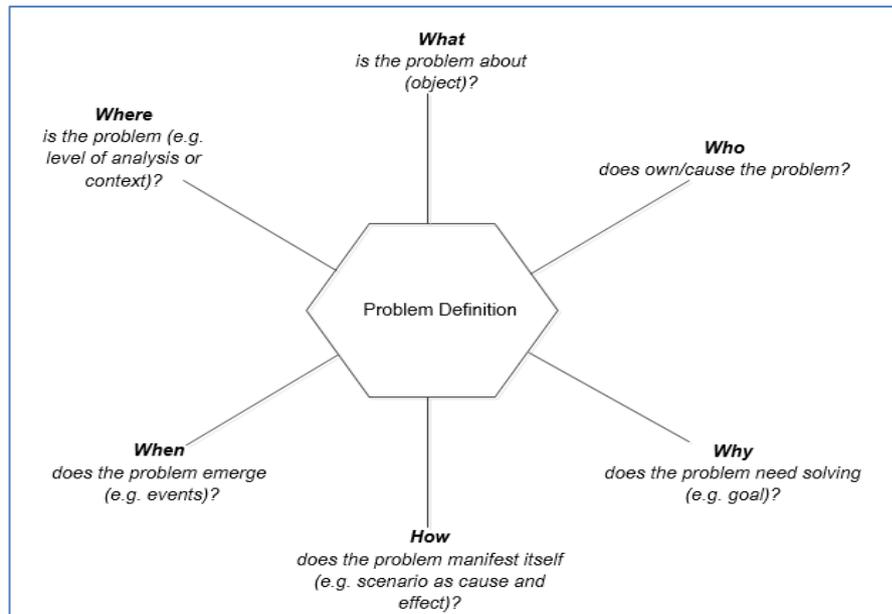
Figure 6.9 The W5H Model for Problem Analysis

3.2. CATWOE

The use of CATWOE (Customers, Actors, Transformation process, Worldview, Owners, and Environmental constraints) is very important. It contains elements by which a problem worldview can be usefully captured and defined. Figure 6.10 presents the way in which CATWOE is adapted to enrich the definition of a recruitment problem worldview
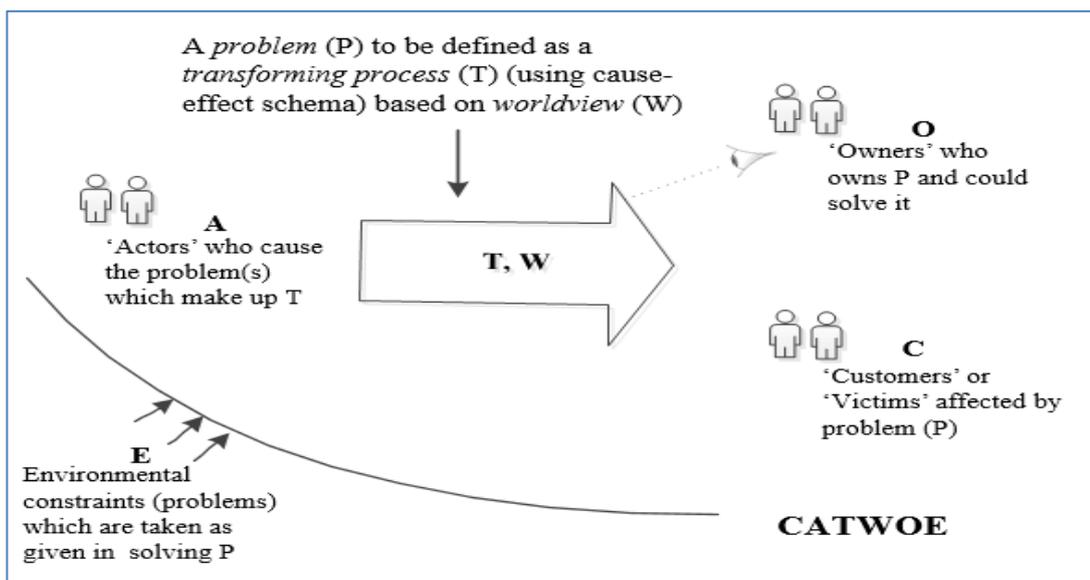
Figure 6.10 The Concepts of CATWOE for Enriching the Definition of problem Worldviews

Using the CATWOE checklist depicted in Table 6.3, the various people and elements of an issue can be explored and then a concrete problem definition can be built.

Element	Problem-Oriented Questions
C: Customers	▪ Who is affected by the issue (problem)? Who does perceive it?
A: Actors	▪ Who is involved in the issue? ▪ Who does cause the problem(s)?
T: Transformation Process	▪ How does the problem manifest itself (signs/symptoms)? ▪ What systems, processes, other problem factors are contributing to the issue? ▪ What are the problem inputs (causes)? Where do they come from? ▪ What is the transformation that lies at the heart of the problem? Why does the problem occur? ▪ What are the problem outputs (effects)? Where do they go to?
W: Worldview	▪ What is the big picture into which the problem fits? ▪ What is the real problem you are working on? ▪ What is the wider impact of the problem?
O: Owners	▪ Whose problem is it? ▪ Who owns the problem being investigated? ▪ Who is going to play the role in finding the solution?
E: Environmental Constraints	▪ What are the constraints and limitations that will impact the problem and its solution? ▪ What in the environment does influence the problem and taken as given?

Table 6.3 The Checklist of CATWOE for Problem Worldview Definition

3.3. Root Cause Analysis (RCA)

RCA is a useful, analytical process for understanding the complex structure of a problem. It enables a comprehensive, system-wide review of a problem by the identification of the various causal factors and conditions that allow that problem to occur. To enrich the CATWOE checklist provided in Table 6.3, RCA and a set of tools such as 5-Whys, Appreciation (so what?) and Drill-Down will be used to build a robust problem definition.

4. Artefacts Development

It has been mentioned earlier in section 6.2.2 that the artefacts development scenarios are different from a case study to another for some considerations. For the SA enlistment case study, problem conceptual models will be constructed to provide a comprehensive view of the

SA enlistment problem from different perspectives. These models will be referred to for abstracting and building the 1st versions of POCM and Onto-RPD with care of the proposed definition of recruitment and the requirements prescribed in phase 2 of the design science method framework adopted in chapter 3. Once the 1st versions of POCM and Onto-RPD are built, they will be used as references to which the new problem concepts extracted from the next case study (i.e. BA enlistment case study) are compared and mapped. Similarly, the 2nd versions of POCM and Onto-RPD will be used as reference for the third case study (i.e. UK UCAS case study).

4.1. Problem Conceptual Models

After selecting, analysing and defining an issue based on a problem worldview using problem analysis techniques (i.e. CATWOE & Root Cause Analysis), this issue is represented in a problem model. This model describes the transformation process (i.e. the causal chain by which the relevant issue occurs) that corresponds to the (T) in the CATWOE checklist. The set of problem models resulting from the analysis of the SA enlistment case study will inform the process of abstracting and structuring the POCM and Onto-RPD artefacts.

4.2. POCM and Onto-RPD Artefacts

The POCM is a high-level Problem-Oriented Conceptual Model derived from the various root problem definitions (RPDs) captured from the analysis of the three case studies. The constructs comprising the POCM are the most common problem abstractions and their relationships that often appear in a recruitment problem represented in reference to the proposed definition of recruitment adopted. On the other hand, the Onto-RPD is a complementary ontology that conceptualises the whole recruitment problem space and that helps understanding and defining a recruitment problem. The process of building these two artefacts is evolutionary through the analysis of the case studies selected.

5. Problem Concepts Encapsulation Guidelines

These guidelines will be collectively used for abstracting and synthesising the recruitment problem concepts and their relationships, and therefore building the POCM and Onto-RPD artefacts. These guidelines are, as follows:

5.1. Problem Definition Formula

The Problem, Object, and Goal (POG) formula will provide a shape for defining a problem concept from one perspective. This formula is presented in Figure 6.11. The author found it so helpful to abstract recruitment problem concepts for the POCM artefacts. The formula is also helpful in writing out a recruitment problem as a statement. However, the key contribution of this formula in building the artefacts is enabling the encapsulating of recruitment problem concepts as interest dimensions (i.e. factors or parameters) that influence someone's interest according to the proposed definition of recruitment.

$$A\ \textbf{Problem (P)}\ \text{defined as the} \begin{bmatrix} \textit{[failure of]} \\ \textit{[need for]} \end{bmatrix} \text{an } \textbf{Object (O)} \text{ to achieve a } \textbf{Goal (G)}$$

Where

Problem (P): A problem perceived and defined through the perspective of a pure, declared worldview which is viewed relevant to the problematic situation.

Object (O): The thing that part of the external reality, be it physical, social, or ideal.

Goal (G): The end or purpose pursued by an agent expressed as a value, need, desire, or objective.

Figure 6.11 The Proposed Problem Definition Formula

5.2. Open and Axial Coding

Open coding is the activity in which the researchers engage in conceptualizing and articulating the often hidden aspects of a set of things that they noted earlier as relevant during their close reading of a set of single studies (Wolfswinkel et al. 2013). *Axial coding* is the activity in which the interrelations between categories and their sub-categories (including their properties and relationships) are identified (Wolfswinkel et al. 2013). In this, similar concepts are grouped together into categories and sub-categories.

5.3. PAIIB Paradigm

The Perception-Attitude-Interest-Intention-Behaviour (PAIIB) paradigm (Rummel, 1979) will be used to link recruitment problem concepts with the *interest* concept in alignment with the proposed definition of recruitment. Based on PAIIB paradigm (Rummel, 1979), perception is a

belief or opinion based on how things seem. An attitude is a latent goal or desire of a person that is not in the process of realisation. For instance, a desire to eat, to watch television, to get a B.A. degree, and so on. Hence, an attitude always has a goal and object (Rummel, 1979). The strength of a person's attitude is his interest. An interest, as an activated attitude, consists of an active tendency, a strength towards the realisation of goals, and thus the gratification of desires. Thus, an interest has both direction (attitudinal goal) and magnitude (power), and is therefore vector (Rummel, 1979). Given the strength of an interest, it may remain entirely latent with no associated behaviour (i.e. no manifest movement to gratify it). Hence, it needs an intention to be transformed into a behaviour. As such, an intention is an interest being manifested through a behaviour. In other words, an intention is a living interest.

5.4. Problems Vs. Symptoms and Opportunities Vs. Threats

During the encapsulation of recruitment problem concepts, problems and symptoms will be distinguished for the ex-poste analysis of a problem situation on one hand; and opportunities and threats will be also distinguished for ex-ante analysis of a problem situation on the other hand.

6.2.3 Observe Phase

In this phase, the POCM and Onto-RPD artefacts resulting in each A-R cycle are evaluated against the requirements prescribed in section 3.4.2. Moreover, these artefacts will be compared into the existing taxonomies in the recruitment literature. The review of the exiting taxonomies is provided in chapter 2. Some of the results of the A-R process (i.e. artefacts) were published in a way to get fruitful feedback from domain experts.

6.2.4 Reflect Phase

In this phase, the results of observe phase are analysed and improvements are suggested. Moreover, the implications of these suggested changes on the POCM and Onto-RPD are also evaluated to reach a state of balance between all requirements prescribed for good artefacts.

6.3 The Results of A-R Cycles

In this section, the results of the A-R cycles conducted on the three case studies will be presented. In line with the methodological framework adopted in Figure 6.8, the A-R deliverables

in each cycle including the tentative POCM and Onto-RPD artefacts will be produced, and the changes on the artefacts from one cycle to another will be provided.

6.3.1 The Deliverables of the 1st A-R Cycle(s)

This A-R cycle is inspired by the SSM. The objectives of this cycle were: (1) to explore and visualise the SA enlistment problem situation; (2) to capture the different problem worldviews relevant to the situation; (3) to model the problem models that correspond to the problem worldviews; and (4) to develop the 1st versions of POCM and Onto-RPD artefacts. The deliverables of this cycle are, as follows:

➢ The rich picture for the SA enlistment problem situation, see Figure 6.12.

➢ Two examples of the CATWOE checklists and RCA applied on the SA enlistment problem situation, see Table 6.4 and Table 6.5.

➢ The corresponding problem conceptual models are provided based on the CATWOE checklists above, see Figure 6.13 and 6.14.

➢ Examples of problem concepts extraction from the CATWOEs and problem models using the problem concepts encapsulation guidelines in Figure 6.8, see Table 6.6.

➢ The tentative POCM and Onto-RPD artefact, see Figure 6.15 and 6.16.

➢ Observations and reflections on the 1st tentative POCM and Onto-RPD.

The aim of the rich picture presented in Figure 6.12 is to informally visualise the as-is model of the SA enterprise enlistment problem situation, including the main entities, structures and viewpoints in the situation, the processes going on, the current recognised issues and any potential ones, thereby enable communication with the problem owners. Looking at the rich picture, a problematic issue (i.e. a concern or problem) can be selected from it and a set of relevant issue owners (i.e. problem stakeholders) can be named and listed. From such a list, many problem worldviews can be captured using the problem analysis techniques described in Figure 6.8. The results of applying these problem analysis techniques on the whole the SA enlistment situation are provided in Appendix 6. Two examples are brought here for presentation: "*enlistment opening announcement problem*" and "*reception and inspection problem*". The CATWOE checklists applied to capture and understand these two problems are presented respectively in Table 6.4 and Table 6.5, and the corresponding problem conceptual models are shown in Figure 6.13 and Figure 6.14 respectively.

Figure 6.12 Rich Picture of the SA Enterprise Enlistment Situation

Element	Problem-Oriented Questions and Answers
C: Customers	▪ Who is affected by the issue? Who does perceive it? - *Applicant, military school*
A: Actors	▪ Who is involved in the issue? Who does cause the problem(s)? - *Enlistment announcer, announcement agent, applicant, military school staff*

T: Transformation Process	▪ How does the problem manifest itself (signs/symptoms)?
	   - *Less no. of highly qualified and regionally diverse applicants attracted*
	▪ What are the inputs (causes)? Where do they come from?
	   - *Incomplete enlistment opening order; lack of job and employer info. provided; limited announcement methods (mainly newspaper); bad timing, less time available; less accessible, and less usable enlistment message; less accessible site to apply; limited resources; information disclosure restrictions (e.g. security, diversity-oriented selection, etc.). (Head of military school, school staff, announcer, announcement agent)*
	   - *No application submitted; incomplete app. form; applicant concerns (e.g. short time for job application, remote location of application, etc.), uncertainty (e.g. is the job interesting? Is it the best choice? Will I get offered? Are there any alternatives (jobs, military schools to apply, application locations, timings, etc.)?), incorrect or bad job expectations, and no value perceived, applicant dissatisfaction (applicant)*
	▪ What is the transformation that lies at the heart of the problem?
	   - *Interaction and conflict between target applicants' needs and military school's needs.*
	▪ What are the outputs (effects)? Where do they go to?
	   - *No intention to apply and bad experience (applicant)*
	   - *Less no. and quality of applicants attracted (military school)*

W: Worldview	▪ What is the big picture into which the problem fits? What is the real problem you are working on?
	   - *enlistment opening announcement, applicant attraction, marketing, advertising*
	▪ What is the wider impact of the problem?
	   - *Less number of quality applicants obtained*

O: Owners	▪ Whose problem is it? Who owns the problem being investigated? - *Military school*
E: Environmental Constraints	▪ What are the constraints and limitations that will impact the problem and its solution? - *Employer image, enlistment strategy (whom to recruit, where, when, etc.), competitors, partners' needs, applicants' needs, job design, timings, budget, government and SA's HR policies and regulations*

Table 6.4 the CATWOE for Defining Enlistment Opening Announcement Problem
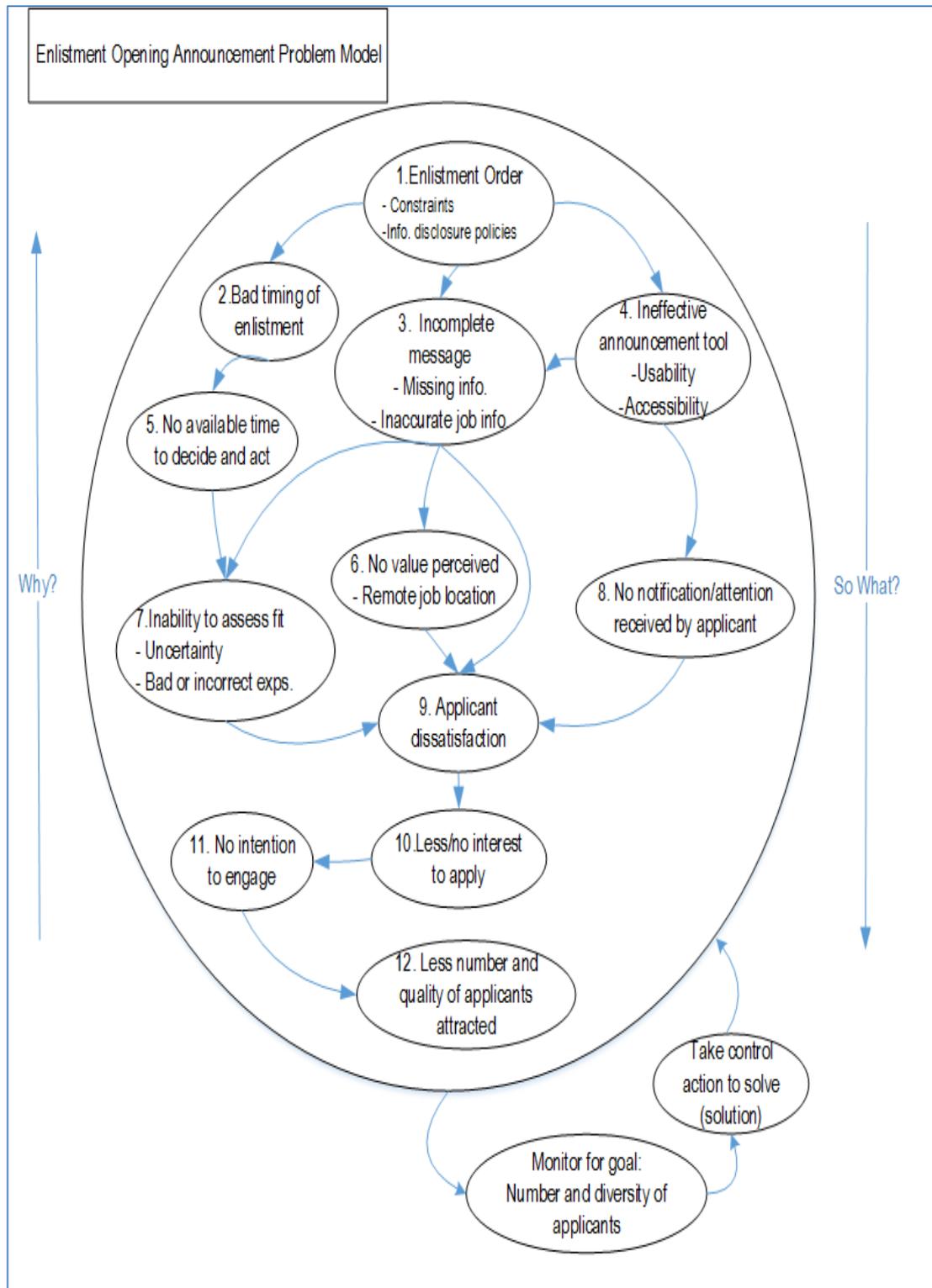
Figure 6.13 A Conceptual Model for "Enlistment Opening Announcement Problem"

Element	Problem-Oriented Questions and Answers
C: Customers	▪ Who is affected by the issue? - *Applicant, military school*
A: Actors	▪ Who is involved in the issue? Who does cause the problem(s)? - *Military school, reception and inspection staff, applicant*

T: Transformation Process	▪ How does the problem manifest itself?
	   - *No. of withdrawals, no. of rejected applications, inappropriate pool of applicants received, cost, delay*
	▪ What are the inputs (causes)? Where do they come from?
	   - *Remote location of reception, restricted access for security, no induction or visit tour, rigid treatment, bad timing, less time available, manual screening, delay, less accessible site, less visible industry, unfamiliarity with military, no alternative opportunities (e.g. re-inspection, re-booking, different job choice, etc.) (military school, screening and inspection staff)*
	   - *Inappropriate applicant received; Incomplete application forms; incomplete docs.; absence; delay (applicant)*
	▪ What is the transformation that lies at the heart of the problem? Why does the problem occur?
	   - *Applicant concerns (e.g. does the job worth attention? Is it the best choice? Will I get passed? Are there any alternatives if fail (jobs, military schools to apply, reception locations, timings, etc.)? incorrect or bad job expectations, no value perceived, applicant dissatisfaction*
	   - *Military school concerns: how much applications shall we accept?, who to recruit, where and how to conduct enlistment recruit, whether to allow re-application and re-inspection or not, how to manage time, shouldn't we be flexible, how to manage resources, what type of information to provide*
	▪ What are the outputs (effects)? Where do they go to?
	   - *Withdrawal, less motivation, continue with hesitation (applicant)*
	   - *Inappropriate pool of applicants, rejected applications, cost, delay (military school)*

W: Worldview	▪ What is the big picture into which the problem fits? What is the real problem you are working on?
	   - *Reception and inspection problem*
	▪ What is the wider impact of the problem?
	   - *Less number of quality candidates, bad reputation of military school*

O: Owners	▪ Whose problem is it? Who owns the problem being investigated? - *Military school, applicant*
E: Environmental Constraints	▪ What are the constraints and limitations that will impact the problem and its solution? - *Enlistment announcement problem, enlistment strategy, employer image, type of applicant, time available, budget*

Table 6.5 the CATWOE for Reception and Inspection Problem
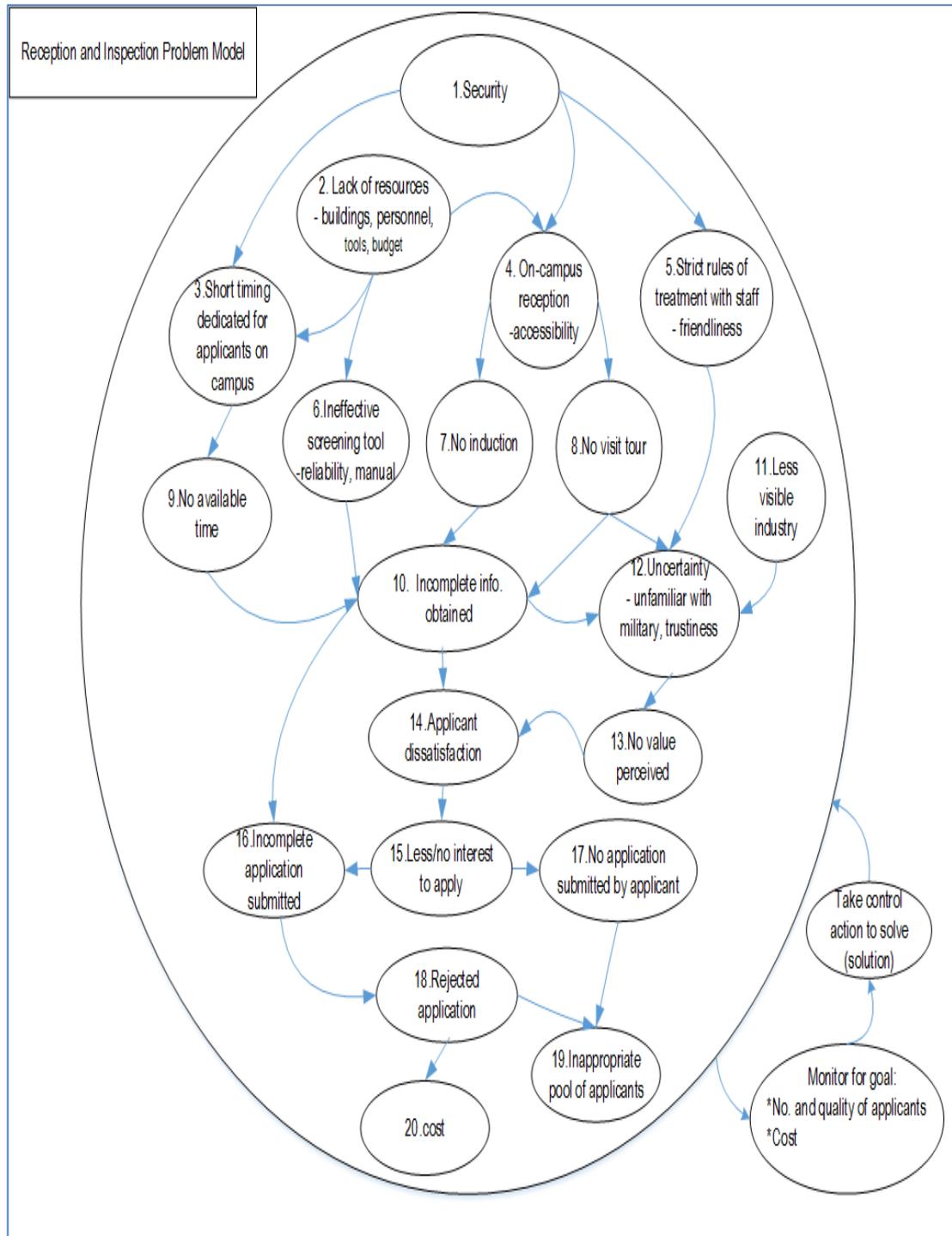
Figure 6.14 A Conceptual Model for "Reception and Inspection Problem"

Who Cause the problem?	Defined as (The failure of/ need of)	What is it about? (Object)	Why is it a problem? (Goal)	How it manifest itself? (effect)
Applicant	Failure of	Application form	To be complete	Rejection
Applicant	Failure of	Application form	To be submitted	Less no. of applicants Less diversity
Enlistment announcer	Failure of	Announcement message	To be complete/ accurate	Applicant dissatisfaction (hard to assess fit)
Enlistment receptionist	Failure of	Behaviour	To be friendly	Apps. withdrawal
Inspector	Need of	Inspection equipment	To be usable/speedy	More interest with apps. to participate
Military school	Need of	Location	To be accessible	More Apps. participation
Military school	Failure of	Location	To be diverse	Apps. withdrawal Less diversity
Head of School	Failure of	knowledge	To be complete	Failure to decide who to recruit
Military unit	Need of	resources	To be attractive	More apps. attracted
Public school	Failure of	Qualification info.	To be on time	Delay of enlistment
SA	Failure of	information	To be complete	Less visibility
Military unit	Failure of	Job (product)	To be attractive	Hard to fill by high quality
Applicant	Need of	desires	To be met	Less withdrawal
SA (all its units)	Need of	Units	To be open to public	Increase trust/ certainty
SA (all its units)	Need of	structure	To be stable/less modular	Military unit (to design good job) Apps (to expect well)
Military school	Failure of	Selection device	To be fair	Apps. withdrawal
SA	Failure of	information	To be specific (not too generic)	Apps. withdrawal
Military units	Failure of	Job	To be well-designed	Less performance
SA (all its units)	Failure of	Identity	To be attractive	Bad expectations with its parties
SA (all its units)	Need of	Strategy	To be reliable	To attract potential apps.
School military	Need of	enlistment staff	To be professional	To make a good impression
Ministry of labour	Need of	Policies	To be rigid	To ensure job opportunities
SA partners (hospital/pub. school/CAA/CRA)	Need of	Reports	To be complete/accurate/timely	to fill vacancy on time

Table 6.6 Examples of Some Problem Concepts Extracted using Open Coding

The problem concepts in Table 6.6 are some examples derived from the CATWOE checklists and problem conceptual models of the SA enlistment situation using the open coding. The Author started by selecting each problem worldview of the SA enlistment situation and derived the problem concepts from those worldviews, see Appendix 7. The various problem concepts

resulting from open coding are then grouped together into categories and sub-categories using the axial coding. In the axial coding, similar concepts are combined together taking into account their properties and causal relationships. The results of such activities (open and axial coding) are the 1st tentative POCM and Onto-RPD artefacts.

The development of 1st tentative POCM and Onto-RPD artefacts using the ongoing open and axial coding was evolutionary producing different versions of these artefacts. These versions are provided in Appendix 8. The final 1st tentative POCM and Onto-RPD resulting from the SA enlistment case study are presented in Figure 6.15 and Figure 6.16 respectively.
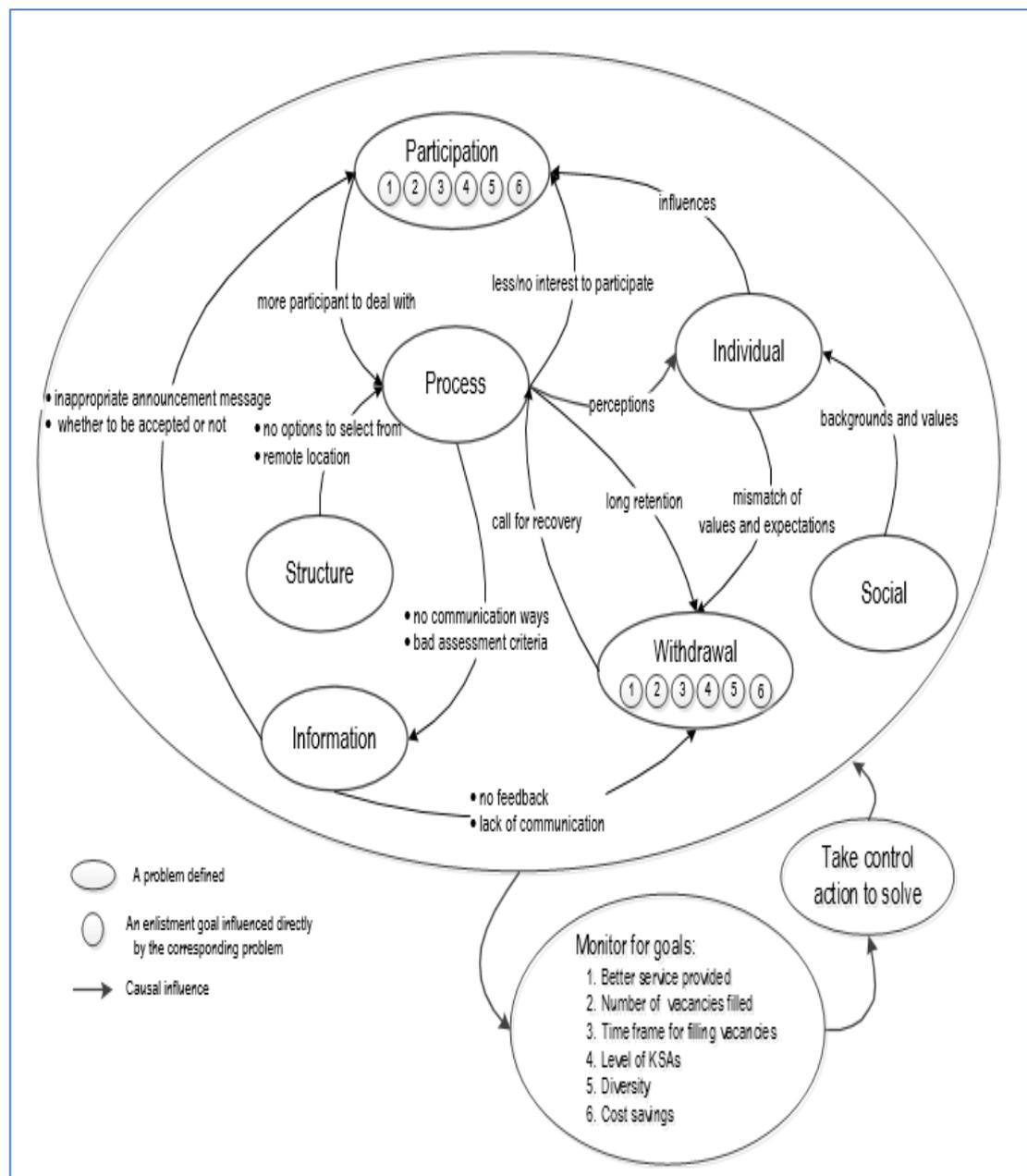
Figure 6.15 the 1st Tentative POCM Artefact Produced from the SA Case Study
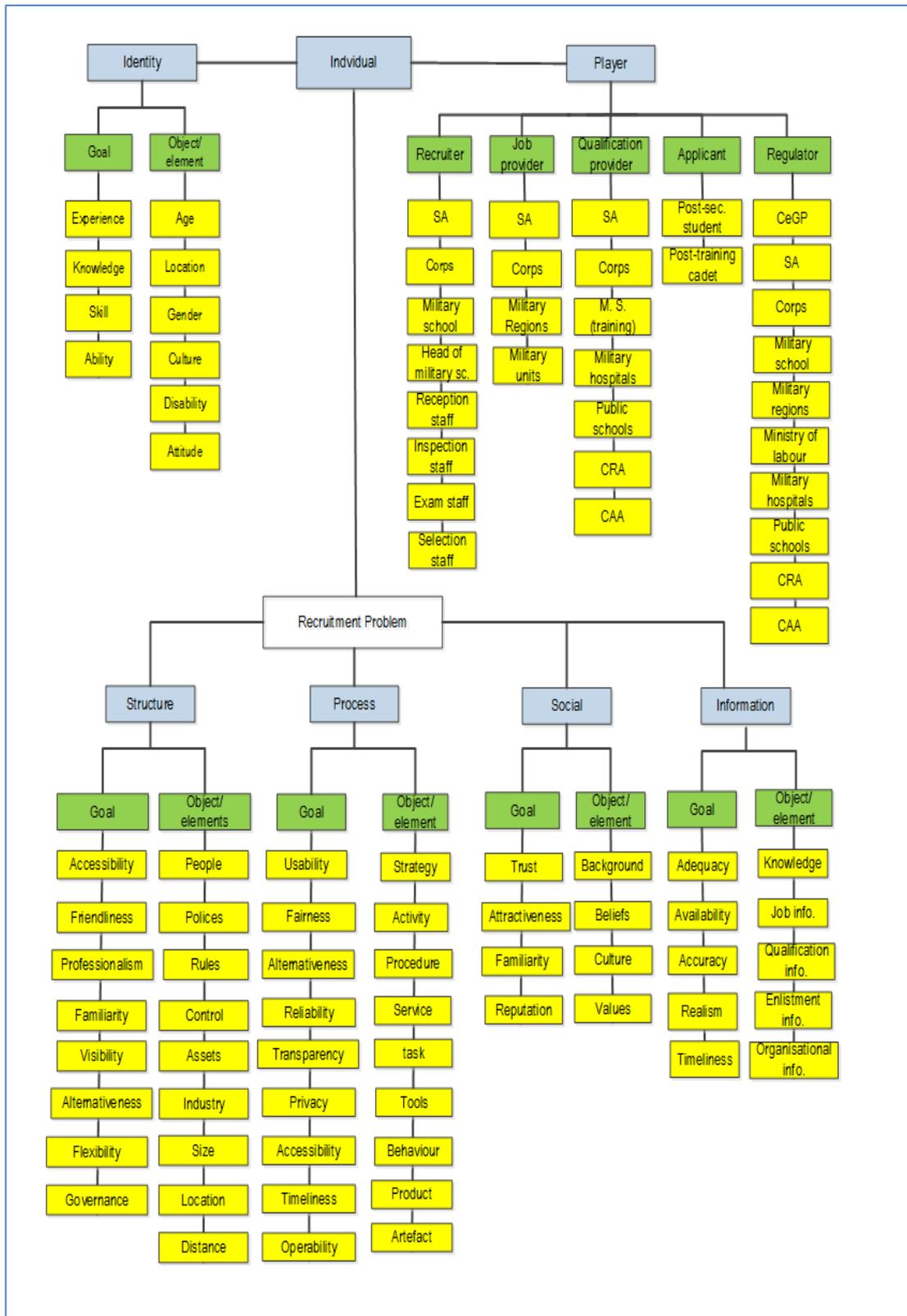
Figure 6.16 the 1st Tentative Onto-RPD Artefact Produced from the SA Enlistment Case Study

Observations and reflections on the 1st tentative POCM and Onto-RPD are, as follows:

- The POCM has provided a representation of the various problems that influence the general goals (i.e. from 1 to 6 on Figure 6.12) previously articulated by the SA enlistment project. Given these various general goals, one might ask what the ultimate goal of a recruitment practice is, or alternatively what the emergent property of a recruitment system is. Thus, the POCM does not provide how these goals themselves influence each other towards the ultimate goal of a recruitment practice.

- The Onto-RPD includes as many as problem-related concepts (e.g. players, actors, roles, etc.), that are not explicit problem concepts, but being related and very necessary for defining the recruitment problem space.

- There is a need of a working definition of recruitment through which the complexity of a recruitment problem can be approached.

- The concept of *interest* appeared on Figure 6.15 (i.e. drivers to participation) has given a clue to the definition of a recruitment problem. The definition is provided in section 6.2.1.3.

- It can be noted that some concepts (e.g. goals) in the Onto-RPD appear in more than one problem dimension. This refers to the interconnectedness of recruitment problem and the various means of achieving a goal, e.g. attractiveness and accessibility.

- There are a bundle of recruitment problem concepts embedded in the SA enlistment case study which make it difficult to include all of them in one artefact (i.e. Onto-RPD). Thus, the Author relied on a quantitative analysis of the concepts and their levels of importance expressed by the respondents in the survey (i.e. questionnaire) as a criterion of inclusion in the Onto-RPD, see Appendix 9.

6.3.2 The Deliverables of the 2nd A-R Cycle(s)

This A-R cycle is dedicated to the BA enlistment case study to enhance the 1st tentative POCM and Onto-RPD resulting from the 1st A-R cycle. Hence, the objectives of this cycle were: (1) to extract as many as possible textual excerpts from the BA enlistment materials; (2) to capture the relevant root problem concepts (i.e. RPDs) and their relationships within these excepts; (3) to map these concepts into their counterparts in the 1st POCM and Onto-RPD artefacts; and (4) to define the new emerging concepts and refine the artefacts accordingly. The deliverables of this cycle are, as follows:

➢ A view of extracting the problem concepts from the excerpts from the BA enlistment materials, and populating them into the concepts in the 1st Onto-RPD using Dedoose software (i.e. open coding), see Figure 6.17.

➢ Mapping the concepts and their relationships extracted from the BA enlistment to the 1st POCM to validate the problem structure of a recruitment problem (i.e. concepts and causal relationships), see Table 6.7 and Figure 6.18.

➢ Findings from the mappings of the BA enlistment concepts.

➢ Refining the 1st POCM and Onto-RPD artefacts and producing new versions based on the new findings from the above mappings, see Figure 6.19 and 6.20.

➢ Observations and reflections on the 2st tentative POCM and Onto-RPD.
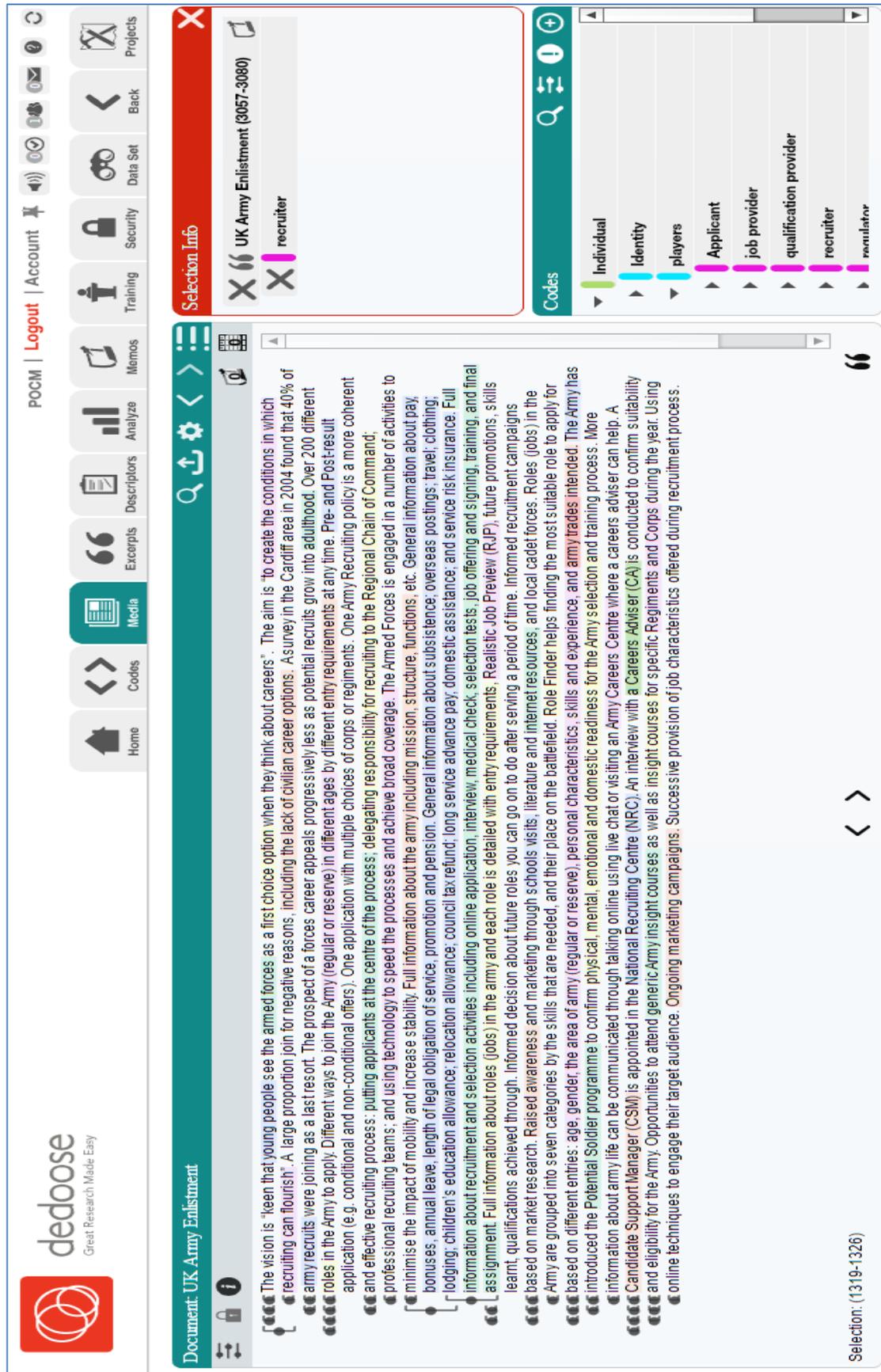
Figure 6.17 A Screenshot of the Extraction of BA Problem Concepts and Mapping to the Pre-Defined Onto-RPD Artefact using Dedoose Software

Figure 6.17 shows some examples of the extraction of concepts from one excerpt related to the BA enlistment case study using Dedoose software (Dedoose, 2015). The Author analysed the content of a number of reports and articles, see Table 6.1, as well as a long live chat with a recruitment advisor in the BA. Hence, the relevant excerpts related to recruitment were collected. In total, 117 excerpts were collected and organized using Dedoose software. The concepts extracted from these excerpts were mapped into the codes created in the 1st Onto-RPD or into the new ones created during the analysis (Lewins and Silver, 2007). The frequency of the concept mappings gave insights into the most important concepts to be adopted because it is impossible to contain all relevant problem concepts and their possible relations.

In parallel with the open coding of the BA enlistment concepts, the Author mapped the concepts and their causal relationships extracted from the BA enlistment to the 1st POCM to validate the current problem structure of a recruitment problem (i.e. concepts and causal relationships). Appendix 10 shows a number of these mappings. Table 6.7 presents an example of mapping some problem concepts extracted from the BA enlistment to the "*better service provided*" problem in the 1st POCM artefact. Figure 6.18 presents the results of these mappings showing the new emerging concepts and their relationships. This initiated another A-R cycle to refine the POCM and its corresponding Onto-RPD.

Goals and Outcomes	Root Problem Concepts and Relationships					
	A. Participation / B. Withdrawal	A1. Information:	A2. Structure:	A3. Process:	A4. Individual:	A5. Social:
(Better service provided • Fail to create the conditions in which recruiting can flourish" (A, B)	A. Participation • "A large proportion join for negative reasons: (from A1) • *Values and needs (from A4)* B. Withdrawal • 38% of army recruits did not complete Phase 2 training	• *Inability to assess job fit* • Some information that might persuade potential recruits to enlisting is not routinely volunteered (e.g. job location and potential overseas missions) (From A2) • *Untimely location info. (A3)* • Job location still missing (From A2) • *Inability to assess job fit*	• *Job location is unknown* • British army participate in peacekeeping forces in many countries (e.g. Afghanistan and Iraq) • Modular organising, dynamic, size, etc.	• *A policy to postpone some job info.* • Recruit will be allocated a job in a specific location based on the need when graduating and type of training accomplished • *Delay (from A1)*	• *Bad or unrealistic Expectations* • The armed forces still draw recruits mainly from among young people with low educational attainment and living in poor communities • *Background (from A5)* • *Perceptions (from A1)* • *Bad or unrealistic expectations (from A3)* • *Inability to match expectations*	• Negative publicity from Afghanistan and Iraq] • less awareness of the 'down-sides' of the career • *Non-verbal communication (e.g. site seeing, visits, etc. (from A2 & A3)* • *Trust and expectation (from A1)*

▪ *Italic* is a causal relationship

Table 6.7 Mapping the BA problem concepts the "better service provided" problem
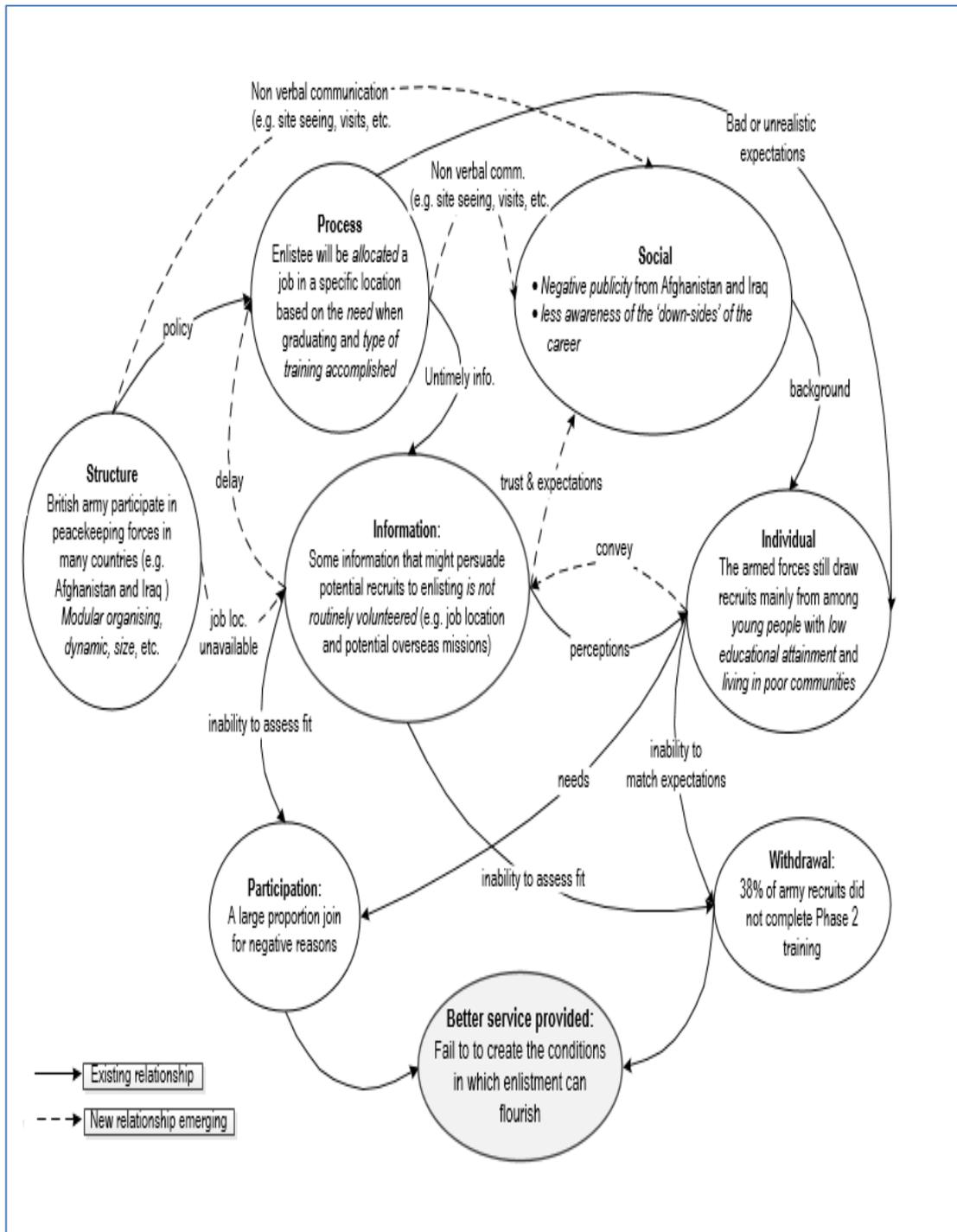
Figure 6.18 Problem Concept Extraction and Mapping to the Pre-Defined POCM Artefact

Findings from the analysis and concept mappings in the BA enlistment case study:

▪ The behaviour of individuals is largely influenced by the environment and social problems, such reputation and trust. Hence, the society (e.g. parents, friends, and others) is a key player in recruitment problem from a larger view of the problem.

- Timing is a key problem concept that intervene the influence of the other concepts on the recruitment problem.

- Equipment, tools, and resources are root concepts that influence recruitment problem.

- The existing mappings of problem concepts and their influential relationships are limited and dedicated to the problem structure related to specific goals of recruitment problem, e.g. better service, number of jobs filled, quality of recruits, etc. Hence, the challenge is how these various problem concepts and their relations are abstracted and integrated towards a better inclusion of different stakeholders' perspectives and understanding of how a recruitment problem arises, develops and evolves through time. This will increase the perspicacity and generativity of the artefacts, as prescribed in 3.4.2.

- Given several aspects that play a role in defining recruitment problem have been captured, the way how the different perceptions and behaviours of different individuals involved influence recruitment problem is still obscure. This requires a working definition of recruitment and recruitment problem in order to deal with its complexity.

- The definition of recruitment adopted in 6.2.1.3 provides a new approach to model and define recruitment problem in reference to the theme that multi-agents interact through multi-interest dimensions towards filling a vacancy.

- Based on the aforementioned definition, the theories pertaining to the concept of *interest,* represented by PAIIB in the methodological framework Figure 6.8, are considered and the concepts of the pre-defined POCM and Onto-RPD are restructured.

- The differentiation between *problems* and *symptoms* in one hand and *opportunities* and *threats* from another hand, is also maintained.

Figure 6.19 and Figure 6.20 present the 2nd POCM and Onto-RPD artefacts respectively. In Figure 6.19, interest plays a key role in driving an individual's behaviour. It starts by influencing an individual to act, and transcends this to influence the other individuals creating many complex relations until a vacancy is filled. The dimensions in Figure 6.19 are encapsulated in a way to establish interest parameters and these are linked through perceptions and expectations. The personal traits of individual (i.e. type of individual dimension) are at the centre of these dimensions due to their indirect influence of someone's perceptions. The factors within the direct dimensions determine the levels of influence on, or the strength of relationships with, interest. Hence, there are many levels of interest which are integrated to influence an individual to act. At large, there is an overarching interest that becomes dominant in a recruitment enterprise, and that determines its position in labour market and the type and quality of filling a vacancy.
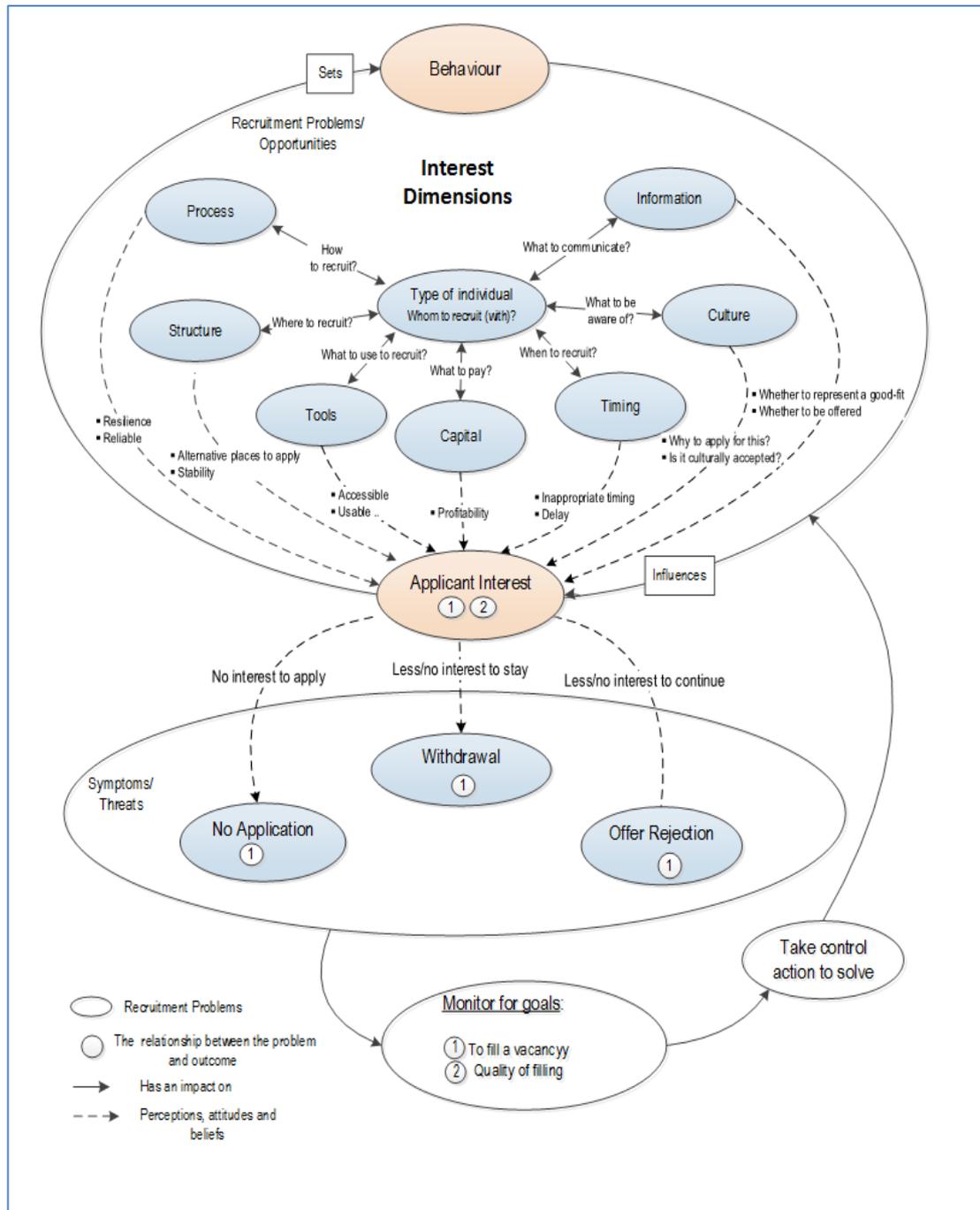
Figure 6.19 the 2nd Tentative POCM Artefact Produced from the BA enlistment Case Study

Based on Figure 6.19, a recruitment problem emerges when an existing state of equilibrium in recruitment members' interests changes based on external factors, therefore, learning how to resolve emerging conflict is necessary; or when a desired state of equilibrium of interests (i.e. new position in market labour) is sought, therefore learning about the existing-desired state gaps and how to remedy these gaps are needed. Failing to achieve the equilibrium state of interests reflect the fragmented interests with recruitment members. This leads to harmful outcomes such as withdrawal or rejection. This, in turn, results in the failure to fill a vacancy.
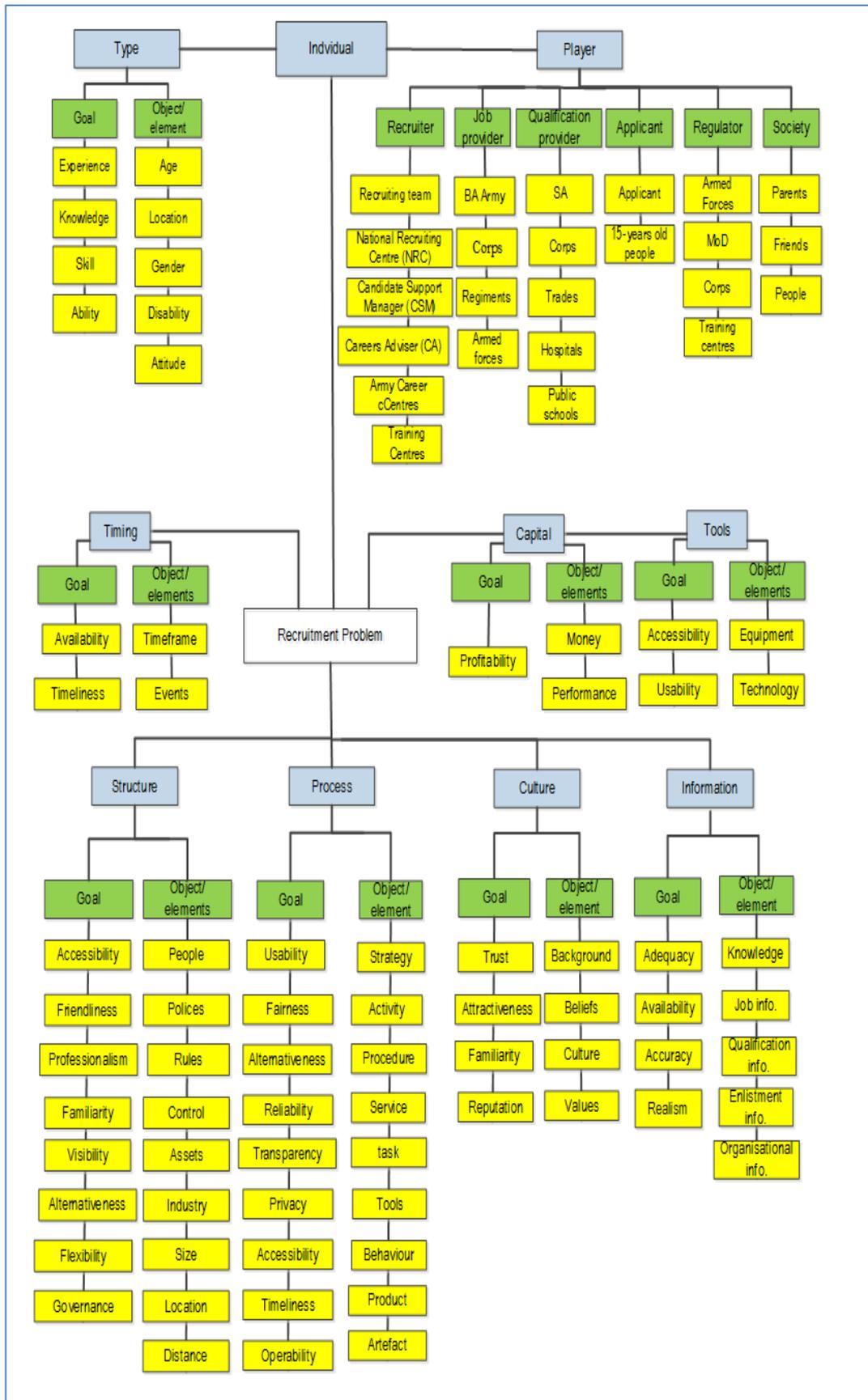
Figure 6.20 the 2nd Tentative Onto-RPD Artefact Produced from the BA enlistment Case Study

Observations and reflections on the 2nd tentative POCM and Onto-RPD are, as follows:

- The previously isolated analysis of recruitment problem as individual types of problems is eliminated by adopting a workable definition of recruitment. Hence, the ultimate goal of recruitment is defined and the rest of goals are incorporated within the interest dimensions.

- Four new root concepts are defined: capital, tools, culture, and timing. On the other hand, social dimension in the 1st POCM is replaced by culture dimension. From a large sense, social factors are any variable arises from interaction between individuals (Whitehead, 2017), hence the culture more specifically describes the factors incorporated.

- Although the 2nd POCM addresses the various interests of different recruitment members, it highlights the interest of applicant as an example for comprehension.

- The 2nd Onto-RPD provides a comprehensive and consistent set of recruitment concepts and their sub-concepts that correspond to the POCM created.

- The 2nd POCM and Onto-RPD have provided a simpler way to represent and understand a recruitment problem from different perspectives and, hence, to enable perspicacity of the models.

- The 2nd POCM and Onto-RPD artefacts provide a large account of problem concepts and sub-concepts that are grouped based on their similarities and their relationships with the concept of interest. However, the artefacts still lack the reflection of real-world recruitment problems and better known recruitment phenomena. To put differently, the artefacts still need to be structured in a way in which most common recruitment problem types are represented and the identification of which organises perceived stimuli and concerns into coherent wholes. This is referred to as *situational structure* (Smith, 1993; Jackson, 2001). Building on the current achievement, the artefacts will be reformed in the next A-R for more structured representation of real-world recruitment problem.

- In next A-R cycle, the application of the 2nd POCM and Onto-RPD artefacts in a different domain, e.g. public domain, is needed to enhance sector-independency of the artefacts.

6.3.3 The Deliverables of the 3rd A-R Cycle(s)

This A-R cycle is to apply the 2st tentative POCM and Onto-RPD resulting from the 2nd A-R cycle to the Undergraduate UCAS case study and refine the POCM and Onto-RPD artefacts accordingly. Although this A-R is considered as another application of the POCM and Onto-

RPD artefacts, it will largely address the need of a more generative problem structure of the real-world recruitment problem that realised in the last A-R cycle. Therefore, the objectives of this cycle were: (1) to extract the relevant excerpts from the undergraduate UCAS case study materials; (2) to capture the relevant root problem concepts (i.e. RPDs) and their relationships within these excepts; (3) to compare these concepts and their relationships with the previous ones from the SA and BA case studies; (4) to find a problem structure to which these concepts and their relationships could fit for a better reflection of the real-world recruitment problem; and (5) to populate the concepts into the new problem structure and build the 3nd POCM and Onto-RPD artefacts. The deliverables of this cycle are, as follows:

- A view of extracting the problem concepts from the excerpts from the Undergraduate UCAS materials, and mapping them into the concepts in the 2nd Onto-RPD using Dedoose software. See Figure 6.21.
- Mapping the concepts and their relationships extracted from the UCAS to the 2nd POCM to validate the problem structure of a recruitment problem (i.e. concepts and causal relationships), see Table 6.8 and Figure 6.22.
- Refining the 2nd POCM and Onto-RPD artefacts and producing new versions based on the new findings from the above mappings and research, see Figure 6.23 and 6.24.
- An example of some concepts from all case studies that are mapped to the 3rd POCM showing the feasibility of the new artefacts, see Table 6.9.
- The glossary of the various concepts included in the POCM and Onto-RPD is provided, see Table 6.10.
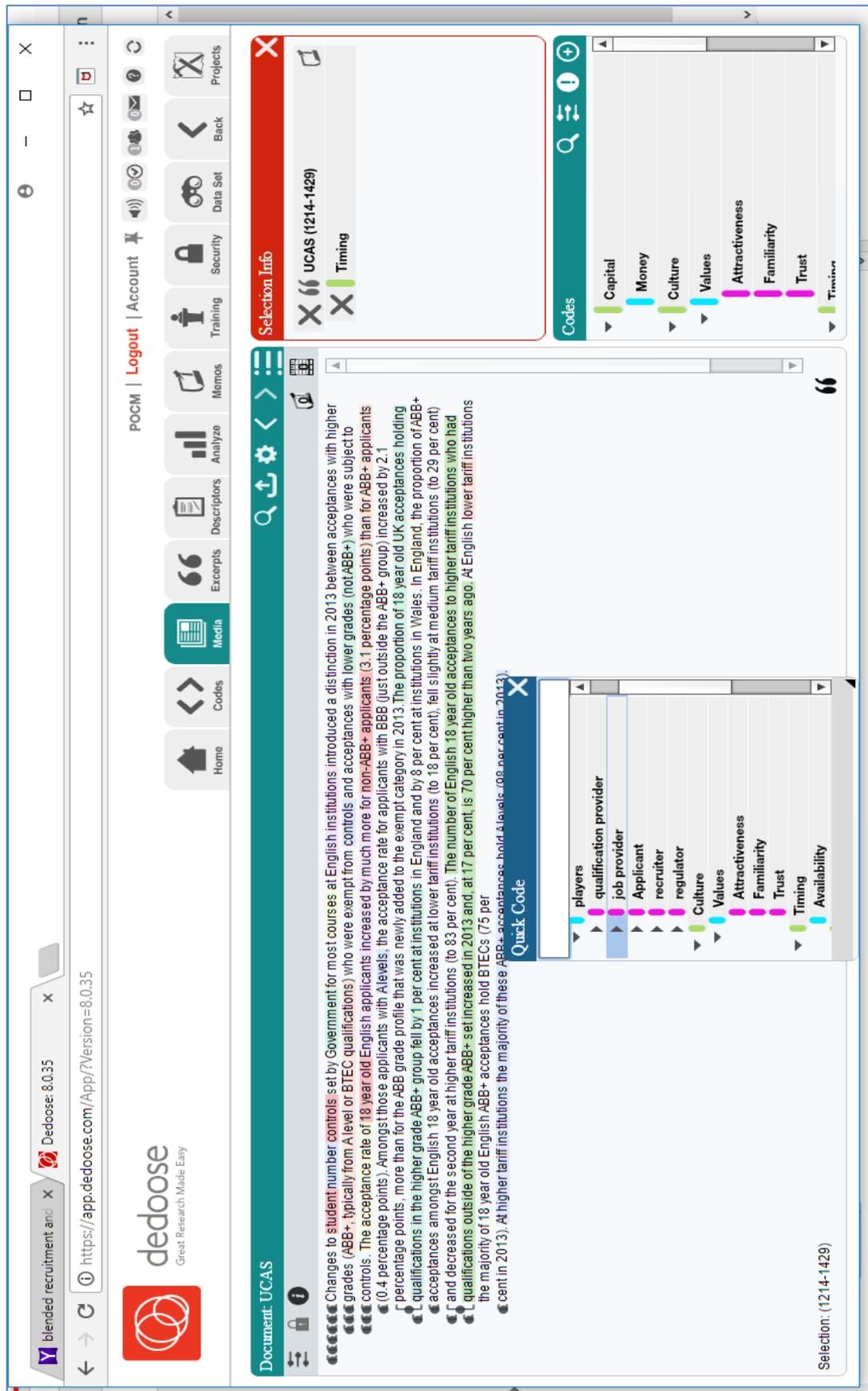
Figure 6.21 A Screenshot of the Extraction of UCAS Problem Concepts and Mapping to the 2nd Onto-RPD Artefact using Dedoose Software

Figure 6.21 presents some examples of the extraction of concepts from one excerpt related to the UCAS case study using Dedoose software (Dedoose, 2015). A number of collected excerpts from many reports and articles, see Table 6.2, are imported to Dedoose. In total, 96 excerpts were collected and organized using Dedoose software. The concepts extracted from these excerpts were mapped into the codes created in the 2nd Onto-RPD or into the new ones created during the analysis (Lewins and Silver, 2007). Based on the frequency of the concept mappings, less frequent concepts are excluded. In parallel with this, the Author mapped the concepts extracted from the UCAS into the 2nd POCM in order to validate the influential relationships between concepts. Appendix 11 shows a number of these mappings. Table 6.8 presents an example of mapping some problem concepts extracted from the UCAS to the 2nd POCM.

Moreover, the Author attempted to address the situational structure (i.e. the relationships intervening the interest dimensions (i.e. interest conflicts)) as a means to build a more reflecting problem structure of a recruitment problem. Figure 6.22 presents some results of these attempts showing the intervening influence between interest dimensions. This triggered another A-R cycle to refine the POCM and its corresponding Onto-RPD for the purpose of enhancing the problem structure of a real-world recruitment problem.

Goal and Outcomes	Problem Concepts Mapped to the Goal through the Influence of applicant's interest	
	Type of Individual (Applicant): • ABB+ level applicant (by degree) • Non- ABB+ A level students (by degree) • Applicants from all domiciles in UK (by location) • Women are higher than men at all types of institutions (by gender)	**Structure:** • Course providers are spread everywhere (accessibility, alternativeness) • A large set of course opportunities in different universities (alternativeness) • Applicant-based choice to apply (flexibility) • Course providers are spread everywhere (accessibility, alternativeness) **Timing:** • A year-over timetable allows good management for unexpected events (availability) • Predefined deadlines to apply and reply (timeliness) • More time available to explore course options (availability) • Different timetables for applications with different tracks (availability, timeliness)
Fill vacancy • The highest number of placement recorded	**Information:** • Full access to information about providers, courses and entry requirements (adequacy, availability) • Clear recruitment activities (accuracy) • Full awareness of application transactions through Track scheme in case of unexpected events (accuracy) • Clear entry requirements (availability, accuracy) **Tools:** • Different modes of information delivery (accessibility) • UCAS is a technology platform for application (accessibility, usability,) Improved reach of UCAS services across social classes and centre types (accessibility)	**Process:** • Different tracks for application (Apply, Extra, and Clearing) with different timetables (Alternativeness, reliability) • High probability of high quality applicant (ABB+ or equivalent) being offered since they do not count towards the total number of places allocated (reliability, fairness) • Opportunities possible for non-ABB+ A level students (Alternativeness, fairness, resilience)) • Possible adjustment after exam results (Adjust service) (resilience) • Apply with 5 course options (Alternativeness) **Capital:** • Significant increases in the volume of applications incur additional costs (profitability) • Improved efficiency and cost savings using a centralized and fully controlled application service based on UCAS technology platform and systems provided (profitability) **Culture:** • Many applicants need to make decisions about higher education at least six months before they receive their results (values) No background-based selection actions (trust)

Table 6.8 Mapping the UCAS Problem Concepts to the 2nd POCM
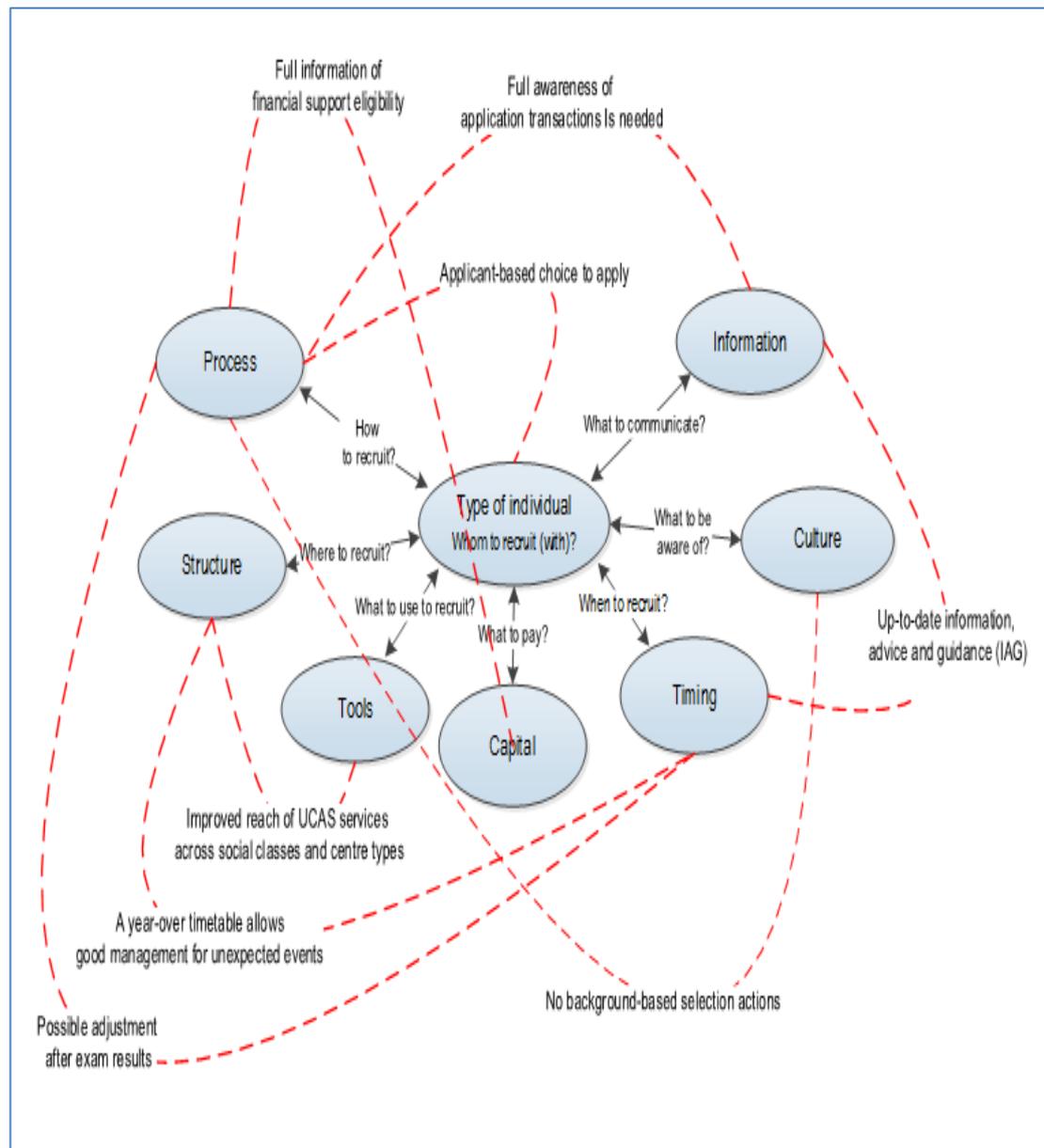
Figure 6.22 A View of Some Interventions between the Interest Dimensions of the 2nd POCM Captured from the UCAS Case Study

Figure 6.22 points up a concern related to the question: what type of problem structure can best represent a real-world recruitment problem is in light of these complex relations. To answer this question, the Author relied on these findings and started an extensive research to discover similar interventions between the root concepts using Dedoose. This required the Author to refer to the root concepts captured from the previous case studies from time to time to validate the emerging findings and refine the problem structure in every time of comparison. Appendix 12 shows some of these comparisons. After a number of A-R cycles, see Appendix 13, the 3rd

versions of POCM and Onto-RPD are produced. Figure 6.23 and 6.24 present these artefacts respectively.
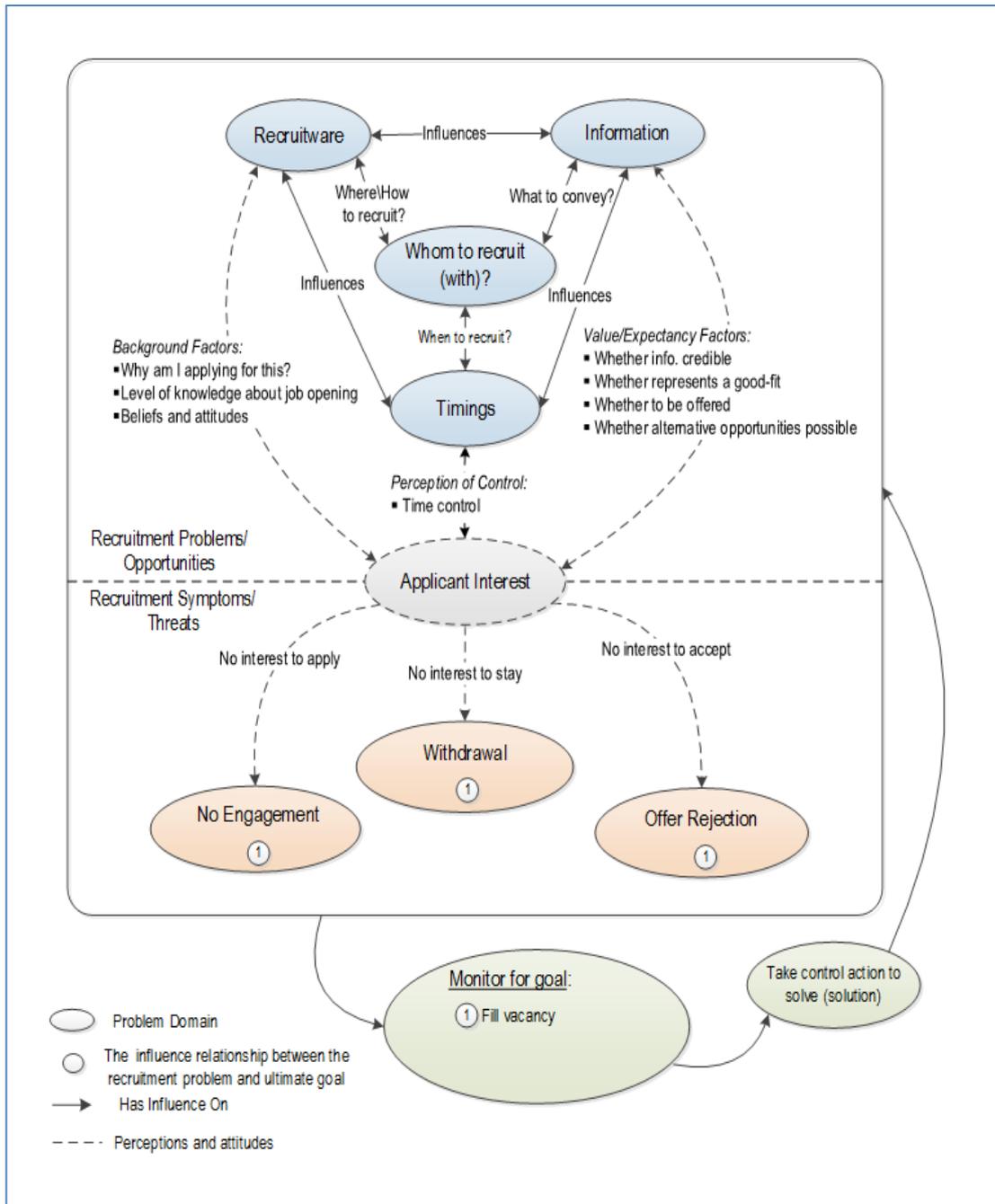
Figure 6.23 The 3rd Tentative POCM Artefact Produced from All Case Studies

Figure 6.24 The 3rd Tentative Onto-RPD

Category	SA Case Study	BA Case Study	UCAS Case Study
Recruitware-Information	Paper-based announcement restricts availability of information	Less visibility of armed forces needs much information be disclosed	Different tools with different modes of information delivery
Recruitware-Whom to recruit	Job locations are remote from local applicants.	We try to minimise the impact of mobility on applicants.	Improved reach of UCAS services across social classes
Recruitware-Timing	Hard to build a strong relationship in a short time.	Loss of timely support needed by other partners.	Possible adjustment after exam results (Adjust service).
Timing-Information	Less time to explore job opportunities.	Successive provision of job characteristics offered during recruitment process.	Up-to-date information, advice and guidance (IAG).
Whom to recruit-Information	High probability of being offered undesired job because of diversity considerations.	Some information that might persuade potential recruits to enlisting is not routinely volunteered.	Undesirable divide between those applicants who receive effective advice and those who do not.
Whom to recruit-Timing	Extra time must be available for remote applicants.	Ongoing marketing campaigns for different categories of applicant.	Predefined deadlines for different applicants to apply and reply.
Information-Interest	Only those who are well-informed about the army and its structure can predict the location of job	The terms of service are extremely confusing and subject to many probabilities	Clear entry requirements promote accurate expectation
Recruitware-Interest	Conceived interest in defending the country needs to be met by reliable enlisting practices	Negative publicity from Afghanistan and Iraq might not persuade potential recruits to enlisting	Apply with 5 course options
Timing-Interest	Post-result recruitment does not allow much time to decide	Career appeals progressively less as potential recruits grow into adulthood	Many applicants were happy with pre-result application (using predicted grades)

Table 6.9 Mapping Some Problem Concepts from Different Case Studies into the POCM

Terms	Definition
Accessibility	The quality or characteristic of someone or something that makes it possible to approach, enter, or use it.
Alternativeness	The quality of being able to give alternatives.
Applicant	A person who is being considered for a job at an organization.
Availability (Information)	A term that describes the quality of information being used as needed, when needed, where needed.
Availability (time)	A term that is used to describe the amount of time available for someone or something to act.
Behaviour	The action of a recruitment actor in a particular way.
Fairness	The quality of making judgments that are free from discrimination
Friendliness	The quality of someone or something being friendly.
Hardware	A general term that includes all physical elements (i.e. physical assets) used or produced by a recruitment actor that can be seen, touched, and controlled.
Humanware	A general term that includes all human-related aspects that describe a recruitment actor (e.g. capabilities, roles, responsibilities, relationships, etc.) and influence the use of hardware and software.
Industry	The people and activities involved in one type of business (Cambridge Dictionary)
Information	Described as a problem owned by all recruitment actors in which: their information revealed through controllable and non-controllable communication fail to/need to influence the others' interests assessed by a set of quality features (e.g. availability, adequacy, relevance, etc.) taking into account all influences of other problem domains. This problem domain can be referred to as *Communicated Identity*.
Intention	Something that you want and plan to do
Interest	Described as a problem owned by all recruitment actors in which: they perceive that recruitware, information, and timing fall short to influence the intentions to react positively assessed by a set of factors (e.g. value/expectancy and background factors). This problem domain can be referred to as *Conceived Identity.*
Market	A medium that allows buyers and sellers of a specific good or service to interact in order to facilitate an exchange. (Investopedia.com)
Mental Process	An activity related to the mind, or involves thinking.
Norm	the perceived social pressure to perform or not to perform the behaviour in question (Ajzen,1991)
Offer Rejection / Withdrawal / no engagement	Described as problem owned by all recruitment actors in which their behaviours/actions influence filling of vacancy. No engagement is when there is no action carried out by the actor; withdrawal is when the actor withdraw out of interaction); and rejection is when the actor send an actual rejection message to an offer.
Outcome	A result or effect of a situation. (Cambridge Dictionary)
Perception	How you interpret the world around you and make sense of it in your mind.
Performance Indicator	A quantifiable measure that a company uses to gauge or compare performance in terms of meeting their strategic and operational goals.
Problem Context	The area in which a problem exists.

Table 6.10 Definitions of Root Problem Concepts within the POCM and Onto-RPD Artefacts

Terms	Definition
Problem Domain	A way of considering or conceptualising problem.
Professionalism	A term describes the qualities, skills, competence and behaviours expected of individuals. (http://www.csp.org.uk/professional-union/professionalism/what-professionalism)
Profitability	The state or condition of yielding a financial profit or gain.
Quality Feature	A distinctive attribute or characteristic possessed by someone or something.
Recruitment	An enterprise system in which different players interact according to their interests to fill a job vacancy.
Recruitment Problem	A problematic situation with a recruitment practice regarded as undesired that needs to be defined to overcome.
Recruitware	Described as a problem owned by all recruitment actors in which: their current attributes, shaped by a number of elements (including humanware, software, and hardware), fail to/need to influence the others' interests assessed by a set of quality features (e.g. visibility, usability, fairness, etc.) taking into account the impact of the other problem domains. This problem domain can be referred to as *Actual Identity*.
Reliability	The ability of a system or component to perform its required functions under stated conditions for a specified period of time. (en.wikipedia.org/wiki/reliability)
Requirement	A statement that identifies a product or process operational, functional, or design characteristic or constraint, which is unambiguous, testable or measurable, and necessary for product or process acceptability (by consumers or internal quality assurance guidelines) (IEEE, 1998)
Resilience	The quality of being able to return quickly to a previous good condition after problems.
Responsiveness	A term describes the extent to which a person or organisation reacts quickly to something.
Solution	A means or action to solve a recruitment problem.
Software	A general term that includes all non-physical elements of a recruitment system (i.e. non-physical assets) that are used to operate the Hardware components such as instructions, procedures, policies, programs, etc.
Stage	A point, period, or step in a process or development.
Timing	Described as a problem owned by all recruitment actors in which: the timings of events fail to/need to influence the others' interests assessed by a set of quality features (e.g. availability, responsiveness, timeliness, etc.) taking into account all influences of other problem domains. This can be referred to as *Timed Identity.*
Transparency	The quality of being done in an open way without secrets.
Usability	The degree to which something is easy to use.
Visibility	The state of something being able to be seen.
Whom to recruit (with)	Described as a problem owned by all recruitment actors in which their decisions in regard to the optimum recruitment partner to recruit with to fill a specific vacancy influence/influenced by recruitware, information, and timing taken into account the external factors e.g. social, economic, political, technological, legal, and environmental.

Table 6.10 Definitions of Root Problem Concepts within the POCM and Onto-RPD Artefacts (Continued)

6.4 The Demonstration and Evaluation of POCM and Onto-RPD Artefacts

Given the design science method framework adopted in this thesis, the artefacts developed in phase 3 are demonstrated (phase 4) and evaluated (phase 5). In the demonstration phase, the POCM and its corresponding Onto-RPD artefacts are used in real-life cases to prove their feasibility. The evaluation phase is an important part to examine how well the POCM and Onto-RPD have contributed to address the practical problems explicated and whether they have achieved the defined requirements. The two phases are conducted using one focus group through two sessions. Figure 6.25 presents the research strategy and steps followed to demonstrate and evaluate the POCM and Onto-RPD artefacts.
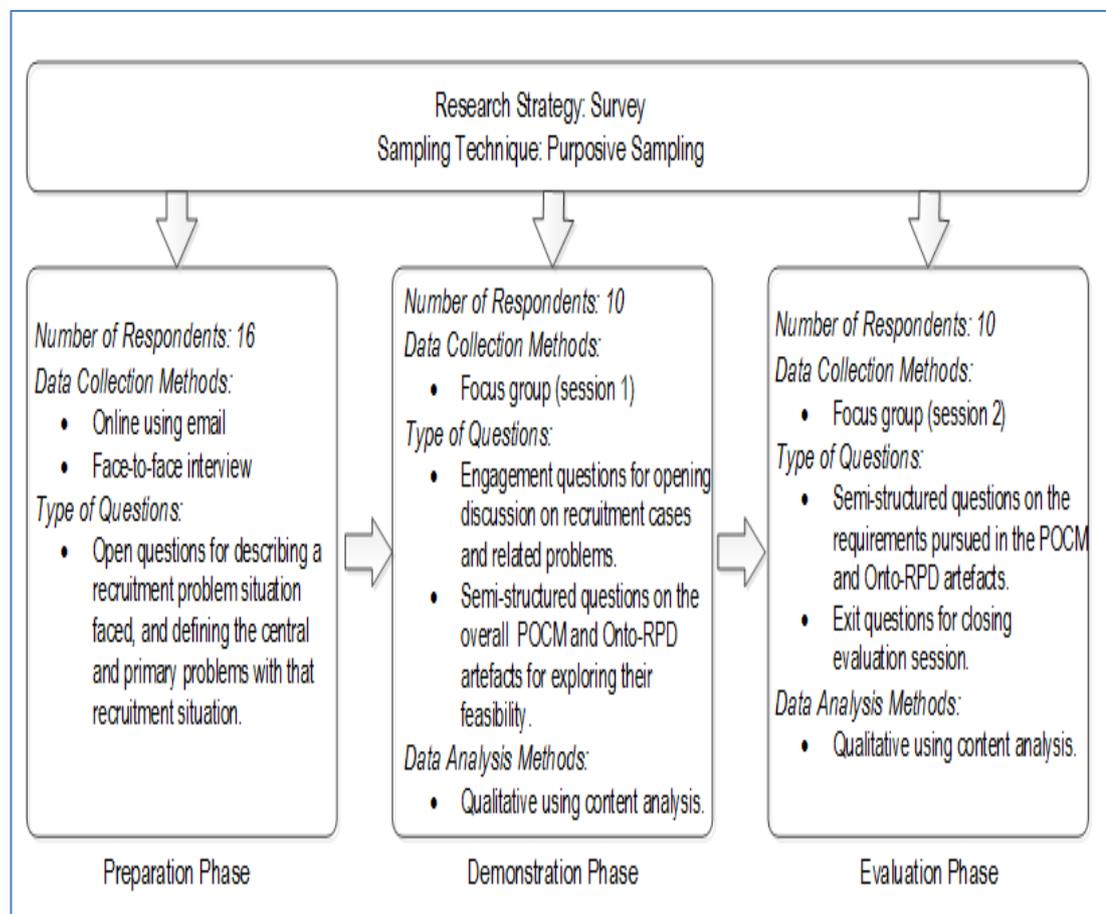
Figure 6.25 The Research Strategy and Steps Applied in the Demonstration and Evaluation of the POCM and Onto-RPD Artefacts

6.4.1   Research Strategy

The research strategy refers to a plan of actions designed to achieve the research goal. The research strategy used for demonstrating and evaluating the POCM and Onto-RPD is a survey. The reason for choosing survey as research strategy was to obtain a broad view of the opinions of academics as well as practitioners. Purposive sampling was meant to select participants in order to receive assessments and feedback from respondents with relevant knowledge and experience (Denscombe, 2014). Since the research centres on recruitment problems and their definitions, the participants were selected from recruitment domain (academic and practitioners). Given the diversity of subjects involved in a real-world recruitment situation, e.g. HR, school registration, marketing, management, sociology, psychology, etc.), the participants virtually cover most of these subjects.

6.4.2   Preparation Phase

The participants were selected from Bournemouth University (academic and practitioners). The choice of Bournemouth University was because of many reasons. First, it is a place where the most common types of recruitment are conducted, e.g. enrolment or registration of students; and HR recruitment (academic or practitioners). Second, it is a place where all recruitment-relevant stakeholders can be easily found in its departments such as HR, marketing, management, sociology, psychology, and business. Third, it provides much savings in time and cost, and ensures a close contact and coordination with potential participants. Hence, the participants were identified using BU staff database and an invitation poster based on the following conditions:

- The participant should have at least 3 years of recruitment-relevant experience.
- The participant should be either an academic expert (teaching staff or PhD students) or a practitioner.
- The participant should be either male or female.

At the beginning, the researcher designed a poster to invite as many as relevant participants (as shown in Appendix 14). The poster was supported with a chance of winning a 20 Pound voucher from Amazon. The poster was distributed through the boards around the public places at Bournemouth University. The purpose of the poster was to widen participation and gain access to those cannot be reached through the BU staff database.

The respondents to the poster were contacted via email to provide more information about their recruitment experience for the purpose of selection. The number of selected participants through the poster was 9 while the number of those selected through the BU staff database was 54. The total number of target participants was 63. The target participants were invited and sent a letter (as shown in Appendix 15) including some information about the researcher, goals and problems of the study, a request to participate in research and a consent form for participation in the study (as shown in Appendix 16). The response rate was low, (25%, 16 respondents out of 63). Appendix 17 presents the profile and demographics of those 16 participants.

The participants were contacted in this phase mainly using email. They were asked to do the following:

> *Based on your recruitment experience, write a short description of a recruitment problem situation you ever faced or were part of.*

Only four recruitment cases were reported. These cases were condensed and prepared for the study, see Table 6.11. These cases were, later, circulated to the other participants being asked the following:

> *Based on the recruitment cases provided, state or define the central or primary recruitment problems in each case.*

A range of definitional responses to each recruitment situation were collected using email and face-to-face interviews. These problem definitions are reported in Table 6.12.

Recruitment Cases Reported by Participants

Recruitment Case #1:

A company X, located in Southampton, had tapped out the local supply of talent. Given its need for software engineers and marketing professionals, the company first utilized job advertisements placed in the major cities located in the UK. The strategy proved ineffective. Thus, the company concluded that it might more effectively recruit by attempting to attract former residents to return home. In order to reach such talents, the company purchased a list of alumni from the high-ranking universities in UK.

Recruitment Case #2:

The General Pharmaceutical Council (GPhC) is the regulator for pharmacists, pharmacy technicians and pharmacy premises in UK. Its job is to protect, promote and maintain the health, safety and wellbeing of patients and the public who use pharmaceutical services in England, Scotland and Wales. Recently, the GPhC decided to recruit a newly established communications team of: the head of communications; corporate communication manager; digital manager; and media and public affairs manager. In order to recruit the whole team at the same time, the GPhC asked for consultation on how to ensure a workable interaction between the individuals of that team when hiring.

Recruitment Case #3:

The UCAS Board in 2012 asked for consultation and proposals for changing the admissions process for undergraduate courses in the UK. A number of proposals suggested a move into a post-results admissions model. The proponents of this model claimed that it provides key benefits such as being fairer for applicants than applying using predicted grades, and more effective and efficient for the HEIs to manage than complex handling of firm and insurance offers. After an extended review of these proposals, the UCAS Board did not support the post-results admissions model for many considerations. Rather, they supported the existing pre-results admissions model with many advanced technical services.

Recruitment Case # 4:

A recent research has been conducted on a UK-wide X company for improving sales and marketing strategies. The research concludes that changing the company itself into a critical attraction and retention force of professionals is the key driver of improved sales and marketing. This requires extraordinary steps into changing the way employees – from the key leaders on down to the entry-level – work in order to attract and retain the best talent. However, one key step claimed in this direction is to have recruiting culture in which recruitment and the need and responsibility for it shall permeate the entire organisation, not just the recruiting function in the HR department. This will serve as a "recruiting machine" and will ultimately lead to improving innovation in sales and marketing.

Table 6.11 Description of Recruitment Case Studies Used in the Study

Case Study	Problem Definitions Stated
Recruitment Case # 1	▪ *Southampton might not be the good place to live in.* ▪ *The location of advertisement is different in the in the two practices.* ▪ *The location of job is critical to job applicants.* ▪ *The advertisement tools in public might not be as same as in universities.* ▪ *New college graduates might be more willing to move than seniors.* ▪ *Individuals are different in their job choices based on geographical location.* ▪ *Targeted recruitment differs from general recruitment.* ▪ *Former residents in Southampton are more insightful into the location of job than others.* ▪ *Former residents might have more realistic job expectations.*
Recruitment Case # 2	▪ *Compatible culture, skills and experience between the members of team must be considered.* ▪ *A standard recruitment process to ensure post-hire cooperation and coordination is needed.* ▪ *A team-based assessment might ensure a workable interaction between individuals.* ▪ *Timing is critical for team-based assessment.*
Recruitment Case # 3	▪ *The applicant's need of information is very crucial in post-results.* ▪ *Different timetables for applications in pre-results paradigm to learn and decide.* ▪ *Delay and loss of teaching time in universities.* ▪ *Lack of time for HEI and applicant to build a strong relationship.* ▪ *Lack of school support over the summer.* ▪ *Insufficient time to prepare for entering HE* ▪ *Better match of applicant to course because of time available in pre-results paradigm.* ▪ *Many applicants are asked to make choices about what and where to study before they are fully ready.* ▪ *The post-results paradigm will eliminate the uncertainty results from reliance on predicted grades, firm and insurance choices.* ▪ *Clearing and recovery after the results posted lead to complexity and inefficiency.* ▪ *The motivational effect of conditional offers in pre-results paradigm.* ▪ *Compression of key admission activities, e.g. exams, which might negatively affect the quality of applicants.*
Recruitment Case # 4	▪ *Recruitment members are more than the individuals in HR department.* ▪ *The context in which recruitment is carried out is very important.* ▪ *The relationship between recruitment and organisational performance is evident.* ▪ *Attraction capability relates to shared knowledge, responsibilities, needs, objectives and others.* ▪ *Organisational culture plays a key role in recruitment.*

Table 6.12 Problem Definitions Stated by Participants to the Cases

6.4.3   Demonstration and Evaluation Phases

The two phases were planned to be conducted using the same participants of the preparation phase through two focus group meetings, one for each phase. Due to the difficulty to arrange these two separate meetings and get a consensus among all participants on the time and location of the two focus group meetings, the meetings were ultimately arranged in one focus group meeting on the same day at the same location. Thus, the meeting was divided into two sessions, one session for each phase. For this arrangement, the participants were contacted via email and the maximum number of participants agreed on the proposed time and location of focus group meeting was 10. The research activities and questions used in the focus group meeting (two sessions) were designed and revised with the research's supervision team. The templates used by the participants to answer the questions and writing down their comments were also designed. Appendix 18 shows the focus group leaflet including the purpose of focus group, the focus group phases and activities, the questions in each activity, and the templates prepared for the answers. A pilot test were also conducted with three recruitment-relevant PhD students from Bournemouth University to validate the focus group activities and questions, and to assess the time required in each session.

Subsequently, the 10 participants were sent a letter for meeting confirmation including some information about the time and location of meeting, the goals of each session, the materials used in the focus group meetings. Appendix 19 shows the letter sent to the participants. This letter was supplemented with the results of research related to "Phase 3: Design and Development of POCM and Onto-RPD Artefacts", see sections 6.2 and 6.3, that concern the following:

- The overall process used for building the POCM and Onto-RPD artefacts, Figure 6.2.
- The theme and recruitment definition based on which the POCM and Onto-RPD artefacts were developed, section 6.2.1.3 and 6.2.1.4.
- The methodological framework for building POCM and Onto-RPD artefacts, Figure 6.8.
- The activities during the focus group meetings (two sessions), see Appendix 18.
- The POCM and Onto-RPD artefacts, see Figure 6.23 and Figure 6.24.
- Some mappings of recruitment problem concepts from different case studies to the POCM artefact, see Table 6.9.
- The glossary of the concepts and sub-concepts in the POCM and Onto-RPD, see Table 6.10.

The purpose of this supplement was to help participants preparing for the focus group meeting and having their questions answered as early as possible.

At the time of focus group meeting, the researcher acted as a facilitator to guide discussion and ensure that the sessions progress smoothly, and that all the topics and questions are covered. The focus group meeting was run through two sessions with a number of key activities and questions to be answered, see Appendix 18, as follows:

6.4.3.1 Demonstration Session:

The purpose of this session was: (1) to demonstrate the POCM and Onto-RPD artefacts to the participants; (2) to ask the participants to apply the POCM and Onto-RPD artefacts to the recruitment cases described in the preparation phase; and (3) and to assess their feasibility by answering a set of semi-structured questions. Hence, the research activities in this session were presentation, engagement and exploration, and assessment. The last two activities (engagement/exploration and assessment) were recursively conducted on each case study described in Table 6.11. The activities involved:

- _Presentation:_ In this activity, the participants were first welcomed. Using the MS PowerPoint the researcher then presented: (1) the themes of research; (2) the artefacts to be evaluated; (3) the way by which this focus group research is conducted; (4) the way the research materials (templates) are used for answers and comments; and (5) the four recruitment case studies to be used in assessment.

- _Engagement and Exploration_: In this activity, the POCM and Onto-RPD artefacts were applied to the four recruitment case studies described earlier in the preparation phase. Each case study was treated individually, where a case was first presented along with the list of problem definitions stated by the participants in Table 6.12. Second, the participants were asked to elaborate on the problems stated in the case study (i.e. defining related potential problems) using the journalist's questions (e.g. what, why, where, when, who, which, and how), see Appendix 18. In the meantime, the participants were directed to the POCM and Ontology artefacts being asked to populate or relate their proposed problem definitions to the concepts on the artefacts, or reversely to use the artefacts' concepts for the knowledge retrieval and define new recruitment problems for the case at question.

- *Feasibility Assessment*: In this activity, the participants were given a set of semi-structured questions to assess the contributions of the POCM and Onto-RPD artefacts to the exploration of each case study. The questions were carefully designed to be somewhat related to the six requirements for which the artefacts will be evaluated in the evaluation session. The answers and comments on these questions would later serve during the evaluation session in many ways. One was that they would serve as prompts for the respondents during the discussion and overall evaluation of the artefacts. Second, they would serve as reference to help the researcher justifying the respondents' opinions during the data analysis of evaluation session. Third, they would serve being easy to analyse and relate them to the categories of requirements in the evaluation session. The questions were about the extent to which the artefacts can support the following:

  - Definition of key recruitment problem concepts embedded in a recruitment case study.
  - Inclusion and representation of many recruitment stakeholders' perspectives.
  - Capturing the complexity of the real-world problem situation (structure and relationships in each case study).
  - Better recruitment problem understanding and analysis towards solving recruitment problem.

For the answers of the abovementioned questions, the participants were encouraged to free talk, share and discuss their assessment notes with other group members, and finally write down their answers on the templates prepared for each question (see Appendix 20) including their comments and suggestions of either amendments, addition, or deletion.

6.4.3.2　Evaluation Session:

After the demonstration and assessment of POCM and Onto-RPD across each case study, the purpose of this session was to generally conclude and examine how well the POCM and Onto-RPD artefacts have addressed the practical problems explicated and whether they have achieved the defined set of requirements in section 3.4.2. Appendix 18 shows the list of requirements and their definitions against which the artefacts were assessed. The participants were asked to write down their comments on the overall contribution of the artefacts to the

requirements prescribed based on the results of application in the demonstration session. The participants were provided with templates for that purpose. These comments were openly discussed in a group in order to come up with new ideas and suggestions for improving the artefacts (see Appendix 20, the last part related to the templates and answers for artefacts evaluation).

6.4.4　Results of POCM and Onto-RPD Evaluation

The data obtained from the focus group sessions were analysed qualitatively through content analysis. To conduct the qualitative content analysis, the researcher started by selecting appropriate texts from the templates of the evaluation session, analysing the texts, verifying their relation to the requirements categories, comparing them to the results of application in demonstration session, and finally presenting them as benefits, drawbacks, or suggestions of change.

The result of the qualitative data analysis is presented below, including the benefits and drawbacks of the POCM and Onto-RPD artefacts, as well as the suggestions of changes to the artefacts.

6.4.4.1　Benefits of the POCM and Onto-RPD Artefacts

The benefits of the POCM and Onto-RPD that stated by the participants are listed in the Table 6.13.

Requirement	Description	Number of Responses	Examples of Citations
Comprehensive	The artefacts offer complete coverage of the knowledge in the recruitment problem domain	4	▪ *"It is impressive, I can say that your models are quite full".* ▪ *"I think you have listed the most important problem concepts that can be faced in a real-world recruitment problem".* ▪ *"It is complete and all problem categories and recruitment actors are relevant".*
Generic	The artefacts are shared and sector-independent	6	▪ *"I think the application of models to the various case studies in the last session has already justified this".* ▪ *"You addressed the entire picture of a recruitment problem including many stakeholders' perspectives and problem viewpoints…..There*

			is no odd concept or chance for any to be sector-specific".
Consistent	The artefacts have correct and accurate concepts compared to the exiting knowledge in the recruitment domain	3	▪ *"The terms in the artefacts are quite common".* ▪ *"The concepts and sub-concepts are correct and the classification is consistent'.*
Abstract	The artefacts represent a core set of primitives that can be instantiated in different levels	5	▪ *"I like the way you encapsulated the concepts of recruitment problem and relationships in your POCM model….. I think this is the best part of your work".* ▪ *"The representation of recruitment problem as interest conflicts between a wide range of recruitment actors through different types of identities can be mapped into different levels of analysis "* ▪ *"The core elements of the POCM can be instantiated in different abstraction levels".*
Perspicacious / Generative	The artefacts are easily understood and consistently applied by practitioners	5	▪ *"Many problem scenarios have been applied which makes it clear that the POCM and Onto-RPD are very effective in this part".* ▪ *"I can understand where the conflicts might happen".* ▪ *"Indeed, we know little about recruitment problem and the way we recruit was just a shot in the dark!……. such models are very helpful to understand and learn about the complexity of a recruitment problem and the size of work needed".* ▪ *"The POCM and Onto-RPD give insights into different problem aspects and relationships that might be trivialised by a stakeholder".*
Minimal	The artefacts contain the minimum number of objects.	3	▪ *"I think the models have covered the key aspects of a recruitment problem.*

Table 6.13 Benefits of POCM and Onto-RPD Artefacts

6.4.4.2 Drawbacks of the POCM and Onto-RPD Artefacts

The drawbacks of the POCM and Onto-RPD artefacts as stated by the participants are presented in the Table 6.14. The drawbacks are listed in reference to the requirements pursued.

Requirement	Relevant Drawback	Number of Responses	Examples of Citations
Comprehensive	Multiple artefacts for representation	1	▪ *"It is better to have one comprehensive model rather than a combination of two models… the POCM was little vague to me until I referred to the Onto-RPD and glossary"*.
Generic	Specificity is required	3	▪ *Some specificity is required especially with selection and interview processes".*
			▪ *"Information problem domain could be clearer with more specific attributes e.g. job attributes".*
			▪ *"The goal (fill vacancy) needs to be expanded where many stakeholders' goals may exist".*
Consistent	Uncommon Term	1	▪ *"The term of recruitware is new, it would be better to use more common one"*
Perspicacious / Generative	Complexity	1	▪ *"The POCM is too complex for a simple recruitment case"*
	Lack of formalism	1	▪ *"The artefacts are descriptive…. They need to be formal for a better insight into problem solving".*
	Lack of guidance to how to use the POCM and Onto-RPD	1	▪ *"Someone may need a set of guidelines to deal with the artefacts".*

Table 6.14 Drawbacks of the POCM and Onto-RPD Artefacts

As presented in Table 6.14, there are some drawbacks that were stated by the participants during the evaluation session. In regard to the multiplicity of artefacts, a real-world recruitment problem has various concepts and relationships that cannot be comprehensively represented in one reference model (Vergidis et al., 2008; Pedell et al., 2014). Given that the major focus of research was problem-oriented (i.e. definition and representation), the researcher developed a specific POCM for representing problem-related concepts and relationships, and then

supported it with a complementary ontology (Onto-RPD) for the definition of other domain-relevant concepts.

For the need of specificity, specificity is always in conflict with the requirement of *abstract (*which implies that concepts need to be generalised and instantiated over many levels of analysis. Hence, selection and interview concepts are specific and conducted by specific actor (e.g. examiner) that cannot be generalised and mapped into other enterprise actors. Similar is job attributes which are related to specific actors (e.g. recruiter and job provider). For the goal "fill vacancy", it is the way how the researcher defined the recruitment in this thesis. Based on that definition, recruitment was treated as a system (section 6.2.1.4) whose emergent property is its purposefulness or its ultimate outcome, filling a job vacancy. Thus, this goal was emergent while other stakeholders' goals were encapsulated in the POCM as problem-oriented concepts through which the stakeholders are interacting.

For the drawback related to consistency, the term 'recruitware' refers to the concepts: humanware, software, and hardware. These three concepts were used in recruitment domain, see Roe (2005). Hence, it is arguably suitable for coding these concepts with reference to the recruitment.

For the drawbacks related to perspicacity, complexity is a property of a real-world recruitment problem due to a set of cognitive, social and organisational variables included and the nature of their relationships (Barber, 1998; Breaugh and Starke, 2000; Breaugh, 2012). Hence, a good model for representation must encompass this complexity in some way to define a right problem to solve (Saks, 2005; Ployhart, 2006). This model shall not be formal, but of a qualitative nature to corresponds to the nature of a real-world recruitment problem. To make this model more generative, it needs to be integrative with many techniques to enable a complete knowledge of recruitment problem and derive solution. Hence, the drawback of "lack of guidance to use the POCM" will be addressed in chapter 7.

6.4.4.3 Suggested Changes to The POCM and Onto-RPD Artefacts

Some suggested changes proposed by the participants and the actions taken by the research are presented in Table 6.15. Each change proposed is linked to the intended artefact using brackets.

Change	No. of Resp's	Examples of Citations	Action Taken
Change "*applicant interest*" into "*interest*" on the POCM artefact. (POCM)	4	▪ "*Why, it is only applicant interest. This should be generalised to include different perspectives*".	Replaced by "interest" to address the interest of different stakeholders
The "*quality of filling*" is added into the goal of recruitment and a link between the concept of "*interest*" and this goal is mapped. (POCM)	2	▪ "*The problem concerns the quality of vacancy is not addressed*"	Addressed
Change "*offer rejection*" to "*rejection*" to address all recruitment interaction phases not only offering phase. (POCM)		▪ "*Rejection is more generic than offer rejection*"	Changed
Address the goal of recruitment on the Onto-RPD (Onto-RPD)	3	▪ "*The goal of recruitment on POCM has not been addressed on the Onto-RPD*"	The goal of recruitment is added into the Onto-RPD
Move "*reputation*" attribute from *software* category into *humanware* category (Onto-RPD)	2	▪ "*Reputation is more human-related element*"	Moved
Move "*culture*" attribute from *software* category into *humanware* one (Onto-RPD)	1	▪ "*I think culture should be within humanware elements*"	Moved
Change "*structure*" attribute into more specific one. (Onto-RPD)	1	▪ "*Structure element may refer to geographical sites, I don't think that it is completely human-related element*"	Structure is defined as "*the set of relationships between its members*" (Donaldson, 2012). Hence, it is replaced by "people" and "relationship" elements added into *humanware* category. However, a location aspect is covered within the *infrastructure* element in hardware category.
Add "*timeliness*" to the quality features in *timing* category. (Onto-RPD)	2	▪ *Timeliness is more expressive than responsiveness in conformance with the attributes comprising timing category*"	Added

Add "*need*" attribute to the *humanware* (onto-RPD)	1	▪ *"The element of "need" should be included into the model"*	Added
Remove "*capability*" from *Whom-to-recruit (Onto-RPD)*	2	▪ *"Capability is somewhat included within the identity"*	Removed
Remove "*solution*" concept and its ""*requirements*" on the Onto-RPD being irrelevant to the problem domain. (Onto-RPD)	1	▪ *"Solution and requirements concepts are in the solution space"*	Removed
Change the "*behaviour*" concept on the Onto-RPD as an output of the "*mental process*" instead of "intention". (Onto-RPD)	4	▪ *"recruitment problem arises from the interactions of individuals which relate to their behaviours not intention"*	▪ Move "behaviour" as an output of "mental process" ▪ Move "intention" as an input of "mental process" ▪ Link "symptoms /threats" to the "interest" in line with POCM.
Rename the relationship "*hasMultiple*" between "*recruitment problem*" and *Interests*" (Onto-RPD)	2	▪ *""hasMultiple does not reflect the nature of relationship between recruitment problem and interest"*	Renamed by "*influencedBy*"

Table 6.15 Suggested Changes to the POCM and Onto-RPD Artefacts

6.4.4.4 The Final POCM and Onto-RPD Artefacts after Evaluation

The actions undertaken in response to the changes suggested by the participants resulted in new POCM and Onto-RPD artefacts, as presented in Figure 6.26 and 6.27 respectively.
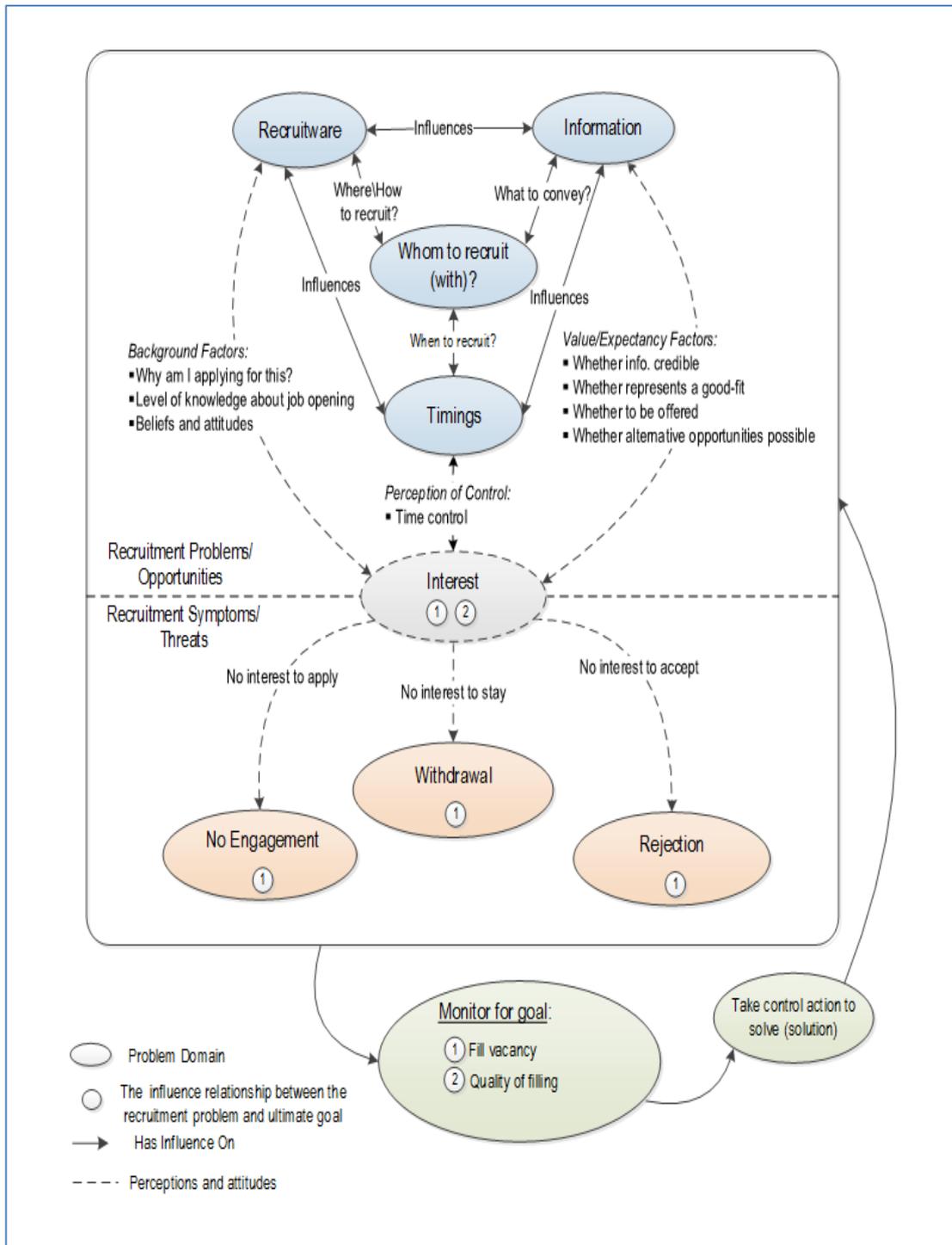
Figure 6.26 Final POCM Artefact

Figure 6.27 Final Onto-RPD Artefact

6.4.5   Limitations in Evaluation of POCM and Onto-RPD Artefacts

The evaluation research of POCM and onto-RPD faced some limitations. One was that the response rate to the study was low. Only 25%, 16 respondents out of 63, participated in the preparation phase. Only 10 out of 16 accepted to proceed to the other two phases (demonstration and evaluation). Second, the arrangement of two focus group sessions for the same participants was difficulty in consideration of time and place. Third, the variety of real-world recruitment problems cannot be encompassed in a sample of recruitment cases. Only four recruitment cases were used to test the applicability of POCM and Onto-RPD artefacts. This gave insight into the need to apply these artefacts to a large set of cases from different domains. Four, the incentives for participation were subject to BU's financial restrictions.

6.5 Summary

The chapter described the overall method by which the POCM and Onto-RPD artefacts were built and validated. A detailed description of the approach and the concepts used for building the two artefacts were presented. The demonstration and evaluation of the two artefacts was conducted. The results of evaluation including benefits, drawbacks, and suggestions of changes were provided, and the artefacts were adjusted based on the evaluation. The limitations of evaluation study were finally outlined.

Chapter 7: Problem-Informed Requirements Analysis Approach POCM-RAA

7.1 Introduction

In reference to the sub-problem no. 1.3 (lack of integrative RE process) explained in chapter 1 (section 1.2.1), this chapter will focus on how the POCM artefact developed can be used in concert with established techniques of RE to systematically transform recruitment problem domain knowledge into e-recruitment solution specifications. This will enable the realisation of value of e-recruitment. For this purpose, a detailed description of the approach called POCM-RAA by which the POCM artefact can be utilised towards requirement elicitation and analysis will be presented, and an example of applying POCM-RAA to a case study is provided.

7.2 A Framework of Integrating POCM and RE Process

The framework shows how the POCM can fit into the RE process for eliciting and reasoning about requirements from different perspectives. Figure 7.1 represents the fusion of the POCM with the RE process. The development community including requirements engineers and all stakeholders can carry out requirements analysis supported by POCM-informed guidance. The POCM delivers this guidance (i.e. knowledge) in a systematic way by using its problem viewpoints to structure the requirements elicitation and analysis.
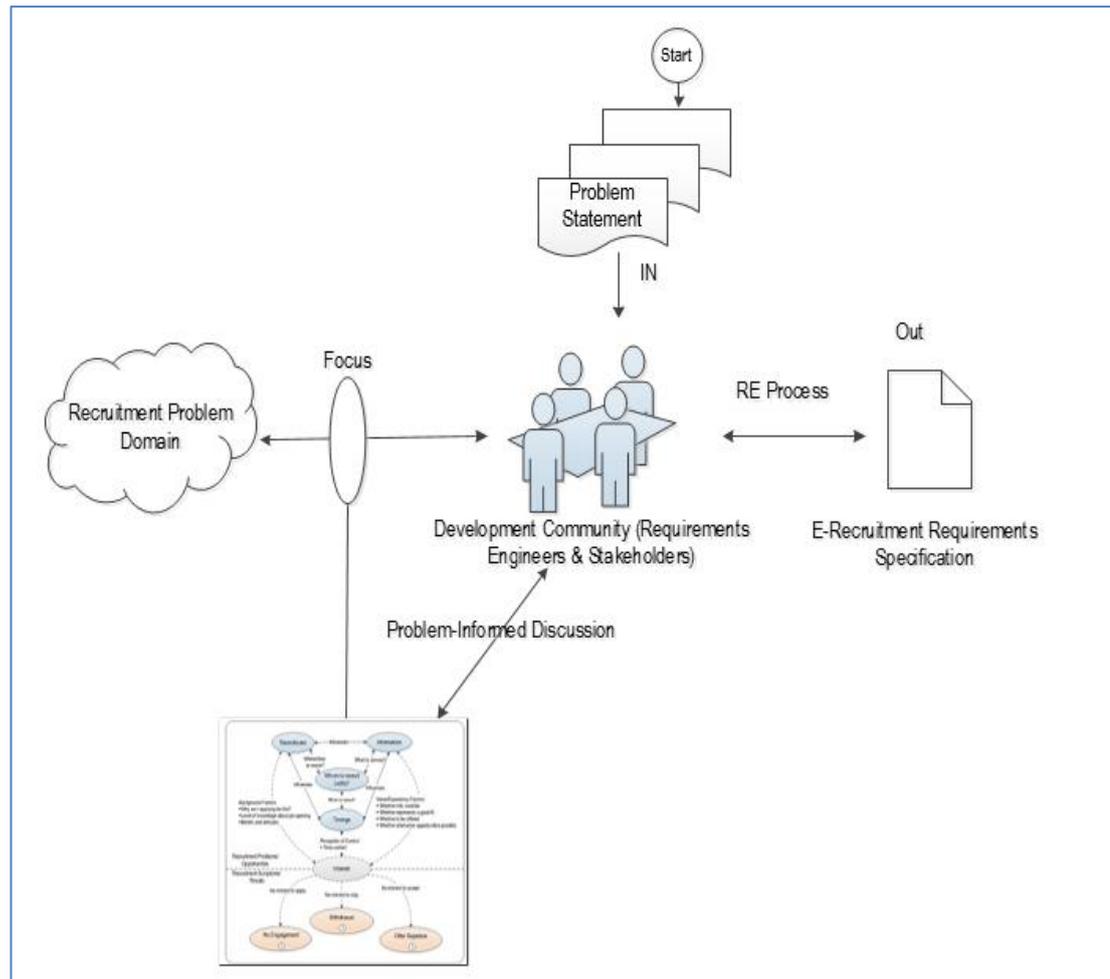
Figure 7.1 The Framework of Integrating POCM and RE Process

7.3 POCM-Requirements Analysis Approach (POCM-RAA)

A POCM-RAA is a four-phase process represented in Figure 7.2. These phases are: recruitment problem definition, early requirements definition, functional or behavioural requirements definition, and e-recruitment solution specifications. To enable these phases to move smoothly and systematically towards e-recruitment specifications, a number of modelling techniques within each phase will be used. In the next section, an illustration of the POCM-RAA phases for transforming recruitment problem domain knowledge towards e-recruitment specifications as well as the corresponding modelling techniques is provided.
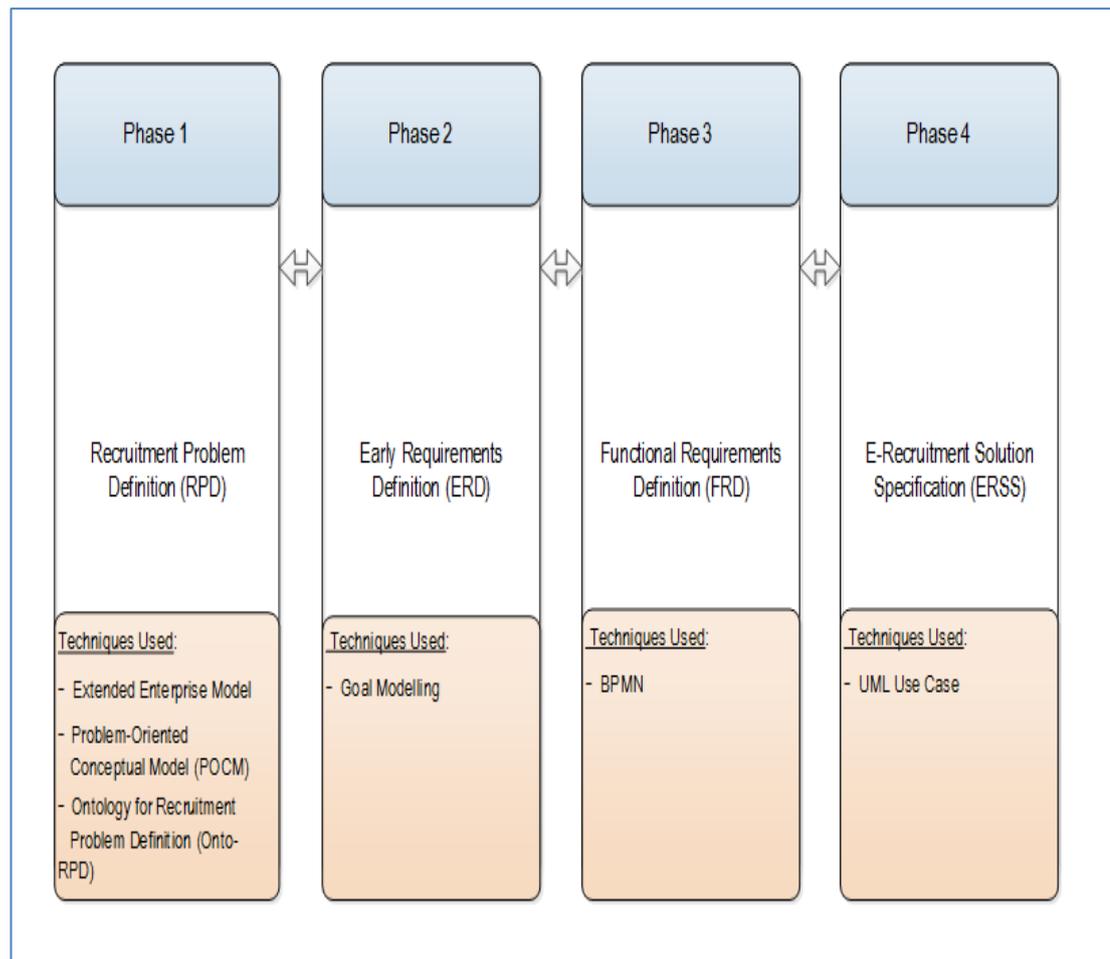
Figure 7.2 The Suggested POCM-RAA and its Phases

7.3.1   Phase 1: Recruitment Problem Definition

An e-recruitment solution is built to solve some kind of problem. Thus, it is the discovery of the problem to solve (i.e. the purpose of the e-solution) that is the basis of RE (Robertson and Robertson, 2012). Faced with the challenge in dealing with complex real-world recruitment problems, a number of activities are to be conducted for this purpose: (1) the identification of recruitment problem (A); (2) the elaboration of the problem situation and generation of recruitment problem domain knowledge (B and C); and (3) the scoping and definition of the recruitment problem to solve (D). These activities are depicted in Figure 7.3.
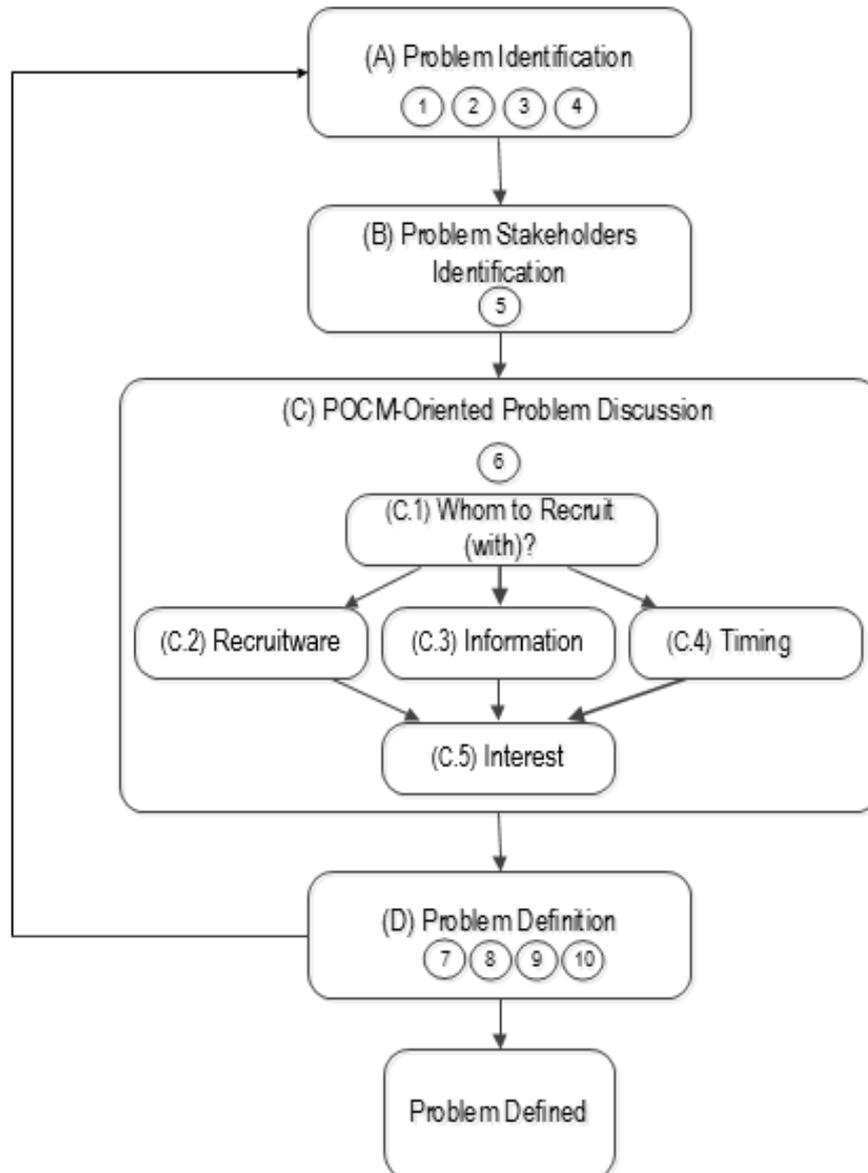
Figure 7.3 The Activities in Recruitment Problem Definition Phase

The activities in Figure 7.3 are supported by a number of questions (i.e. circled number from 1 until 10) to enable recruitment problem definition. Figure 7.4 gives insights into how these questions and their answers lead the POCM-informed discussion towards recruitment problem definition

1. What is the presenting recruitment problem or issue that arouse a concern? (statement of need)

2. Why does the problem need solving? (the goal of recruitment)

3. How can we solve the problem? (the purpose of change or product offered)

4. How does the problem manifest itself? (threats/symptoms: no engagement, withdrawal, or rejection)

5. Who are the problem stakeholders? (problem owners/ system engineers)

6. Where is the problem? (problem: interests' differentiation or fragmentation; or opportunity: new interests' integration)

7. Which problem needs to be solved? (problem frame, interest dimensions)

8. Who/what might prevent us from solving the problem? (external interests so extend scope)

9. Can the problem owners find the appropriate pair of shoes? (see the integration aspects of interests from different perspectives)

10. How much shall we tackle? (project time and cost constraints)

Figure 7.4 The POCM-Informed Discussion Guidelines

In the following sections, the guidelines of how the activities of recruitment problem definition phase are conducted are explained and elaborated into questions to drive the analysis:

A. Problem Identification

A problem starts from a vague position (Hull et al., 2010). It starts often from the statement of need. It could be expressed verbally, or written as a simple document showing that there is a problem or concern for which a solution is needed. This statement(s) is more likely to contain woolly expressions such as problems or symptoms mixed with descriptive information. Hence, the challenge is to untangle this statement of need and specify the problem in a form that reflects someone's concern from a concrete and operational sense (Smith, 1989). One form is to specify a problem as an existing state-desired state gap (Nuseibah and Easterbrook, 2000). Others suggest that the problem should be specified as purpose, advantage, and measurement (PAM) (Robertson and Robertson, 2012). In any form used to identify the problem, the evidence indicating existence of the gap or supporting the purpose and advantage pursued must be specified. However, since the desired state has no physical evidence, it is important to avoid a bias towards overt, quantified performance measures. Evidence specification can include known facts about the current problem and symptoms, or assumptions about the opportunities and potential problems (threats) in response to trends and likely future states.

In terms of recruitment problem, the POCM contributes to the problem identification by addressing the questions 1, 2, 3, and 4 on Figure 7.4. For PAM, as an example, the POCM addresses *P* as to influence someone's interest or a set of people interests; *A* as to fill a vacancy; and *M* as the quality of filling (e.g. the quality of interests or strength of interest influences). Figure 7.5 shows the way the recruitment problem is identified using the concept of interest. Given that the identification of recruitment problem starts with the statement of need as specified earlier, this POCM posits that the statement should be interpreted as an existing/potential conflict between different interests (across interest dimensions) that needs to be resolved (i.e. re-influencing interests towards a new state of integration or stabilisation). This integration will reflect in filling a vacancy (i.e. the goal of recruitment) and determines the quality of filling.
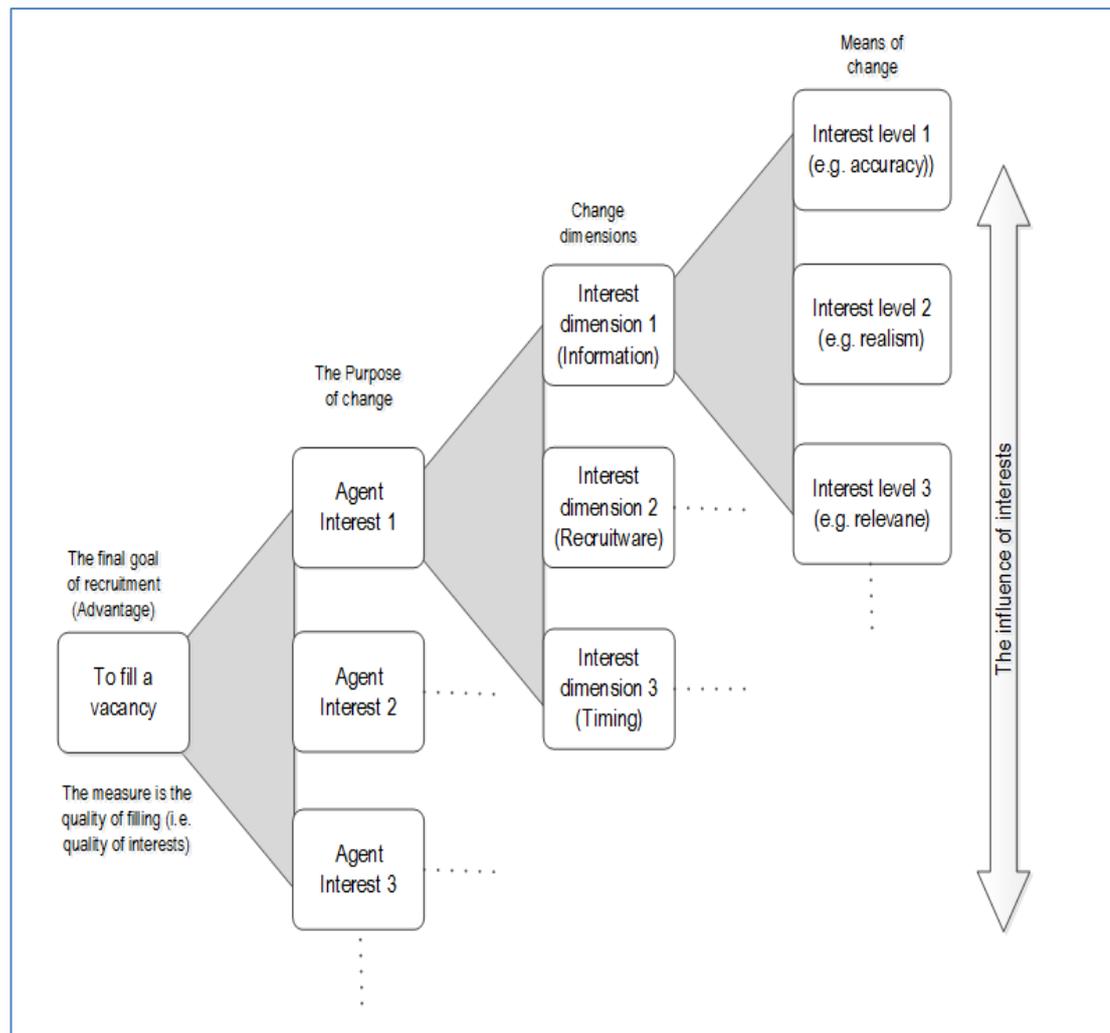
Figure 7.5 The Identification of Recruitment Problem Using the Concept of Interest

B. Identification of Relevant Problem Stakeholders

A stakeholder can be any person or organisation that has an opinion, a responsibility for, or who may be influenced or affected by the proposed product (Hull et al., 2010). The types of stakeholders vary according to some considerations, e.g. the type of business or product, the type and size of project, and so on. Given that the focus of thesis is on enterprise recruitment, the enterprise can be approached from different levels or perspectives. Graves (2009) defines four levels of enterprise containing the key stakeholder categories in each level. These are shown in Figure 7.6.
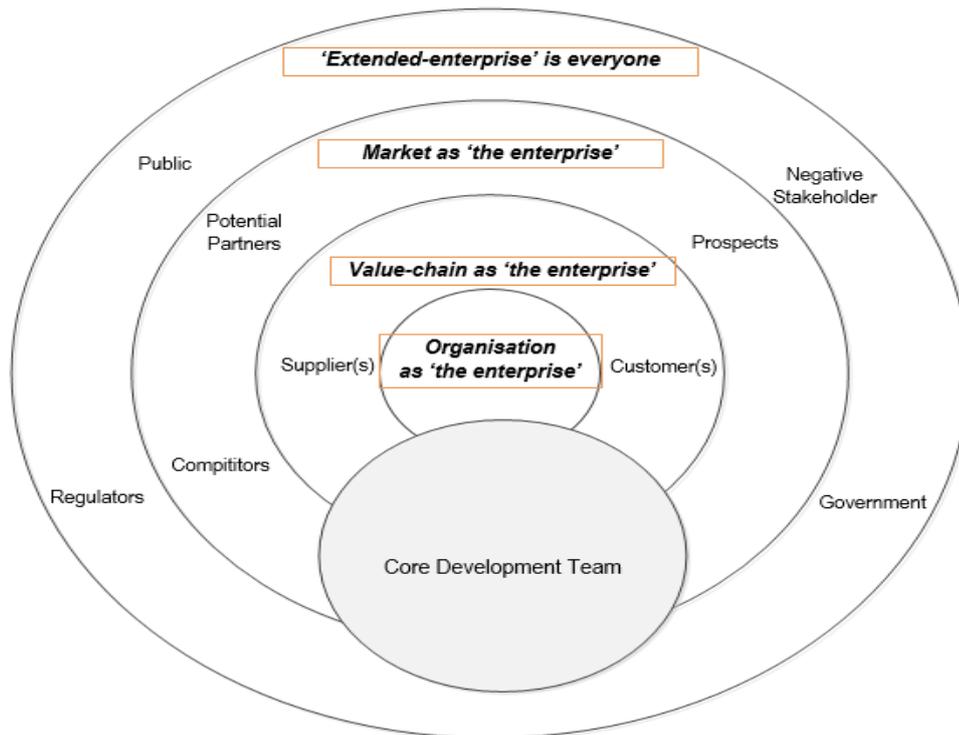
Figure 7.6 The levels of Enterprise with Relevant Stakeholders (Graves, 2009)

According to Graves (2009), 'organisation as the enterprise' is the common view of enterprise. In this view, an organisation is bounded by rules. However, in the 'value-chain as the enterprise' view the boundaries between the organisation, suppliers and customers may be partly porous. Hence, rules may not be applied but they are connected through the shared aims and goals to offer a product and/or a service to the market (Chen et al., 2008). In the view "market as the enterprise' the organisation connects to the prospects and market via the vision. Therefore, the enterprise is bounded by the shared commitment to the vision. Finally, the 'extended enterprise' view contains all stakeholders in the broader ecosystem including public, government, regulatory authorities, and negative stakeholders (non- or anti-clients). The stakeholders in the view of 'extended enterprise is everyone' are connected via values.

Given the enterprise perspectives of recruitment, the key players that derived from the analysis of the three case studies in chapter 6 and defined in the Onto-RPD will be populated into the Graves's enterprise model. This is done in Figure 7.7. This population will help in understanding the ways in which the recruitment enterprise can be addressed and demarcating the scope of a recruitment problem. Back to Figure 7.4, the identification of stakeholders starts from the initiator of a recruitment problem (i.e. client) as a key problem owner (Checkland and Poulter, 2010).

From this, the list of stakeholders will be identified as the recruitment problem situation is elaborated.
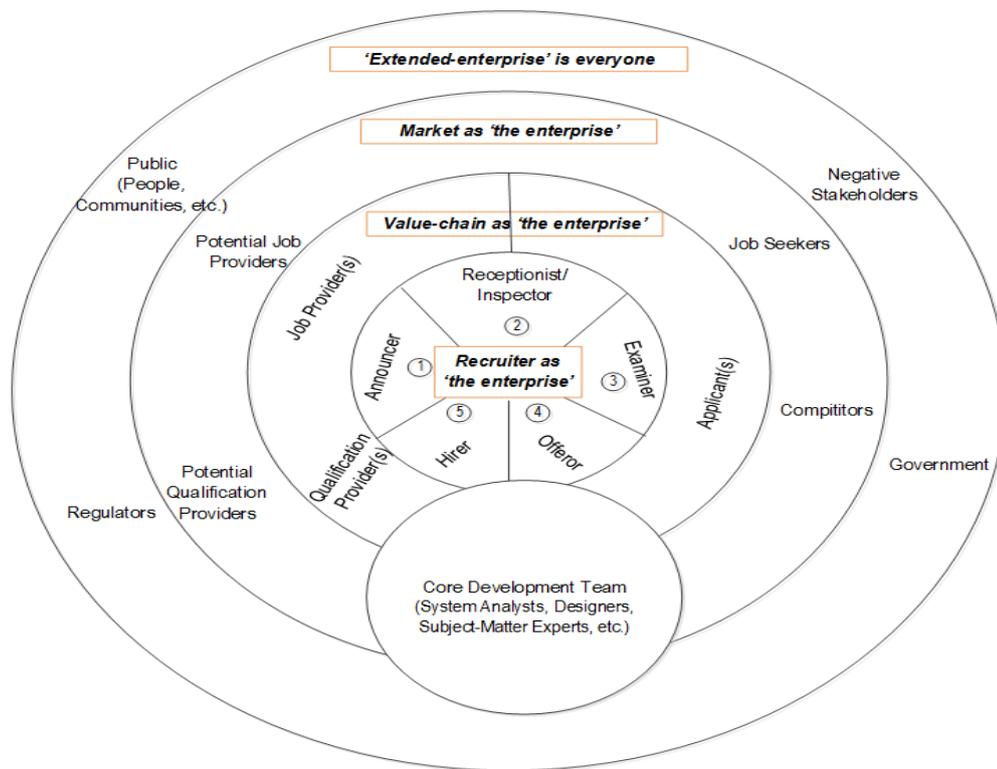
Figure 7.7 The levels of Enterprise Recruitment with the Top-Level View of Stakeholders (Based on (Graves, 2009))

C. POCM-Oriented Problem Discussion

The POCM consists of problem viewpoints, each of which is a partial analysis of the problem situation as seen from a particular stakeholder perspective. Reconciling and integrating the separate viewpoints leads to a complete analysis of a recruitment problem. In this activity of recruitment problem definition, a number of questions to apply across all problem viewpoints and their features included in the Onto-RPD are provided. These questions are derived from the recruitment-related literature as well as the results of analysis (i.e. texts extracted from the three case studies) in chapter 6. These questions are not checklist items that must be responded to, but are proposed as guidance for analysts to sensitise them to the features of the problem situation. These questions are to be asked to each relevant stakeholder to collect information about the problem situation. Driven by the problem identified earlier (e.g. PAM), the use of this list of questions will generate knowledge and drive stakeholders negotiation towards a comprehensive working problem definition. Table 7.1 presents the list of questions.

Activity No.	Activity	Relevant Features	Guidelines and Questions
1.	Statement of need		▪ A problem starts from a vague position. ▪ It can be stated by any agent in enterprise recruitment. ▪ It is likely to contain woolly expressions of need mixed with descriptive information. ▪ Untangle the statement according activity 2 and 3.
2 and 3	Identify the client and the problem as PAM		▪ Start with problem owner A as the client (the perceiver of problem). ▪ P (the purpose of project) is to influence an interest or a set of interests (e.g. problem owner B) ▪ A (the advantage of P) is to fill a vacancy. ▪ M (the measure of A) is the quality of vacancy filling (the quality of interest(s)).
4.	Collect evidence How does the problem manifest itself?	▪ Existing conflict of interests (i.e. interests differentiation or fragmentation)	▪ The problem is ex-poste perception and interpreted as "undesirable state, failure, difficulty, or lack of" ▪ Find the symptoms of interest conflict as: "No engagement, withdrawal, or rejection" and related consequences such as time and cost ▪ Perceptions of the other agent's dissatisfaction (sometimes called conceived identity). ▪ Trace the symptoms using Root Cause Analysis to find mismatch between the conceived identity (i.e. image) and the current interest dimensions (recruitware (actual identity), information (communicated Identity), timing (timed identity), and whom to recruit (with). ▪ Use questions in Activity 6 and 7 for guidance. ▪ Extend the scope of analysis if possible (Activity 8)
		▪ Potential conflict of interests	▪ Potential conflict emerges when an external event in environment occurred so a response to it is necessary (e.g. new technology to take advantage of) ▪ The response will change the state of balance between interests. ▪ The problem is ex-ante perception and interpreted as "the need to, or what to do) ▪ Find the potential conflict between the two agents' interests, and find new integration aspects. ▪ Assess the threats and consequences of change. ▪ Use the questions in Activity 6 & 7 for guidance, and Activity (8) to extend scope of analysis
5.	Relevant stakeholders		▪ Any relevant problem owner including the client ▪ Requirements engineers, analysts, etc.

Table 7.1 Recruitment Problem Viewpoints Questions

Where/what is the problem?
(The essence of problem causing the existing or potential conflict of interests)

#	Viewpoint	Dimension	Questions
6	Whom to recruit (with)?		▪ Who is the other agent(s) in interaction? (This starts from individuals and extends to a group of individuals or an organisation as a whole) ▪ Use a model that represents the interactions with the agents based on the stakeholder map in Figure 7.7. ▪ The agents can be multiple of the same stakeholder category (i.e. applicant, recruiter, job provider, etc.)
	Interest (conceived identity) ▪ What are the perceptions (image) held by the other agent(s) about us? ▪ What are the desires of the other agent(s) to be influenced? ▪ Which agent groups' perceptions are most important?	▪ The perceptions and desires of each applicant group will be matched to each interest dimension.	▪ What are the perceptions/desires about recruitware? ▪ What are the perceptions/desires about information? ▪ What are the perceptions/desires about timing?
6_1	Information (Communicated Identity) ▪ What type of information are communicated? ▪ What type of information do the interacting party look for? ▪ What type of information can be provided to influence the other party's interest? ▪ Refer to the features comprising the Onto-RPD's information dimension to assess their qualities.	Adequacy	▪ Are the information adequate for the agent to assess and decide to interact or not?
		Availability	▪ Are the information available for the agent to access 7/24? ▪ Are the information sensitive so availability is restricted? ▪ Are the information provided via verbal or written cues?
		Accuracy	▪ Are the information accurate so cannot be misunderstood by the agent? ▪ Does the information allow realistic expectations?
		Realism	▪ Does the information reflect the actual reality (i.e. actual identity)? ▪ Can the information be credible?
		Relevance	▪ Does the information relate to the matter in question? ▪ Are the information personally relevant?

Table 7.1 Recruitment Problem Viewpoints Questions (continued)

		Category	Questions
6.2	Recruitware (Actual Identity) • What type of Software features do the agent have? (refer to the software features in the Onto-RPD) • What type of Hardware features do the agent have? (refer to the hardware features in the Onto-RPD) • What type of Humanware features do the agent have? (refer to the human features in the Onto-RPD)	Accessibility	• How far/easy are the recruitware to access? • Shall the recruitware be made accessible by the agent?
		Usability	• To what extent the recruitware are easy to use or deal with? • To what extent the recruitware are quick to learn about/from? • To what extent the recruitware are helpful to remember what and how to do things? • To what extent the recruitware are making positive experience?
		Reliability	• Are the recruitware able to function for a specified time at a specified condition? • How often do the recruitware fail/go down?
		Resilience	• To what extent the recruitware are able to recover when something fails? • To what extent the recruitware are able to cope and adapt in order to prevent failure?
		Friendliness	• To what extent the recruitware are agent friendly?
		Alternativeness	• To what extent the recruitware are able to offer alternative choices?
		Professionalism	• To what extent the recruitware are communicating effectively? • To what extent the recruitware are culture-sensitive? • To what extent the recruitware are in good appearance? • Do the recruitware seem team-oriented? • Do the recruitware seem responsible?
		Visibility	• To what extent the recruitware are publicly visible?
		Familiarity	• Are the recruitware experienced first-hand or second-hand? • Are the recruitware in a close relationship with the interacting agent?
		Fairness	• Do the recruitware treat people equally? • Do the recruitware have rules against bias? • Do the recruitware enable someone's rights to be heard? • Do the recruitware enable equal opportunities?
		Transparency	• To what extent the recruitware are open to the public?
		Profitability	• To what extent the recruitware offer a value to the agent?

Table 7.1 Recruitment Problem Viewpoints Questions (continued)

6.3	Timing (Timed Identity) ▪ In what events the interaction does take place? ▪ How long does the interaction take?	Availability	▪ How long is the length of interaction? ▪ Does the time suffice for the agent to decide and act? ▪ Are there different time periods for agent to engage?
		Timeliness	▪ Does the event of interaction happen in a fixed time? ▪ Is the moment of interaction critical/sensitive? ▪ Can delay be tolerant? ▪ Can the event of interaction be changed into different times? ▪ To what extent the change of event influence the interacting agent's perception and desires, recruitware and information
7	Problem Definition	▪ Comparison between interest dimensions ▪ Finding the imbalance aspects between interest dimensions	▪ Are the interest dimensions (whom to recruit (with); recruitware (actual identity); information (communicated identity); and timing (timed identity in congruence with the perceptions and desires (conceived identity)? ▪ Where is the incongruence aspects? In which interest dimensions does the incongruence reside? (problem frame) ▪ What are the most important interest dimensions and features that can be addressed/adjusted to resolve incongruence? ▪ Who could prevent the current interest dimensions to be adjusted? ▪ What are the external interests (other relevant stakeholders) that impede the resolution of incongruence? ▪ What are the project constraints that prevent enlarging the scope and involving other relevant stakeholders?

Table 7.1 Recruitment Problem Viewpoints Questions (continued)

D. Problem Definition

After the recruitment problem has been elaborated using POCM-informed discussion (questions 6.1, 6.2, and 6.3 in Table 7.1), it is time for the real problem to be discovered and defined (question 7-10 in Table 7.1). Having recognised that this activity is the basis of RE (Robertson and Robertson, 2012), it includes setting the boundary of the problem; selecting the type of recruitment problem, i.e. problem frame (Jackson, 2001); and identifying the difficulties and constraints localised in each sub-problem of the problem frame. This definition of recruitment problem needs to be agreed on as the right problem to solve towards the PAM earlier identified. In case of disagreement, a return to the earlier activity (i.e. problem identification) is needed to collect new evidence and information.

7.3.2　Phase 2: Early Requirements Definition (ERD)

The ERD is used to derive any requirements to be imposed by the suggested system (Fouad et al., 2011). Goal modelling (GM) is a widely used technique during the early phases of RE (Kavakli, 2004). It offers modelling concepts to represent the rationale of actors in a real-world problem through notions like goals, soft goals, decomposition, actors and their interaction (Castro et al., 2002). Back to the phase 1, the problem frame (i.e. type) defined distinguishes a problem context with particular problematic issues and relationships. This frame will affect subsequent management actions (i.e. policies) to handle this type of problem. Hence, the key activity in this phase is to capture and model these early requirements (managerial means) to solve the type of the defined recruitment problem.

7.3.3　Phase 3: Functional Requirements Definition (FRD)

In this phase, the early requirements (policies) impose a course of functional or behavioural actions (i.e. a way of how to tackle a type of problem). Thus, the functional or behavioural requirements are derived and modelled based on the ERD. To do this, BPMN, as a standard business process model, is used to highlight the specific functional requirements and the behaviour of the involved recruitment process. It has been claimed that BPMN supports both business and IT people thereby supporting migration from business to software specification.

7.3.4   Phase 4: E-Recruitment Solution Specification (ERSS)

Software system specification is defined by the boundary between business and hardware/software machine (Bray, 2002). This boundary distinguishes those functions required by the machine (i.e. machine behaviour) from those that are not; and are derived from the FRD. To capture the ERSS, the UML Use Case diagram is a common approach to specification in RE. It is used by the software engineering community to capture, model and validate software specifications (Stevens and Pooley 2000; Robertson and Robertson, 2012). Hence, it will be used in this phase to capture and model the ERSS.

7.4 Running Example: Post-School Results Enlistment in the SA

Given the large size and complexity of the SA enlistment case study that have been addressed within the previous chapters of this thesis, the application of the POCM-RAA will not address the SA enlistment problem as a whole. However, a key part of it will be addressed to show the applicability of the POCM-RAA. This is post-school results enlistment problem. The work on the post-school results enlistment problem will undergo the four phases of the POCM-RAA (RPD, ERD, FRD, and ERSS) to enable the value of e-recruitment solution to be realised in a systematic way. The modelling techniques that are suggested within each phase will be also applied and the resulting models will be produced as deliverables. To do this, the author will be acting as a system engineer while the previous *WhatsApp's SA* stakeholders group used in chapter 6 to develop the artefacts, see Appendix 3, will be recalled for participation.

7.4.1 Recruitment Problem Definition (RPD)

As stated earlier, a recruitment problem starts with the statement(s) of need. There are a set of needs that were stated in the case of the SA enlistment problem. The e-vision of the SA enlistment project that informally stated by the SA's Commander was: "*a reliable e-enlistment solution that enables the SA in filling its vacancies on a timely basis by highly qualified and regionally diversified recruits is needed*" (Secureland Army, 2013b). This statement was debated by a number of principal stakeholders in the SA. For instance, the SA's Head of HR raised an issue saying "*we recruit in a different environment and attract different categories of people compared to the other sectors" (*Secureland Army, 2011b*). He added "*the assumption that the SA can get a competitive advantage over rivals from e-enlistment is doubtful".* On the other hand, some Corps' HR and military schools claimed that competing for highly qualified applicants is possible. However, they raised an issue saying "*it is the regional diversity imposed*

by the SA that impedes enlistment of highly qualified applicants". Given this range of conflicts between those key recruitment stakeholders of the SA, the activities of RPD and the guidelines suggested in Figure 7.3 and 7.4 will be applied to define the problem of the SA's enlistment.

7.4.1.1. Recruitment Problem Identification

The initial analysis of the SA Commander's statement of need showed that the statement asks for a solution (e-recruitment solution), while it does not really state what the real problem is. The feedback from the lower levels of SA (e.g. HR managers and military schools) gave insights into some aspects from the problem. However, until the real problem is completely understood, there is little point in thinking about solutions (Robertson and Robertson, 2012). For this purpose, the set of statements of need will be analysed and the problem will be specified in a form that reflects the SA Commander's concern from a concrete and operational sense. The questions from 1-4 in Table 7.1 are to be used for analysis. The results based on these questions are listed in Table 7.2.

Activity No.	Activity	Results of Analysis
1.	Statement(s) of need	▪ The statements are offered by the SA principal recruitment actors in different levels including individuals (recruiting staff), military schools, corps, and the SA command. ▪ Those organisational actors carry out the role of the *recruiter* (i.e. recruiting organisation) with particular individual interests. ▪ Those interests can be influenced by the control of the SA command. ▪ They can be dealt with as one organisational entity's interest (recruiter interest). ▪ The elaboration of the SA enlistment problem involves finding the existing interests conflict (across the interest dimensions) between the SA as a recruiting organisation and other relevant stakeholders.
2 and 3	Identify the recruitment problem as PAM	▪ Purpose: to find the conflict in stakeholders' interests and re-influence these interests towards a new sate of balance based on the boundary of the problem. ▪ Advantage: to fill a vacancy and increase the quality of filling (timing; KSAs; and diversity). ▪ Measurement: no. of vacancies filled; no. of withdrawals; no. of offer rejection; the avg. of recruits' KSAs; regional diversity of recruits; time; and cost.
4.	Collect evidence	▪ Refer to Chapter 5 "explicating the problem in the SA enlistment project". ▪ There is a bundle of information that can be used as evidence of change.

Table 7.2 The Answers of Problem Identification Questions Relevant to the SA Enlistment

7.4.1.2. The Development and Elaboration of the SA Enlistment Problem

In this section, the most relevant stakeholders in the SA enlistment problem are identified and mapped to the Graves's model in Figure 7.7. The mappings are presented in Figure 7.8. Given the Graves's model focuses on the abstract view of stakeholders (i.e. roles rather than actual actors), Figure 7.7 does the same by addressing the recruitment roles that can be played by many actors ranging from the individuals in the operational level to the ones in the strategic level. To make it simple, Figure 7.8 selects from the list of actors for each role the most important ones (e.g. military school is selected as the most important actor for the *recruiter* role). This is not to neglect the importance of other actors in each level, but to set a starting point from which the other actors in different levels of control can be addressed.
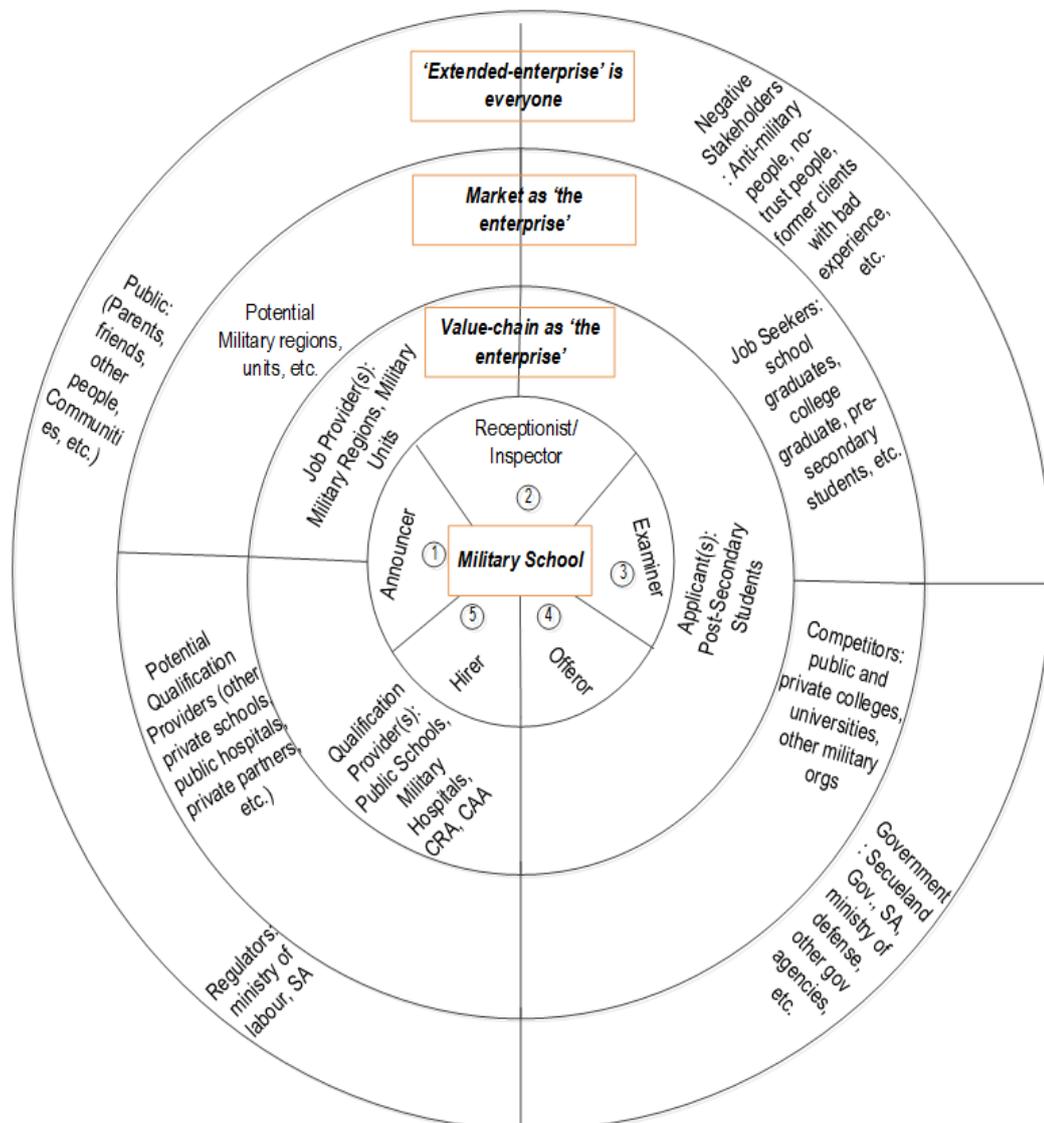
Figure 7.8 The Key Recruitment Players in the SA Enlistment Case Study (According to (Graves, 2009))

The stakeholder map in Figure 7.8 and the POCM will be together applied to the SA enlistment problem to elaborate the problem and capture the relevant knowledge of it from different perspectives. The Author, as a system engineer, will use the POCM (i.e. viewpoint-based questions and guidelines in Table 7.1) to organise discussion between all stakeholders and retrieve their memorial problem domain knowledge by linking it to the PAM. Some results of using the POCM in developing the knowledge domain of the SA enlistment problem from the recruiter perspective are presented in Table 7.3. For more results about the application of POCM to other stakeholders, please refer to the Appendix 21.

The different stakeholders' perspectives on the enlistment problem using POCM:
The enlistment problem analysis from the recruiter's perspective.

Activity No.	Activity	Relevant Features	Guidelines and Questions
1.	Whom to recruit (with)?	• What type of individuals or groups of individuals are we recruiting with?	• Using the conversation model, the key interacting agents with the recruiter (military school) are: ➤ Applicants (post-secondary school students from different regions) ➤ Job providers (military units) ➤ Qualification providers (public schools, military hospitals, CRAs, CAAs, and etc.)
		Interaction with Applicant	
2.	What is the problem? (Existing or potential conflict of interests)	• Existing/potential conflict of interests (i.e. interests differentiation or fragmentation)	• The symptoms of the problem (signs of problem or existing conflict) are: ➤ Avg. of withdrawals (54.43%), and avg. of process time (52 weeks). ➤ Quality of vacancy filling: avg. of KSAs (72%.34) and avg. of regional diversity (53.45%). • The existing conflict might develop in light of seasonal market (post-school results recruitment) and results in: ➤ Loss competition for high KSAs; less applications submitted; increased withdrawals. ➤ Increased cost and time.
3.	Interest (conceived identity) • What are the perceptions held by applicant(s) about us? • What are the desires of applicant(s) to be influenced? • Which applicant groups' perceptions are most important?	• The perceptions and desires of each applicant group will be related to each interest dimension.	• Perceptions of recruitware: ➤ Remote sites to apply (accessibility); unfair allocation to regions (fairness, transparency); lack of communication (accessibility); not the first choice to apply (profitability, familiarity); cost of travel and accommodation (profitability) • Perceptions of information: ➤ Lack of information (adequacy), uncertainty (accuracy, adequacy, relevance, realism); lack of communication (availability) • Perceptions of timing: ➤ Less time to decide (availability); delay in response (timeliness).

Table 7.3 The Elaboration of the SA Enlistment Problem from Different Perspectives

4.	Information (communicated identity) ■ What type of information are communicated to applicant? (Answer: recruitment message, recruitment notifications, application and selection results, offer info, contracting info.) ■ Each information communicated to applicant will be assessed against information quality features from the recruiter's perspective.	**Adequacy**	■ Are the information provided adequate for the applicant to assess and decide to interact or not? ➤ Job location is missing (not determined at the time of enlistment). ➤ Some info. about corps and military regions and units are confidential. ➤ Info. about post-enlistment training is missing. ➤ Info. about selection procedures are hidden for regional diversity considerations.
		Availability	■ Are the information available for the applicant to access 7/24? ➤ No, only at the job opening time ■ Are the information sensitive so availability is restricted? ➤ Yes, some key info. about the mission and activates of the SA and corps are not available. ■ Are the information provided via verbal or written cues? ➤ Both.
		Accuracy	■ Are the information accurate so cannot be misunderstood by the applicant? ➤ No, for instance (job location is not provided and info. about military regions and units are not provided) ■ Does the information allow realistic expectations? ➤ No, due to inaccuracy of info.)
		Realism	■ Does the information reflect the actual reality? ➤ No, in terms of job location ■ Can the information be credible? ➤ Yes.
		Relevance	■ Does the information relate to the matter in question? ➤ (Yes) ■ Are the information personally relevant? ➤ No, generic not tailored to applicant groups.

Table 7.3 The Elaboration of the SA Enlistment Problem from Different Perspectives (continued)

6.5	Recruitware (actual identity) - What type of Software features does the recruiter (military school(s)) have? (refer to the software features in the Onto-RPD) - What type of Hardware features does the recruiter (military school(s)) have? (refer to the hardware features in the Onto-RPD) - What type of Humanware features does the recruiter (military school(s)) have? (refer to the human features in the Onto-RPD)	**Accessibility** - How far/easy are the recruitware to access by applicant? ➤ Remote job opening site ➤ Manual handling (in-person, by mail) - Shall the recruitware be made accessible by the agent? ➤ Yes, different applicant from different regions
		Usability - To what extent the recruitware are easy to use or deal with? ➤ Rigid military rules (on access and treatment) ➤ Manual applications, exams, and physical exercises. ➤ Lack of online communication - To what extent the recruitware are quick to learn about/from? ➤ Info. needs careful revision and inquiries ➤ Some key info. cannot be provided. - To what extent the recruitware are helpful to remember what and how to do things? ➤ Only through careful reading of docs. - To what extent the recruitware are making positive experience? ➤ Well-selected staff for recruitment; school sites; etc.
		Reliability - Are the recruitware able to function for a specified time at a specified condition? ➤ Almost no, many delays and calls for recovery. - How often do the recruitware fail/go down? ➤ Very often with remote applicants
		Resilience - To what extent the recruitware are able to recover when something fails? ➤ Hard to recover; if possible then in cost of time) - To what extent the recruitware are able to cope and adapt in order to prevent failure? ➤ Unable in light of criticality of time and current recruitware.
		Friendliness - To what extent the recruitware are agent friendly? ➤ They try to be friendly with care of military conditions.
		Alternativeness - To what extent the recruitware are able to offer alternative choices? ➤ There are a number of recruiters and military schools to apply to, but no way to be available at one location.

Table 7.3 The Elaboration of the SA Enlistment Problem from Different Perspectives (continued)

6.5	Recruitware (actual identity) ▪ What type of Software features does the recruiter (military school(s)) have? (refer to the software features in the Onto-RPD) ▪ What type of Hardware features does the recruiter (military school(s)) have? (refer to the hardware features in the Onto-RPD) What type of Humanware features does the recruiter (military school(s)) have? (refer to the human features in the Onto-RPD)	**Professionalism** ▪ To what extent the recruitware are communicating effectively? ➤ Mainly in-person and mail communication ▪ To what extent the recruitware are culture-sensitive? ➤ Restricted to military rules; multicultural personnel ▪ To what extent the recruitware are in good appearance? ➤ Good looking; well-organised process; good buildings ▪ Do the recruitware seem team-oriented? ➤ Yes, in some work areas ▪ Do the recruitware seem responsible? ➤ High responsibility
		Visibility ▪ To what extent the recruitware are publicly visible? ➤ Largely invisible; remotely and independently located for security and work issues
		Familiarity ▪ Are the recruitware experienced first-hand or second-hand? ➤ Second-hand ▪ Are the recruitware in a close relationship with the interacting applicant(s)? ➤ No
		Fairness ▪ Do the recruitware treat people equally? ➤ Yes, but not in the selection activity due to regional diversity requirements. ▪ Do the recruitware have rules against bias? ➤ Some monitoring and control ▪ Do the recruitware enable someone's rights to be heard? ➤ Not always possible ▪ Do the recruitware enable equal opportunities? ➤ No, remote enlistment sites for non-local applicants.
		Transparency ▪ To what extent the recruitware are open to the public? ➤ Far to be open due to many considerations
		Profitability ▪ To what extent the recruitware offer a value to the applicant(s)? ➤ Job security; fast track to job; competitive job benefits; chance to join army; chance to travel, chance to adventure

Table 7.3 The Elaboration of the SA Enlistment Problem from Different Perspectives (continued)

6.	Timing (timed identity) - In what events the interaction does take place? - How long does the interaction take?	Availability	▪ Does the time suffice for the applicant (s) to decide and act? ➢ Almost short because of time pressure ▪ Are there different time periods for applicant(s) to engage? ➢ No
		Timeliness	▪ Does the event of interaction happen in a fixed time? ➢ Yes, based on the timetable ▪ Is the moment of interaction critical/sensitive? ➢ Yes, it is very sensitive for competition purpose ▪ Can delay be tolerant? ➢ No ▪ Can the event of interaction be changed into different times? ➢ Yes, if possible
7/1	Problem Definition	▪ Comparison between interest dimensions ▪ Finding the key imbalance aspects between interest dimensions (problem frame)	▪ Are the interest dimensions (whom to recruit (with); recruitware (actual identity); information (communicated identity); timing (timed identity); and the perceptions and desires (conceived identity) in congruence? ➢ No ▪ Where is the incongruence aspects? In which interest dimensions does the incongruence reside? What are the most important interest dimensions and features that can be addressed/adjusted to resolve incongruence? ➢ Whom to recruit (remote region applicant (location)) X recruitware (military school site: accessibility) ➢ Recruitware (site accessibility) X timing (availability) ➢ Recruitware (announcement method (newspaper: usability) X information (availability) ➢ Recruitware (familiarity) X information (adequacy) X timing (availability) ➢ Recruitware (recruitment process: reliability) X timing (job info: timeliness) X information (job location: adequacy) ➢ Information (job info: adequacy and accuracy)) X applicant's expectations ➢ Timing (availability/timeliness) X applicant's expectations ➢ Recruitware (transparency/fairness) X applicant's expectations

Table 7.3 The Elaboration of the SA Enlistment Problem from Different Perspectives (continued)

	Problem Definition	
7/2	- Comparison between interest dimensions - Finding the key imbalance aspects between interest dimensions (problem frame)	- Who could prevent the current interest dimensions to be adjusted? What are the external interests (other relevant stakeholders) that impede the resolution of incongruence? ➤ Applicant (desires) ➤ Job provider (military units): policies, org. structure, job design, time of vacancies, etc. ➤ Qualification provider (public school, military hospitals, CRA, and CAA): timing of activities and products, org. structure, - What are the project constraints that prevent enlarging the scope and involving other relevant stakeholders? ➤ Time and cost
	Interaction with Job Provider (Military Units (MUs))	
2.	- Existing/potential conflict of interests (i.e. interests differentiation or fragmentation) - What is the problem? (Existing or potential conflict of interests)	The symptoms of the problem (signs of problem or existing conflict) are: ➤ Circulating new enlistees between different corps due to inappropriateness (rejection). ➤ Quality of vacancy filling: avg. of KSAs (72%.34) and avg. of regional diversity (53.45%). ➤Increased cost and time.
3.	- The perceptions and desires of each MU will be related to each interest dimension. - Interest (conceived identity) ▪ What are the perceptions held by military unit(s) about us? ▪ What are the desires of military unit(s) to be influenced? ▪ Which MU groups' perceptions are most important?	- Perceptions of recruitware: ➤ Less qualified recruits (reliability); cost for recovery and (profitability) - Perceptions of information: ➤ Less contract information provided (adequacy - Perceptions of timing: ➤ Delay in job filling (timeliness).

Table 7.3 The Elaboration of the SA Enlistment Problem from Different Perspectives (continued)

7.4.1.3. The SA Enlistment Problem Definition

After the SA enlistment problem situation is elaborated and analysed from different stakeholders' perspectives as in Table 7.3, the exploration of the essence of SA enlistment problem takes place. This includes scoping and defining the problem frame to which a solution is needed. The definition and choice of the problem frame must be agreed on by relevant stakeholders as a basis for RE process (i.e. the next phases in POCM-RAA). Figure 7.9 presents the agreed problem frame of the SA enlistment that needs to be tackled by all stakeholders to influence the interests of each other towards better quality of vacancy filling.
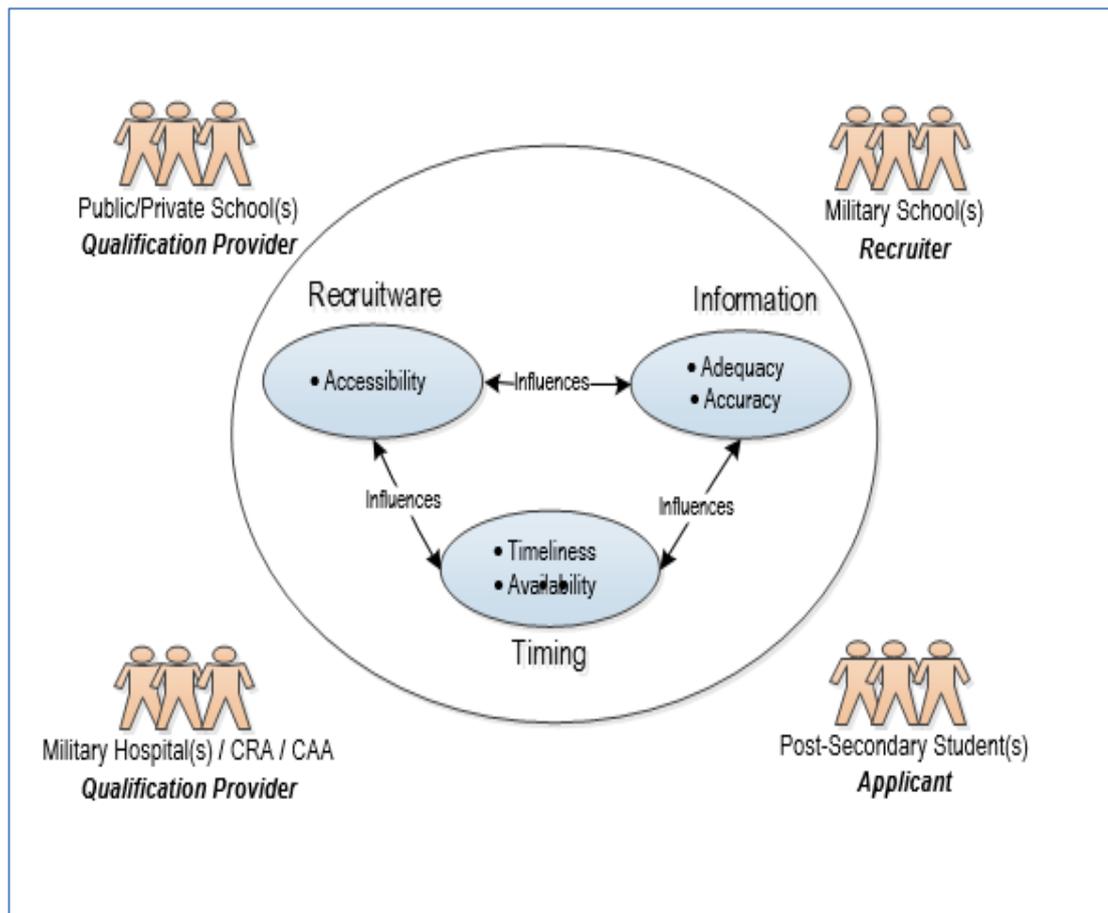
Figure 7.9 The Problem Frame of the SA Enlistment Situation

As presented in Figure 7.9, the problem frame best addresses the essence of the SA enterprise enlistment problem. The different stakeholders' perspectives related to this problem frame are outlined in Table 7.4.

Stakeholder	Whom to interact with	Difficulties with Timeliness	Difficulties with Time Availability	Difficulties with Accessibility	Difficulties with Info. Adequacy	Difficulties with Info. Accuracy
Military Units (Job Provider)	▪ Military schools (recruiter)	▪ The time at which a job becomes vacant is variable (HR activities cannot be aligned with the peak time, thus the job info. are not completely ready to exchange at the time of school results (peak time) ▪ MUs rely heavily on the length of enlistment time (including training) to make a job vacant	▪ Delay in filling a job vacancy. ▪ Military readiness is impacted.	▪ Remote military regions compared to military schools (recruiters) ▪ Manual interaction with the recruiter (military schools)	▪ Job info. (e.g. job location and job benefits) are not known at the peak time. ▪ Some key job-related info. (e.g. the employer info.) are not provided for security issues.	▪ Job info. provided are very generic and this can be changed when a real vacancy becomes available.
Public/Private Schools (Qualification Provider)	▪ Military schools (recruiter) ▪ Students (applicant)	▪ The results must be posted directly at the end of school year.	▪ School closure time for summer holiday	▪ Remote military schools to interact ▪ Country-side schools still use manual interaction	▪ The school results give measure of some competencies needed, but not enough for job filling (e.g. military fitness)	▪ Printed school results might need to be authenticated
Military Hospitals (MH)/ CAA/ CRA (Qualification Provider)	▪ Military schools (recruiter) ▪ Students (applicant)	▪ The inquiries needs time to be processed ▪ Hard to align these with the peak time because the delay in receipt of requests from recruiter	▪ Fixed timeframe for inquiries ▪ Large no. of inquiries to be dealt with	▪ Remotely located MH, CRA, and CAA. ▪ Some inquiries need person presence.	▪ Printed inquiry forms can limit the size of information needed.	▪ Printed school results might need to be authenticated

Table 7.4 The Different Stakeholders Perspectives Related to the Problem Frame Defined

Stakeholder	Whom to interact with	Difficulties with Timeliness	Difficulties with Time Availability	Difficulties with Accessibility	Difficulties with Info. Adequacy	Difficulties with Info. Accuracy
Military schools (recruiter)	• Military units • Applicants • Public/private schools • MH, CAA, and CRA • Applicants	• Delay in filling a job vacancy on time because of length of enlistment. • Delay in sending and receiving inquiries orders • Fail to timely offer a job vacancy to an applicant	• Market season and time pressure • Commitments and deadlines with relevant stakeholders as an intermediary	• Remotely located and independent military schools • Physical assessment of applicants needs their presence.	• The info. of recruitment message are incomplete from the source (military units) • Some of the job info. are intentionally hidden to enforce regional diversity of recruits. • No notifications for application progress.	• Some inquiry orders have unclear requirements. • No specific job info. provided for application. • No specific job locations (MUs) to select from but by regions.
Post-secondary students (applicant)	• Military schools (recruiter) • P/P schools, MH, CRA, and CAA (qualification providers) • Military units (employer)	• A number of job applications possible so that delay in response is very likely. • Delay caused by other stakeholders. • Other life commitments	• Many job choices are available in the market so they need time for careful thinking.	• Different applicants from different remote regions. • Digital divide of applicants	• Missing personal info. in job applications. • No feedback and notifications to be considered.	• Errors in application forms • Incorrect info. provided

Table 7.4 The Different Stakeholders Perspectives Related to the Problem Frame Defined (continued)

The SA enterprise enlistment problem concludes that there is a labour market at which sellers (e.g. job providers and qualification providers), buyers (e.g. applicants), and intermediaries (e.g. recruiters) interact (i.e. exchange product, services, or information) to fill a job vacancy (within that market). At this market, there is a seasonal peak, which is the time when the secondary students' results are posted by public/private schools at the end of year. The demand in this period is very high so that the whole interaction (exchanging information between all stakeholders) needs to be timely (*timeliness*) compared to the peak time. Thus, the quality of vacancy filling "being timely" is achieved, otherwise the delay might result in the loss of competition. However, the time needed by a relevant stakeholder to decide whether to interact or not, and act accordingly is also very crucial (*time availability*). Hence, there is a trade-off between timeliness and availability. These two quality features are highly influenced by the place or medium of interaction (*accessibility*) since they determine the length of time to decide and act. The medium of interaction, in turn, influences the *adequacy* and *accuracy* of information exchanged during the interaction. This lack of information, in turn, causes more time needed for deciding and acting (*time availability*).

7.4.2 Early Requirements Definition (ERD)

Based on the problem frame defined for the SA enterprise enlistment problem, the goal model will be used to capture the various policies possible to handle this type of problem from different perspectives. The goal model including the policies and their influences on the interest dimensions are presented in Figure 7.10. The policies in the goal model can be applied to each actor in the enterprise based on the defined problem frame and the context of problem. The influential relationships between the interest levels (dimensions) in the POCM will guide the selection of policies and their impacts to influence someone's interest and then the overarching enterprise interest. To establish the interest of each stakeholder in the SA enterprise enlistment, the Author will obtain the interest levels for all stakeholders included in the enterprise. To do this, Table 7.5 and Table 7.6 are used. Table 7.5 gives some abbreviations of the policies used based on the problem frame, while Table 7.6 establishes some of the interest levels to deal with the problem frame defined by responding to the four questions provided.
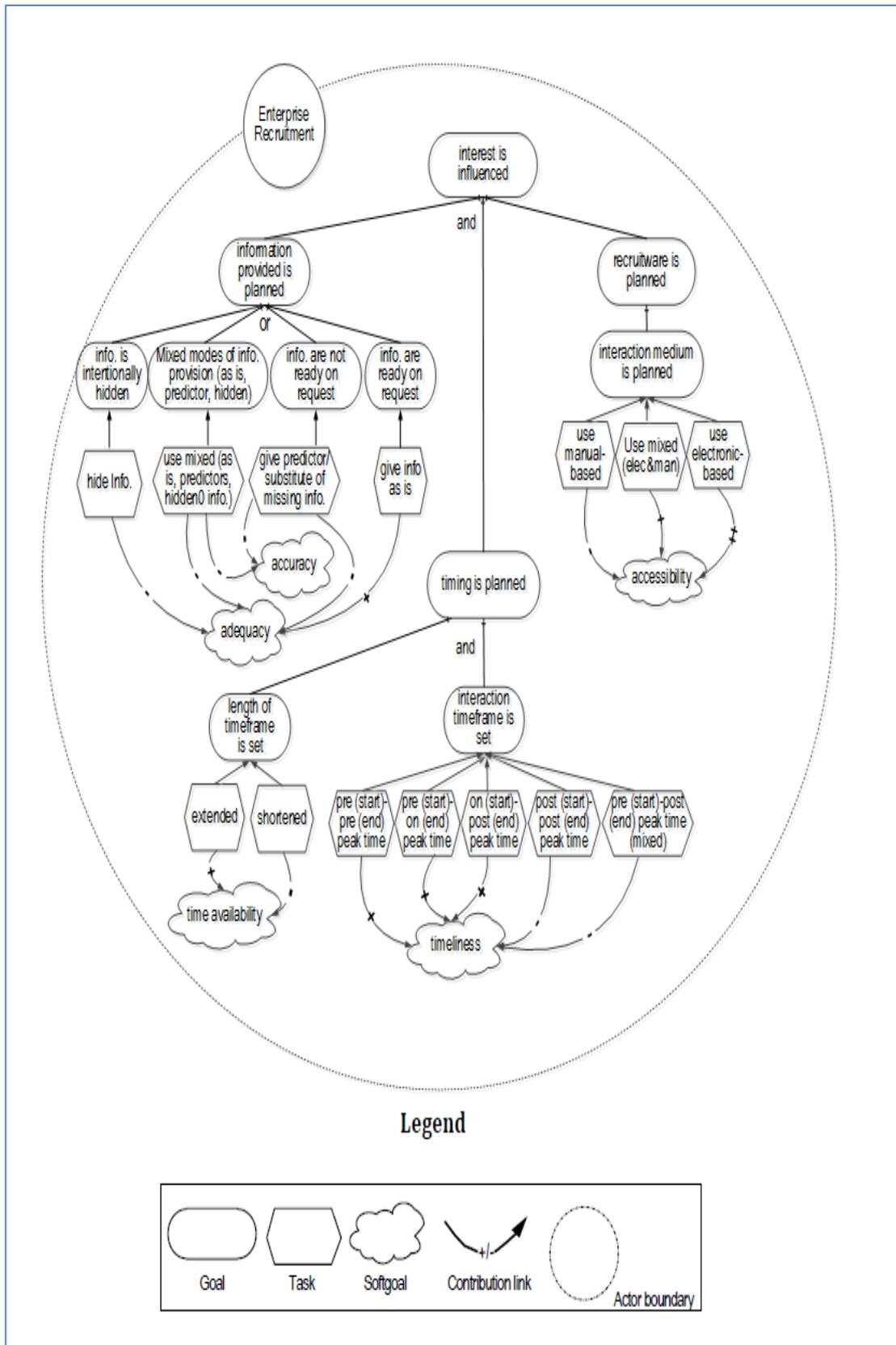
Figure 7.10 The Goal Model Representing the Various Policies and their Influences on the Interest Dimensions Based on the Problem Frame Defined

Problem Frame Policies		
Policy Category	Abbreviation	Definition
Timeframe of interaction	TF1	Pre (start)-pre (end) is a policy in which the timeframe of interaction starts and ends before market peak time.
	TF2	Pre (start)-on (end) is a policy in which the timeframe of interaction starts before market peak time and ends on time with the peak time.
	TF3	On (start)-post (end) is a policy in which the timeframe of interaction starts on the market peak time and ends after the peak time.
	TF4	Post (start)-post (end) is a policy in which the timeframe of interaction starts after the market peak time and ends after the peak time.
	TF5	Pre (start)-post (end) is a policy in which the timeframe of interaction starts before the market peak time and ends after the peak time (i.e. mixed of F1-F4).
	TF6	On (start)-On (end) is a policy in which the timeframe of interaction starts on the market peak time and ends on time with the market peak.
Information Provided	IN1	(Give info. as is): information items are given as they are at the time of interaction.
	IN2	(Give predicted/substitutive info.): the required information are not available at the time of interaction but predicted or substitutive information can be given.
	IN3	(Hide info.): some information required are hidden for some considerations (e.g. security).
	IN4	(mixed info. policies): a mixture of I1, I2, and I3
Medium of Interaction	RM1	Manual medium used for interaction.
	RM2	Electronic medium used.
	RM3	Mixed of M1 and M2.
Length of interaction	TL1	Shortened
	L2	Extended timeframe

Table 7.5 The Abbreviations of the Policies Used for Handling the Defined Problem Frame

Q1. What type of interaction timeframe (TF) is chosen by the agent A?

Q2. What type of information (IN) are provided by the agent A?

Q3. What type of interaction medium (RM) is used by the agent A?

Q4. How long is the time (TL) needed by the agent A to make an interaction?

Interest Set (a set of interest levels)	Recruitment Policies			
	Timeframe	Information	Medium	Length
5	TF3 Weight (1-5):5	IN1 Weight (1-5):5	RM2 Weight (1-5):5	TL1 Weight (1-5):5
3.5	TF3 (5)	IN1 (5)	RM1 (2)	TL 2 (2)
3.5	TF2 (4)	IN2 (3)	RM1 (2)	TL 2 (5)
2.25	TF4 (2)	IN3 (2)	RM3 (3)	TL 2 (2)
2.75	TF5 4	IN4 2	RM3 2	TL 2 3

Table 7.6 Some of the Recruitment Policies and their Interest Sets

The recruitment policies, such as the ones depicted in Figure 7.6, should be established based on the problem context (i.e. problem frame). These policies can be used in any level of analysis.

7.4.3 Functional Requirements Definition (FRD)

The policies selected to handle the SA enlistment problem entail a course of functional or behavioural actions (i.e. a way of how to tackle a type of problem). The BPMN model that captures these functional requirements are derived and presented in Figure 7.11. It can be seen from the BPMN model the type of policies used by each stakeholders on the left corner, and the course of actions based on these policies.
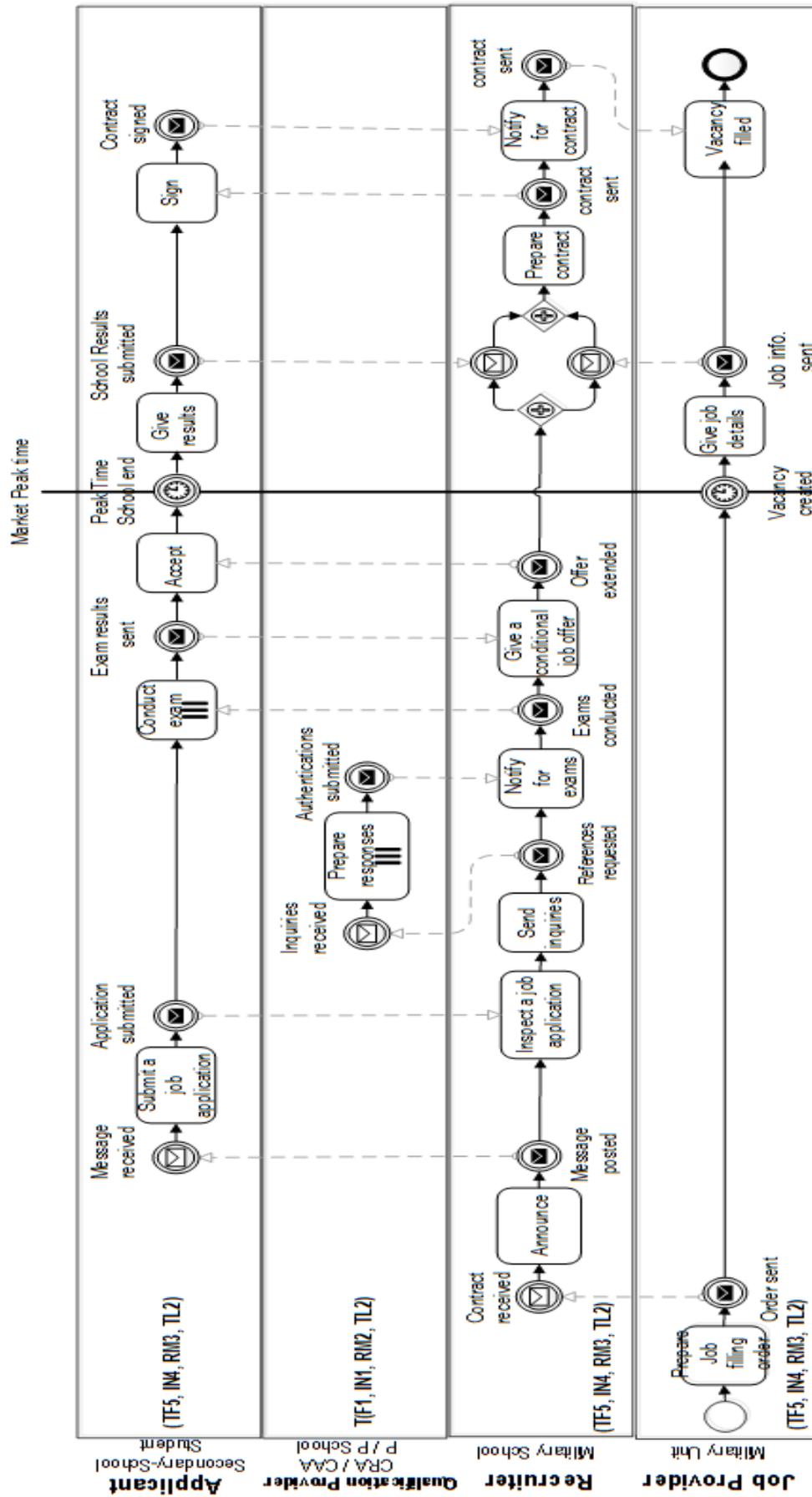
Figure 7.11 The BPMN Model of the SA Enlistment Functional Requirements Definition

7.4.4 E-Recruitment Solution Specification (ERSS)

The transformation from the BPMN model to the UML case diagram can be mapped. The case diagram will capture the boundary between the business domain (captured in BPMN) and the software domain (Bray, 2002) showing those functions required by the machine and the interacting actors with them. The use case diagram to capture these functions systematically from the BPMN is shown in Figure 7.12.
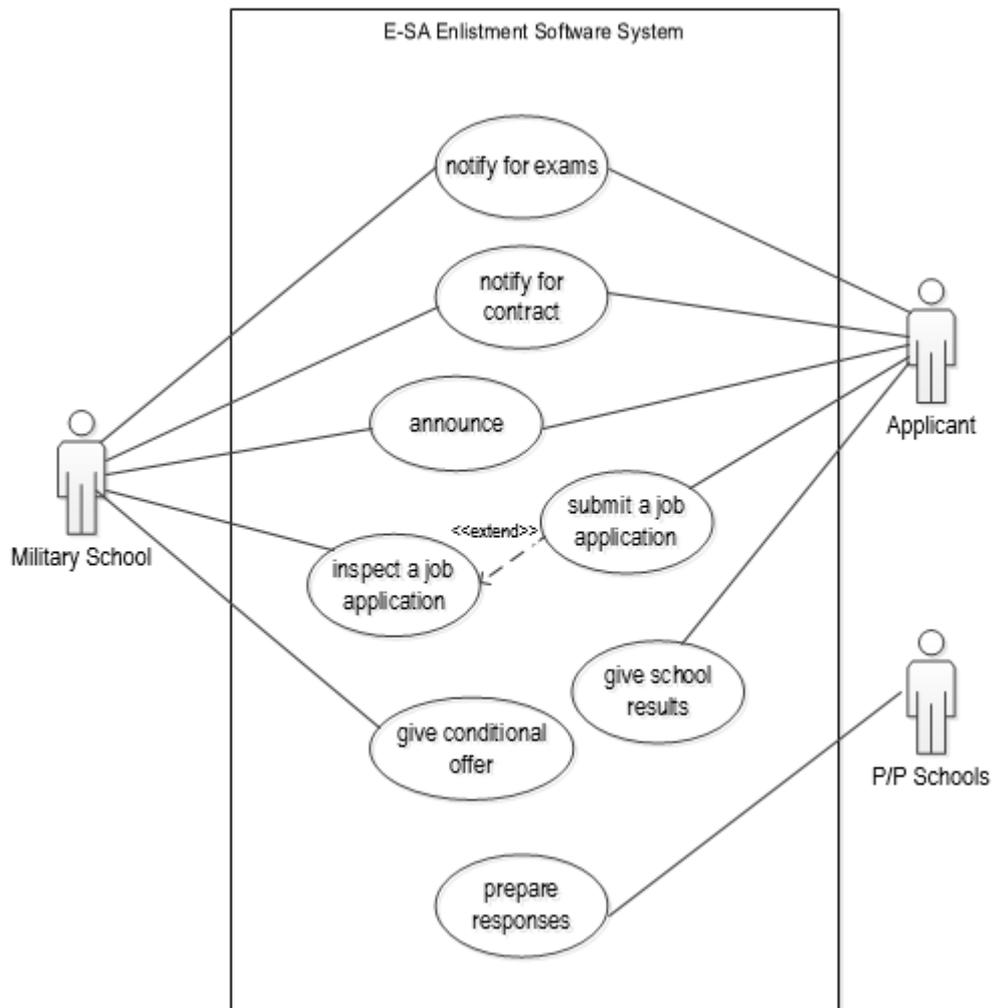
Figure 7.12 The UML Case Diagram of the SA e-Enlistment Software

7.5 Reflections on the Application of POCM-RAA

The application of POCM-RAA to the SA post-results enlistment problem has shown some benefits and drawbacks.

7.5.1 Benefits of POCM-RAA

The application of POCM-RAA to the SA post-results problem has supported its benefits. First and foremost, it has flexibly used the problem viewpoints of POCM and elaborated on them using the list of questions provided. The answers of those questions have guided the analysis and knowledge of the SA post-results problem. Secondly, it assisted in the problem definition (i.e. problem frame or type) and provided systematic links between POCM and standard RE analysis approaches (e.g. goal model, BPMN, and use case diagram). Thirdly, it would help drawing out general and abstract lessons about the problem nature in a recruitment context and reusing them.

7.5.2 Drawbacks of POCM-RAA

In contrast to the POCM benefits, there were a number of drawbacks that require further attention and future work. First, the list of questions provided for viewpoint-oriented problem elaboration needs to be consolidated using different recruitment case studies from different industries. Second, a limited set of RE modelling techniques, e.g. goal model, BPMN, and use case diagram, were used to show the transformation between POCM and RE approaches. Extra application with different modelling techniques would support its applicability. Third, the application of POCM-RAA was limited to the SA post-results problem. Hence, this needs to be extended into many recruitment case studies from different industries. Fourth, the users in the running example, i.e. WhatsApp's SA stakeholders group, were part of the participants in developing the POCM. As a result, the feedback from their usage will not accurately reflect its usability or applicability in guidance.

7.6 Summary

The chapter outlined the way the POCM can be utilised to capture recruitment problem domain knowledge and systematically transform this knowledge to the e-solution specification. Hence, the POCM-RAA was developed, and applied using a running example. Based on this application, some benefits and drawback of POCM-RAA were outlined.

Chapter 8: Enterprise Recruitment Metamodel (ERM) for Enterprise Recruitment Practices Documentation

8.1 Introduction

In response to the problem no. 2 (lack of modelling, structuring and documenting knowledge of enterprise recruitment best practices) explained in chapter 1 (section 1.2.2), this chapter presents an Enterprise Recruitment Metamodel (ERM) that can be used to capture, structure and document the enterprise recruitment best practices (ERBPs). Hence, the objectives of this chapter are to: (1) review the artefacts developed in this thesis (POCM, Onto-RPD and POCM-RAA) and define the major elements in these artefacts that must be considered when addressing a real-world enterprise recruitment problem; (2) define a specific template with a set of elements to document the ERBPs; (3) combine the major elements selected from the artefacts with the elements of template to build the ERM; and (4) provide an example of enterprise recruitment practice documentation. As a result, the ERM will provide a model-driven environment that combines all elements that must be considered when documenting ERBPs. This will facilitate the identification of ERBPs and provide recruitment stakeholders with the guidelines of how to reuse them. The ERM will also open routes for the exploitation of the outcome of this research towards further research.

8.2 The Framework of Building the Enterprise Recruitment Metamodel (ERM)

The concept of building the ERM was born to address the gap with the documentation of ERBPs that impedes the realisation of their value (i.e. sharing and reuse). A key problem is the lack of modelling and structuring the domain knowledge of ERBPs. Hence, the ERM will provide a means of modelling and structuring the domain knowledge of ERBPs, and then support the successful documentation and reuse of ERBPs. To do this, the artefacts developed in the last chapters will be reviewed and combined with a specific template defined with the aim of documenting ERBPs. The framework is presented in Figure 8.1.
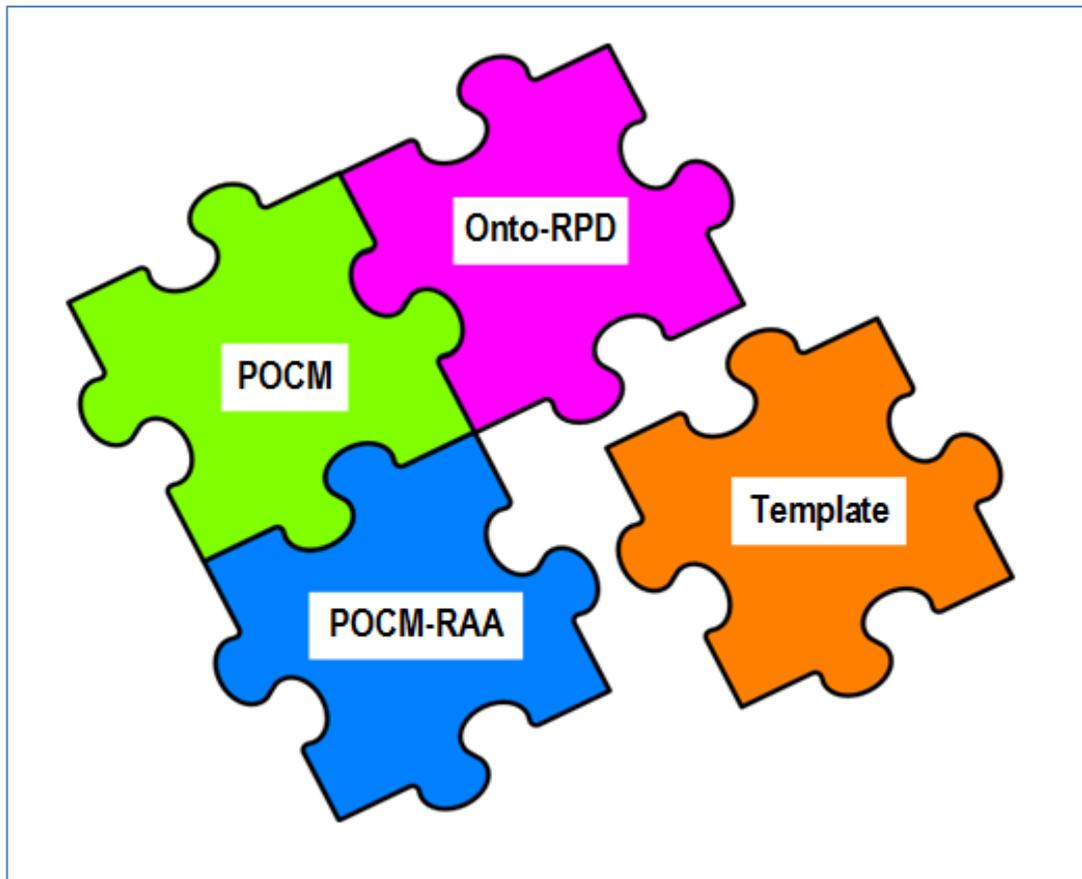
Figure 8.1 The Framework of Building the ERM for Structuring and Documenting the ERBPs

As depicted in Figure 8.1, the artefacts: POCM, Onto-RPD, and POCM-RAA, will be combined with a specific template for documentation to build the ERM. The artefacts contain a set of elements (i.e. concepts) that are very important to address a real-world recruitment problem. To enable the integration between those elements provided by the artefacts and the elements of the proposed template, the major elements in every artefact that must be taken into account by the recruitment analyst are highlighted. The elements defined in every artefact are, as follow:

- In POCM artefact: The elements selected are *goal, problem, and symptoms/threats*.

- In Onto-RPD artefact: The elements selected are *context and stakeholders*.

- In POCM-RAA artefact: The elements selected are *the different levels of solution abstraction including RPD, ERD, FRD, and ERSS*.

In the next texts, these major elements that are selected to be included in the ERM are discussed.

8.2.1 Goal of Recruitment

The goal of enterprise recruitment has been clearly defined as "to fill a job vacancy". Depending on the size and the type of industry and organisation in which recruitment is conducted, the number of vacancies and their types may vary.

8.2.2 Problem

The problem of enterprise recruitment reflects the potential/existing differentiation or fragmentation between a number of stakeholders' interests across a number of interest dimensions such as recruitware, information, and timing. An enterprise recruitment problem is defined as the problem frame (i.e. type of problem) that is agreed on by all stakeholders as the most problematic issue to be solved towards the goal of recruitment.

8.2.3 Symptoms/Threats

There are a number of symptoms or threats that are associated with the enterprise recruitment problem and prevent the goal of recruitment to be achieved. These are: no engagement (i.e. when there is no action received at all from the target agent); withdrawal (i.e. when a target agent withdraw out of interaction); and rejection (when a target agent clearly send a rejection message to an offer). A recruitment analyst must be aware of these symptoms/threats and find the root causes (i.e. interest dimensions) that lead to such actions.

8.2.4 Context

A major factor of successful sharing and reuse of an ERBP is to capture the knowledge of the business context or domain in which a recruitment problem exists. The business context can be recognised by a combination of the specific recruitment problem frame and the corresponding recruitment solution (i.e. policies, actions, and software specifications) to solve this type of problem according to its goal of recruitment and environment. It is very common that problem owners characterise the problematic situations as being of a known problem type or category (Smith, 1989; Abd Rahman et al., 2011). Hence, rather than representing and defining the current situation as a whole, they define a problem by matching the features of this situation to the characteristics of well-known experienced problems so facilitating the selection and tailoring of recruitment policies, mechanisms, and IT solution specifications. When facing a real-world recruitment problem, the recruitment analyst has to consider as many as problem types (specific interest dimensions and related quality features) as well as their relevant recruitment policies, mechanisms, and IT solutions to deal with the problem faced.

The environment for ERBPs is composed of recruitment players (*note: this will be later referred to as recruitment realms (RRs), see section 8.4.2.2*) and is associated with an enterprise overarching interest (*note*: *this will be referred to as interest record, see 8.4.2.3)* based on the interest levels and the set of policies applied on each interest dimension within these RRs. These sub-elements will be explained in the next sections.

8.2.5 Stakeholders

A stakeholder can be any individual, a group of individuals, or an organisation with an interest or set of interests in enterprise recruitment system. The stakeholders of an ERBP populate the recruitment realms (RRs) and interact with each other across interest dimensions. In addition, there might be some exiting sub-systems that also interact within enterprise recruitment so that the consideration of them is also very important.

8.2.6 Solution

E-recruitment solutions can effectively and efficiently assist in filling job vacancies. However, information systems such as recruitment system could operate without the use of e-solution. Hence, the e-solutions are technological tools used to provide the desired level of recruitment; they do not add to the business system's functionality. Thus, the ERM will provide a top-down strategy based on models for capturing solutions in different levels of abstractions, including e-solution specifications. In chapter 7, POCM-RAA provides a method of capturing a recruitment solution in a systematic way over four layers of abstractions: RPD, ERD, FRD, and ERSS. This enables the realisation of the value of ERBPs.

8.3 Template for ERBPs Documentation

The ERBP template for documentation is designed to incorporate the key elements of recruitment practice in an enterprise environment. These elements of template will be combined with the elements of the artefacts abovementioned in section 8.2 for a more comprehensive documentation of an ERBP. The elements of template correspond to the sections of the template provided by Buschmann et al. (2007) and add some important sections such as *intent*, *known cases* and *considerations*. The template is described in Table 8.1.

Sections	Description
Name	The name of practice should represent the problem to be solved. The name must be also unique and within the scope of this type of practice.
Intent	This provides a short description of the intended purpose of the practice
Context	This section describes the generic environment under which the ERBP should be applied. This may include: (a) the type of vacancies to be filled (job description and specification); (b) the RRs involved in the ERBP; (c) the set of stakeholders within each RR; and (d) the general features and interactions between RRs. This context can be specified by context diagram.
Problem	This section describes the problematic situation that has led to the necessity to apply the corresponding solution, including: (a) the threats/symptoms; (b) the forces (problem frame and interest dimensions) that cause the problem and guide the solution; and (c) the type of interacting agents (whom to recruit (with)) because this will affect the recruitment mechanisms of the solution.
Known cases	This section describes the real cases of known recruitment incidents related to the problem.
Solution	This section describes how the problem is solved and how the threats associated with filling job vacancies and forces are treated. The solution will be expressed through the four levels of abstractions used in the POCM-RAA: RPD, ERD, FRD, and ERSS.
Considerations	This section describes the set of key perceptions and impressions of all relevant stakeholders about the solution given in the ERBP.
Consequences	This section discusses the benefits and drawbacks of the solution in relation to the forces (interest dimensions) found in the problem.
Known uses	This section describes the real cases where the solution provided is used.
Related ERBP	This section gives references to the ERBPs that solve similar problems, consider similar contexts, or complement this ERBP.

Table 8.1 The Elements of the ERBP Template for Documentation

8.4 Enterprise Recruitment Metamodel (ERM)

The ERM will include a wide range of items describing an ERBP that solves an enterprise recruitment problem in a specific context. To do this, the ERM will combine, in one cohesive UML metamodel, both the template elements (defined in Table 8.1) and all elements of the artefacts (defined in section 8.2). Figure 8.2 presents the ERM that defines the elements of the ERBP template (white rectangle with *) and the elements of thesis artefacts (shaded rectangle), as well as the relationships between them. However, some of these elements are shared such as context, problem, and solution. As depicted in Figure 8.2, the elements of ERBP template are related to the major elements of the thesis artefacts. Thus, the ERBP template for documentation takes into account including and documenting all the major aspects and issues

of a real-world enterprise recruitment problem. For instance, the 'solution' element of the template is associated with the 'context', the 'problem' element of the template is associated with the 'threat' element, and the whole template is associated with the goal of recruitment (to fill 'a job vacancy').
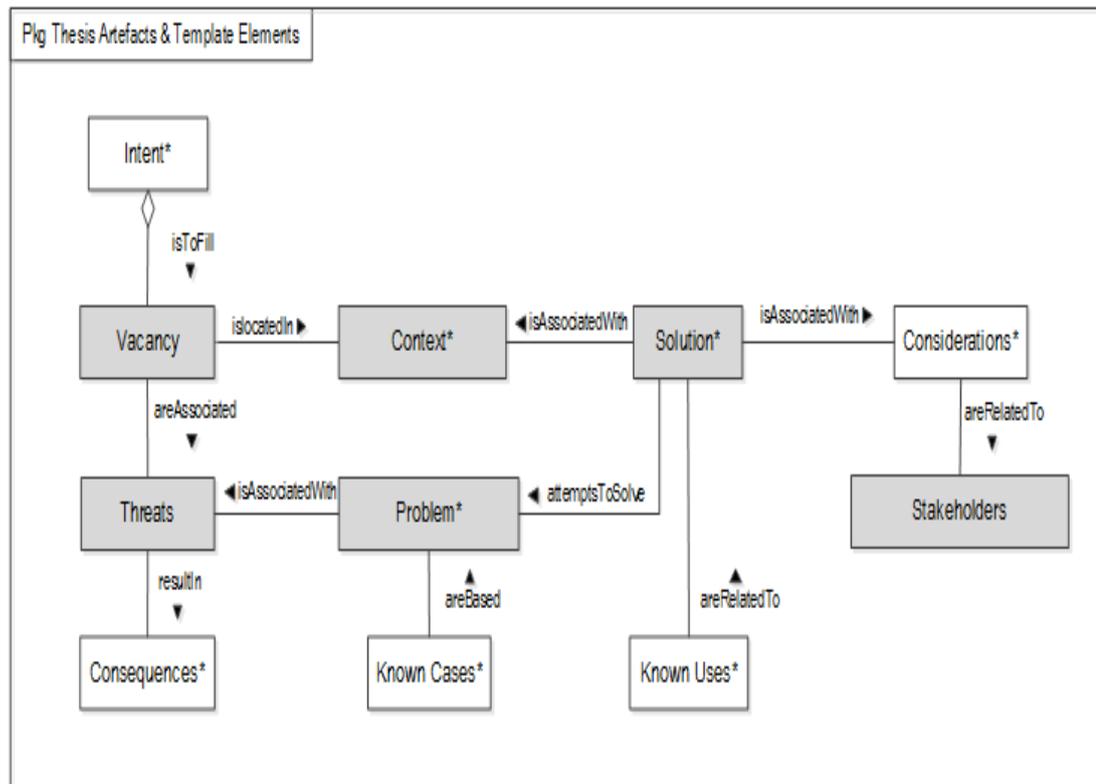
Figure 8.2 UML Enterprise Recruitment Metamodel (ERM)

In the next sections, the ERM will be complemented with a number of UML diagrams to describe the details of each element of the thesis artefacts (shaded rectangles) used in Figure 8.2 to define and document the ERBPs.

8.4.1 UML Metamodel for Vacancy

When building a recruitment system, organisations should identify their job vacancies in order to facilitate the recruitment analyst's work. This identification includes the *job description* (i.e. all the job-oriented information about a specific job); and the *job specification* (i.e. all employee-oriented information required to fill a job). These information indicate the importance that those job vacancies have for organisations and the *interest record* that has to be obtained or influenced by all relevant stakeholders to fill them. This value may depend on several aspects or factors so that when classifying jobs, the organisations should seek support from a risk analysis methodology.

The identification of job vacancies will facilitate the setup of cost-effective policies that constitute the interest record necessary to fill these vacancies. For example, the 'location of work' of a job vacancy will need recruitment policies related to the quality feature "accessibility"; the 'tasks involved' will need recruitment policies related to the quality feature "familiarity". However, there might be vacancy elements that need a set of recruitment policies to be considered. Figure 8.3 presents the metamodel of vacancy and Table 8.2 outlines the key items of vacancy.
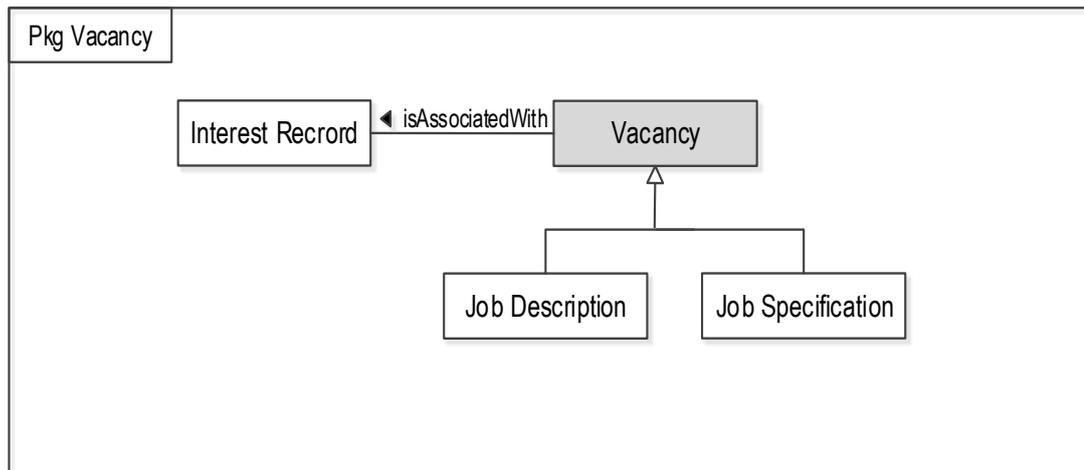
Figure 8.3 UML Metamodel of Vacancy

Information Category	Items
Job Description (Job-Oriented)	Job name
	Job type
	Salary
	Job benefits
	Job summary
	Location in hierarchy (rank/position)
	Responsibilities
	Conditions of work
	Location of work
	Relation to other jobs
	Tools used
	Hazards
Job Specification (Employee-Oriented)	Education
	Experience
	Training
	Initiative
	Physical effort
	Physical skills
	Communication skills

Table 8.2 The Categories and Related Items of Vacancy

8.4.2 UML Metamodel for Context

The elements included in the context of ERBPs are: the type of enterprise recruitment addressed in an ERBP, the recruitment realms (RRs) involved in that type of enterprise, and the interest record associated with those realms. Figure 8.4 presents a UML metamodel of the context elements and the relationships between them.
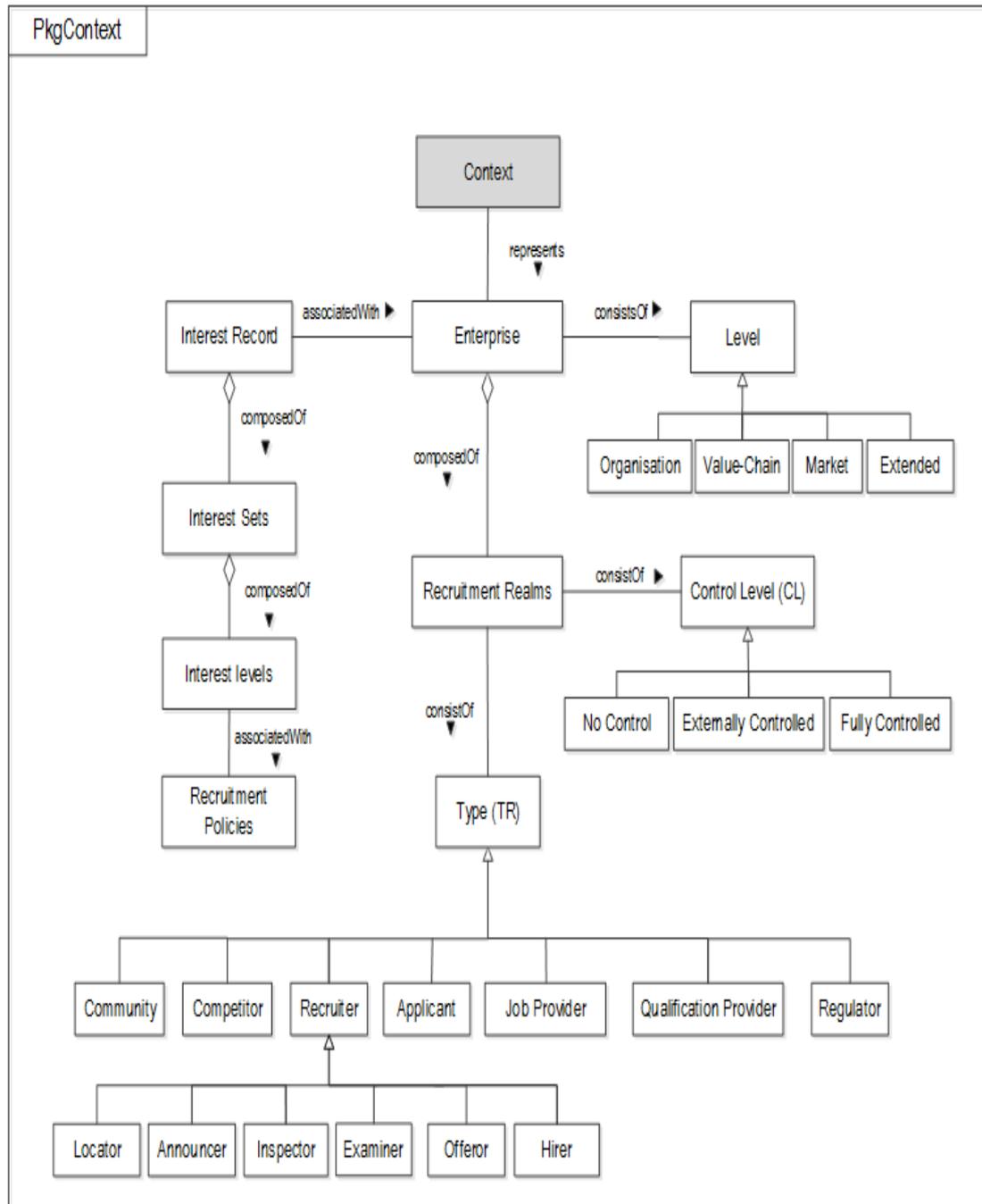
Figure 8.4 UML Metamodel of the Context

8.4.2.1 The enterprise Levels

The enterprise can be addressed from different perspectives or levels. Refer to chapter 7 where these levels are explained in details. According to Graves (2009), these levels are the organisation level, the value-chain level, the market level, and finally the extended level where the enterprise includes everyone. In each level, there will be a set of recruitment realms (RRs) involved. These RRs are explained in the next section.

8.4.2.2 Recruitment Realms (RRs)

The previous work in chapter 6 uses the "recruitment players" to refer to the enterprise entities involved in a recruitment problem. However, the term "recruitment player" has made confusion with the meanings of "actor" and "role" in some areas. To remove this confusion, Recruitment Realms (RRs) is adopted in this ERM. RRs can be defined as logical and discrete entities that partition the enterprise network. Based on the POCM and its corresponding Onto-RPD artefacts developed in this thesis, these RRs have the same interest dimensions and quality features through which they interact. Therefore, a set of different recruitment policies can be applied in each RR.

In Figure 8.4, there are different types of realms (TR) that can be found in enterprise recruitment. These RRs are reproduced from the Onto-RPD artefacts developed in chapter 6. These are:

- *Recruiter:* This realm consists of a recruiter or a group of recruiters with the same purpose. Recruiters typically conduct recruitment activities. This realm is composed of the following:
  - *Locator: The one who typically* define or find where the potential applicants are.
  - *Announcer: The one who* prepares recruitment message and selects one or a set of methods to announce it to the target applicants.
  - *Inspector: The one who screens applicants or their applications against a set of requirements to discover if there is anything wrong with them.*
  - *Examiner: The one who assesses the things such as knowledge, skills, and abilities that have been thought to the applicant.*
  - *Offeror: The one who selects a candidate and extends an offer for him.*

- o *Hirer: The one who signs the recruitment contract with an applicant.*

- *Applicant:* This realm consists of one applicant or a group of applicants with the same purpose. An applicant typically seeks a job and apply for it. Applicants could be internal as employees inside the organisation; or external from the outside. Applicants are the customer of recruiter in case of value-chain enterprise.

- *Job Provider:* This realm consists of one job provider or a group of job providers with the same purpose. Job providers are typically responsible for the creation of a job vacancy, the notification for filling, and the embarkation of new recruits. Job providers are job suppliers in the case of value chain enterprise.

- *Qualification Provider:* This realm consists of one qualification provider or a group of qualification providers with the same purpose. Qualification providers are those provide things such as statements, references, reports or letters that qualify an applicant to apply for a job. Examples of this realm are schools, universities, hospitals, or identity checkers. Qualification providers are supplier of recruiter in case of value-chain enterprise.

- *Regulator:* This realm consists of one regulator or a group of regulators with the same purpose. A regulator is typically a person or organisation whose job is to control recruitment-related activities and make sure that they operate according to official rules or law.

- *Competitor*: This realm consists of one competitor or a group of competitors with the same purpose. A competitor typically a person or company who is a rival against others.

- *Community*: This realm consists of one person or a group of persons with the same purpose. The influence of such realm typically appears in case of extended enterprise. Examples of this realm are non-client, anti-client, or society as a whole.

The RRs are also classified by their control level (CL) for the recruiting organisation. Based on this level of control, the recruitment policies applied in each RR could change. These CLs are derived from the work of Alwazae et al. (2015), as follows:

- *No control (NC)*: If the RR with no control, the realm is not controlled by any organisation. Hence, the recruiting organisation has no ability to set or impose recruitment policies within that realm. However, the policies and mechanisms of this RR can be expected.

- *Externally controlled (EC):* If the RR is externally controlled, the RR is managed by another organisation or partner. Hence, the recruiting organisation has no ability to set recruitment policies within the realm but it can have a service agreement (agreed conditions) by which a set of policies are agreed on.

- *Fully controlled (FC):* If the RR is fully controlled, the recruiting organisation has the full ability to set or impose a set of recruitment policies within the realm.

When classifying the RRs, two things have to be considered: the TR that can be found in an enterprise network, and their CL (who manages this type of realm). Hence, the classification of RRs can be defined as RR: TR X CL. These specific RRs can be used to describe the different types of contexts in which ERBPs are applied. Table 8.3 presents the various types of RRs resulting from our classification marked with ($\sqrt{}$).

Type of Realm (TR)	Control Level (CL)		
	No Control	Externally controlled	Fully controlled
Recruiter	-	$\sqrt{}$	$\sqrt{}$
Applicant	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$
Job Provider	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$
Qualification Provider	$\sqrt{}$	$\sqrt{}$	$\sqrt{}$
Regulator	-	$\sqrt{}$	-
Competitor	$\sqrt{}$	$\sqrt{}$	-
Community	$\sqrt{}$	-	-

Table 8.3 The Classification of Recruitment Realms

8.4.2.3 Interest Record

In ERBPs, the interest levels that are applied in all RRs included in a specific context of enterprise form the interest record needed for filling a vacancy. In each RR, there will a set of interest levels which determine the overall interest of that RR to interact for filling a job vacancy. These interest levels are reflected by the recruitment policies adopted in a specific realm and by the corresponding set of actions used in interaction. The recruitment policies applied in each

realm are defined in reference to the recruitment problem type (frame) to solve (i.e. interest dimensions as well as their interrelationships and related quality features, see Onto-RPD artefact). The problem types suffered in each realm can vary according the POCM and Onto-RPD artefacts, but the focus here will be on a set of problems that can be suffered by all RR in common.

Given the definition of recruitment adopted in this thesis being a set of interactions, the common problems of these interactions are related to: the information exchanged (information dimension); the timeframe of interaction (time dimension); the duration or length of interaction (time dimension); and the medium of interaction (recruitware dimension). For each problem, there are some related recruitment quality features that must be taken into account by all RRs when defining recruitment policies to solve such a problem. For instance, an information-related problem is associated with features such as information adequacy and accuracy; a timeframe-related problem is associated with a feature such as timeliness; a duration-related problem is associated with a feature such as availability; and finally a medium-related problem is associated with a feature such as accessibility. In chapter 7, a set of recruitment policies were defined to deal with these problems and their quality features using a goal model. These policies and their definitions are re-brought here for the sake of reader, see Figure 8.5 and Table 8.4 respectively.

To establish the interest record for filling a job vacancy in an enterprise context, the recruitment analysts should maintain the interest sets of all RRs included in the context. To maintain the interest set in each recruitment realm, the recruitment analysts will assign a set of appropriate recruitment policies to each realm according to the problems suffered and their related quality features taking into account the dependencies between the problems themselves as well as between RRs in the different levels of abstractions. To make it simple, Table 8.5 shows some interest sets and the assigned policies applied that can exist in one individual level. In that table, the first column has a number which represents the interest set based on the interest levels or the set of policies assigned against each problem in the other columns (1 is the lowest and 5 the highest).

The output of interest record is a set of numbers that represent the interest sets (the set of interest levels and the policies applied) for each RR included in the context. These numbers or interest levels will help recruitment analysts to select a course of recruitment actions that fit to

these levels. Moreover, based on these numbers, recruitment analysts can decide whether the ERBP is appropriate or not when reusing.
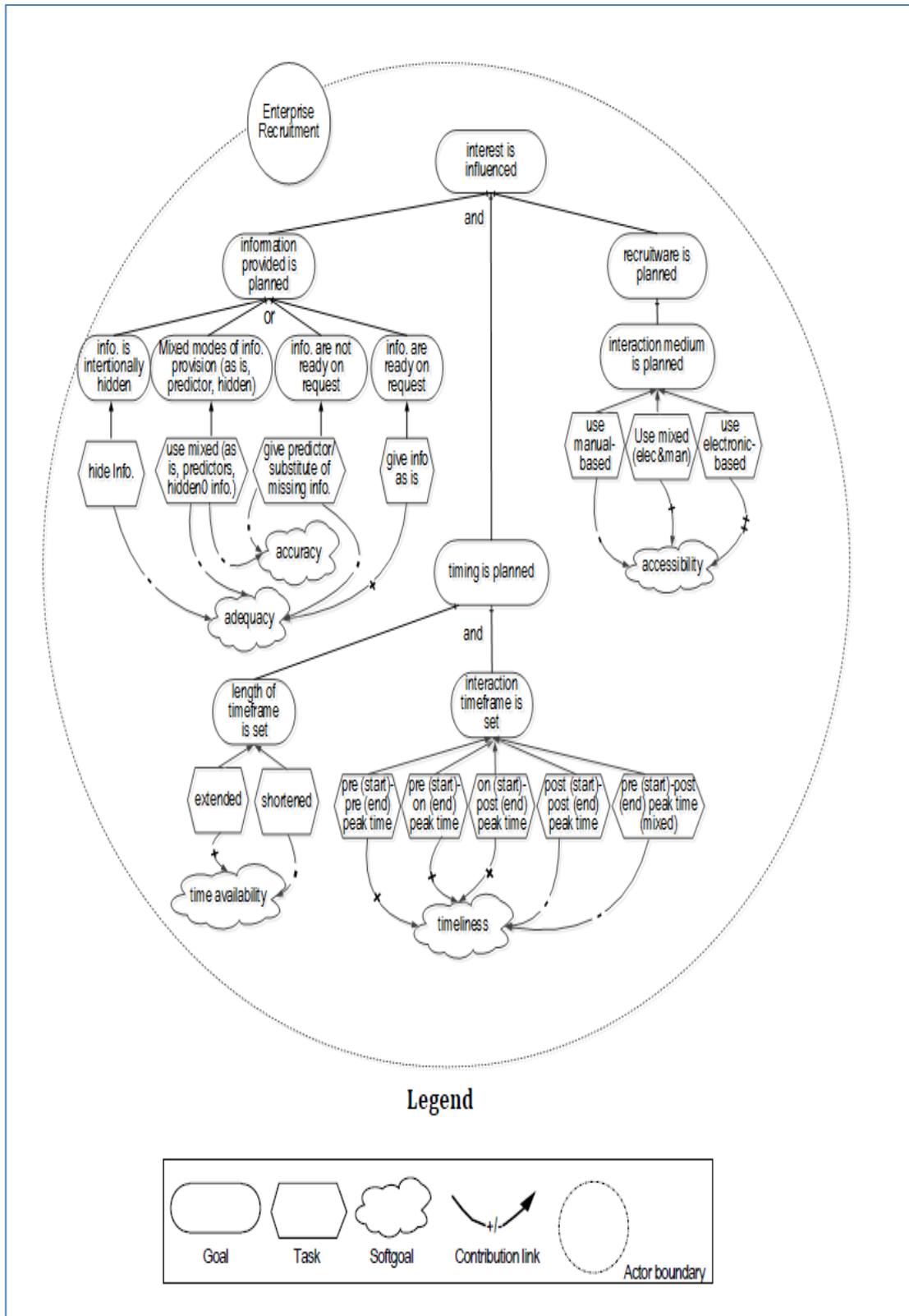
Figure 8.5 The Goal Model Representing Some Recruitment Policies Defined Based on the Problem Frame Defined

Problem Frame Policies		
Problem Category	Policy Abbreviation	Policy Definition
Timeframe of interaction	TF1 (Pre-Pre)	Pre (start)-pre (end) is a policy in which the timeframe of interaction starts and ends before market peak time.
	TF2 (Pre-On)	Pre (start)-on (end) is a policy in which the timeframe of interaction starts before market peak time and ends on time with the peak time.
	TF3 (On-Post)	On (start)-post (end) is a policy in which the timeframe of interaction starts on the market peak time and ends after the peak time.
	TF4 (Post-Post)	Post (start)-post (end) is a policy in which the timeframe of interaction starts after the market peak time and ends after the peak time.
	TF5 (Pre-Post)	Pre (start)-post (end) is a policy in which the timeframe of interaction starts before the market peak time and ends after the peak time.
	TF6 (On-On)	On (start)-On (end) is a policy in which the timeframe of interaction starts on the market peak time and ends on time with the market peak.
Length of interaction	TL1 (Short)	Shortened time
	TL2 (Extend)	Extended time
Information Provided	IN1 (As-Is)	(Give info. as is): information items are given as they are at the time of interaction.
	IN2 (Pred-Sub)	(Give predicted/substitutive info.): the required information might not available at the time of interaction but predicted or substitutive information can be given provided that the required ones are given when get ready.
	IN3 (Hide)	(Hide info.): some information required are hidden for some considerations (e.g. security).
	IN4 (Mixed)	(mixed info. policies): any mixture of two or three of I1, I2, and I3
Medium of Interaction	RM1 (Manual)	Manual medium used for interaction.
	RM2 (Electronic)	Electronic medium used.
	M3 (Mixed)	Mixed of M1 and M2.

Table 8.4 The Policies and their Definitions Used for Handling the Defined Problem Frame

Interest Sets	Recruitment Policies			
	Timeframe Weight (1-5)	Time Length Weight (1-5)	Information Weight (1-5)	Rec. Medium Weight (1-5)
5	TF6 (5)	TL1 (5)	IN1 (5)	RM2 (5)
4.5	TF3 (4)	TL1 (4)	IN1 (5)	RM2 (5)
3.5	TF3 (5)	TL2 (2)	IN1 (5)	RM1 (2)
4	TF2 (5)	TL2 (5)	IN1 (4)	RM1 (2)
3.5	TF2 (4)	TL2 (5)	IN2 (3)	RM1 (2)
2.25	TF4 (2)	TL2 (2)	IN4 (3)	RM1 (2)
2.25	TF4 (2)	TL2 (2)	IN1 (3)	RM1 (2)
2.75	TF5 (3)	TL2 (3)	IN4 (2)	RM1 (2)
3.5	TF1 (3)	TL2 (4)	IN2 (4)	RM1 (3)

Table 8.5 Some of the Recruitment Policies and their Interest Sets

8.4.3 UML Metamodel for Problem and Threats

Figure 8.6 shows a UML metamodel for the problem and threats. The problem that the ERBP attempts to solve must address the threats associated with filling a job vacancy and the set of forces that enable those threats. The threats, such as no engagement, withdrawal, and rejection, stop filling of a vacancy and result in some consequences. These consequences should match the threats identified. The forces consist of interest dimensions (recruitware, information, and timing), their elements, and the intervening relationships between these elements. The problem lies in the conflict between these interest dimensions and their elements when the RRs are interacting. Hence, documentation of the problem to solve must consider these kinds of trade-offs and make them explicit.
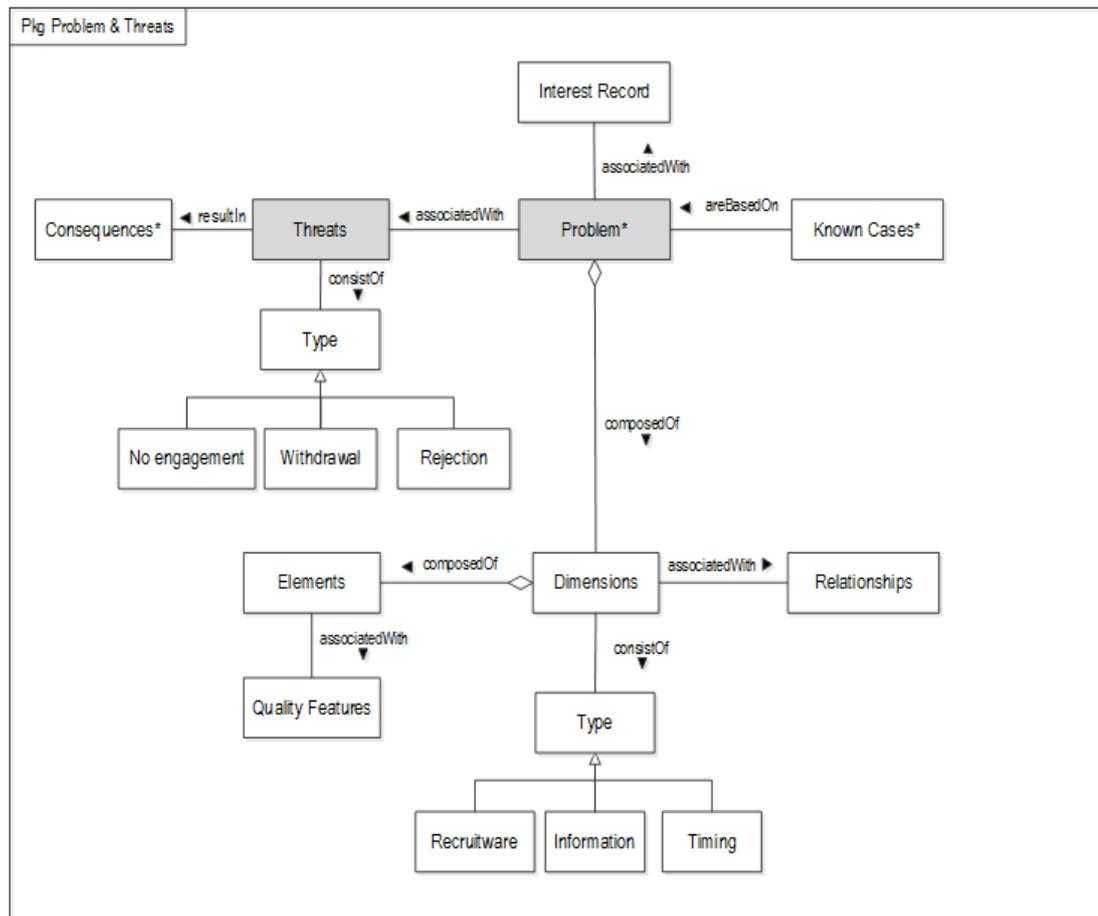
Figure 8.6 UML Metamodel of the Problem and Threats

8.4.4 UML Metamodel for Solution

Solutions cannot function in isolation from the system in which it is embedded (Nuseibah and Easterbrook, 2000). In Figure 8.7, the UML metamodel for the solution element defines four system viewpoints. The first is the RPD (recruitment problem definition) which is related to the problem environment and model the type of problem to solve. The other three ERD (early requirements definition), FRD (functional requirements definition), and ERSS (e-recruitment solution specifications) are related to the solution environment and modelled in three levels of system abstractions. To describe the solution of an ERBP, the transformations from the problem environment into the solution environment should be systematic. Hence, the RPD is plugged into the solution viewpoints to ensure a problem-driven solution.

As can be seen in Figure 8.7, the RPD is used by the recruitment analysts to capture the problem domain knowledge and then define the enterprise recruitment problem to solve. The ERD is used by the recruitment analysts to define the early requirements of the system without

considering of the functional aspects of a process. These early requirements are the recruitment policies that the system solution enforce. The FRD is used by the recruitment analysts to define the functional and operational requirements of the system. In this viewpoint, the recruitment mechanisms and actions that the system should perform based on the predefined policies are captured. Finally, the ERSS is used by both the business and software analysts to define the context and specifications of e-recruitment solution. The four models used in the UML metamodel for solution are instantiated over the same set of RRs in a specific context to build the solution for the enterprise problem.
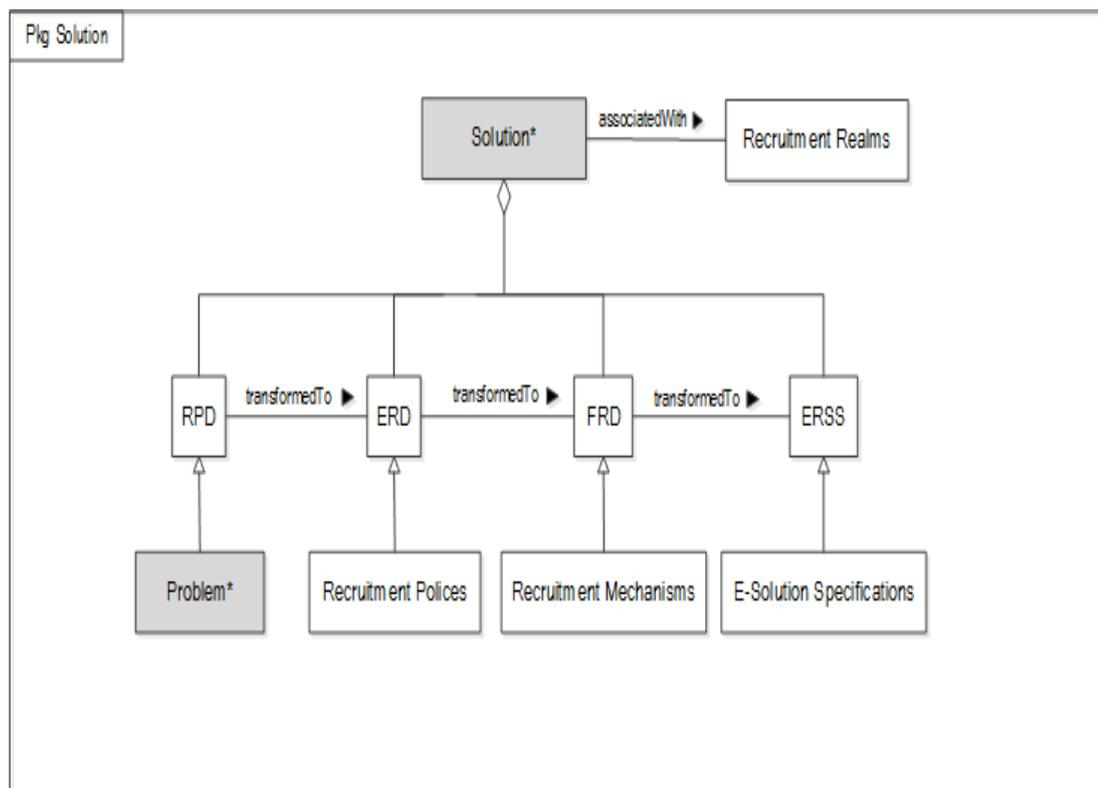
Figure 8.7 UML Metamodel of Solution

8.4.5 UML Metamodel for Stakeholders

Figure 8.8 shows the UML metamodel for stakeholders. The ERBP should provide a qualitative evaluation (set of considerations) of the solution from different stakeholders' perspectives according to the same set of RRs in a specific context. When carrying out the evaluation, the quality features of the Onto-RPD artefact should be used for assessment.
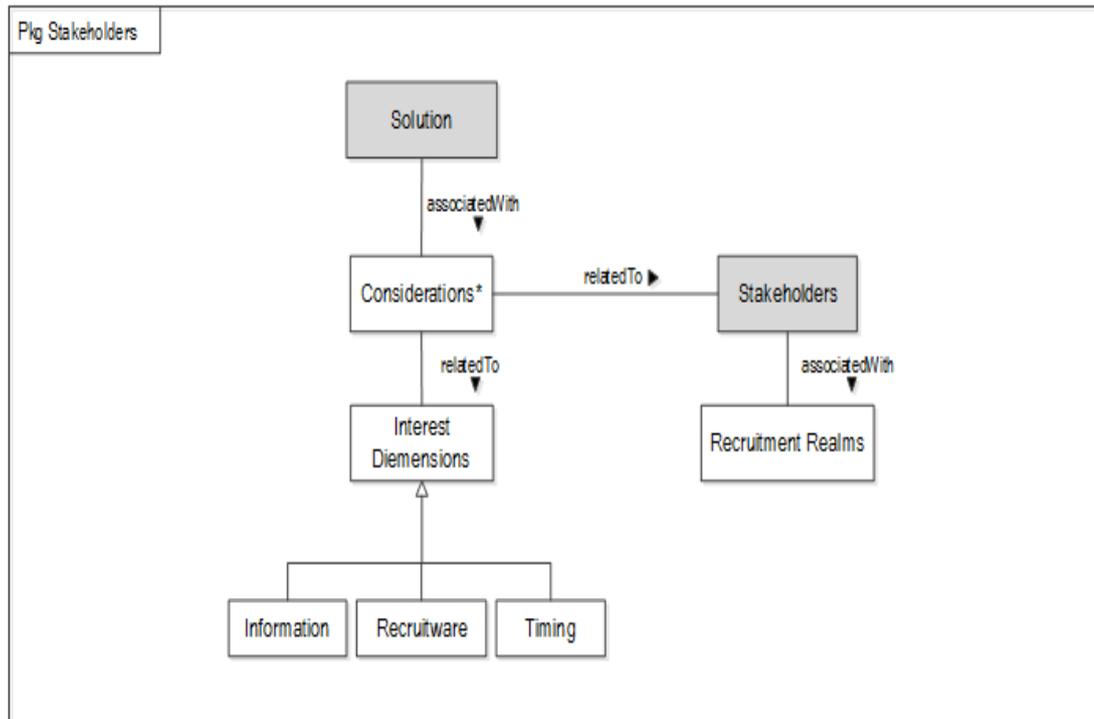
Figure 8.8 UML Metamodel of Stakeholders

8.5 An ERBP Example: Pre-Market Peak Time Recruitment

In this section, an enterprise recruitment best practice example will be presented for clarifying our ideas. This practice could be used by different enterprises from different industries. The practice will be documented according to the template defined in section 8.3.

8.5.1 Intent

The practice is to timely fill a job vacancy in a seasonal labour market.

8.5.2 Context

The choice of representation models is dependent on some aspects such as the type of business or problem, and the features of analysis (Osada et al., 2007; Neetu and Pillai; 2013) Because of this ERBP is time-dependent, the context is represented using UML timing diagram. Thus, Figure 8.9 presents a context diagram of the ERBP. As can be seen, the type of enterprise is a value-chain enterprise. The organisation is the *recruiter*, the suppliers are *job provider* and *qualification provider*, and the customer is the job *applicant*. There are many instances of each realm. The recruiters are fully controlled (*FC*) by the organisation, hence, the organisation can set recruitment policies and mechanisms for the recruiter. The suppliers (qualification providers and job providers) are externally controlled, therefore, the recruiter is dependent on suppliers

and the recruiting organisation (*EC*) can only align with their policies and mechanisms. However, it can have a set of interaction policies agreed on with the suppliers. The applicants (i.e. customers) are from the public, therefore there is no control (*NC*) over them to make interaction policies but they are expected to have (i.e. get influenced) similar recruitment policies to the recruiter because of dependency.
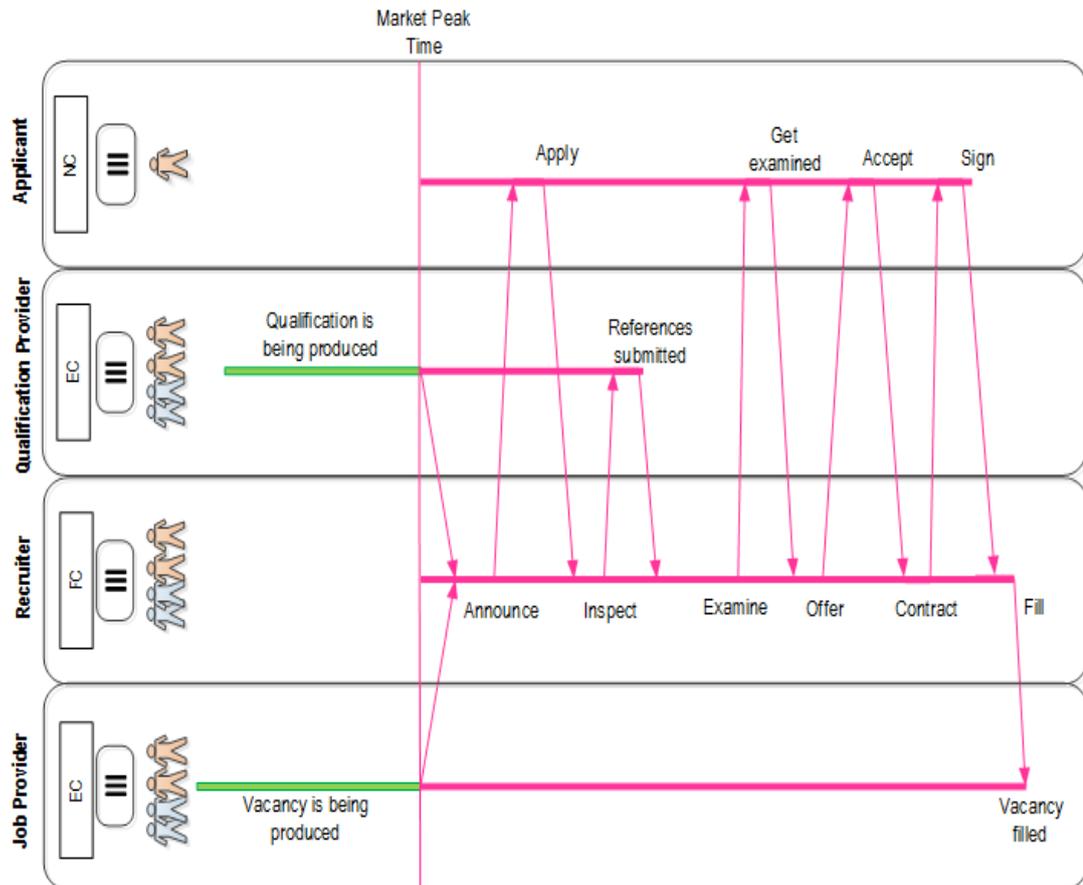
Figure 8.9 Context Diagram

Each realm, except the applicant realm, consists of a group of actors perform the corresponding activities of that realm. The number of actors could be large or small. Some of those actors are shown in different colours to represent difference in the roles performed. For example, within a recruiter realm, roles such as announcer, inspector, examiner, offeror, contractor or hire are all needed. A job vacancy is filled through the interaction between all actors across the enterprise realms. These interactions are distinguished by red and green colours. The red interactions are very critical because they lie in the market season. The start of season is demarcated by the vertical red line. However, the green interactions denote the stage at which suppliers prepare for market season. The context diagram shows the various time intervals of interactions to fill a vacancy.

As shown in the context diagram, both realms (i.e. job provider and qualification provider) align their product lifecycles with the market season as sellers. Because of both being externally controlled (EC) and the recruiter being dependent on them, as an intermediary to market their products to the applicants, is confronted by the seasonality of labour market. Thus, the recruiter has to find ways to mitigate the risk of market season and ensure a successful job opening to fill job vacancies. During the job opening, the recruitment message is prepared and announced by the recruiter, the applications are submitted by the applicant; the application documents are inspected; the references are requested and checked; the recruitment tests are conducted; job offer are extended and confirmed; contract is printed out and signed off; and finally the job gets filled.

The interest record (Section 8.4.2.3) that this ERBP attempts to influence towards a better filling of a job vacancy is shown in Table 8.6. As shown in that table, the interest record of a job vacancy to be improved by this ERBP is (3.20). This interest record is constituted by a collection of the interest sets used by the job provider, recruiter, qualification provider, and applicant. These interest sets are 4, 2.75, 3.37, and 2.75 respectively. These interest sets relate to the interaction policies applied in each RR for recruitment. For the job provider, the policies applied for the interest features (timeframe, time length, information and medium of interaction) are TF5 (pre-on), TL2 (extended), IN1 (given as is), and RM1 (manual) respectively.

Recruitment Realms	Recruitment Policies				Interest Sets	Interest Record
	Timeframe	Time length	Information	Medium of interaction		
Job Provider (EC)	TF2	TL2	IN1	RM1	4	3.20
Recruiter (FC)	TF3	TL2	IN1	RM1	2.75	
Qualification Provider (EC)	TF5	TL2	IN1	RM1	3.37	
Applicant (NC)	TF4	TL2	IN1	RM1	2.75	

Table 8.6 Interest Sets and Interest Record of the Current Problem Situation

The policies applied by the recruiter for the same interest features are TF3 (on-post), TL2, IN1, and RM1 respectively. However, the policies applied by the qualification provider for the same interest features are TF5, TL2, IN1, and RM1 respectively. Finally, the policies applied by the applicant for the same interest features are TF4, TL2, IN1, and RM1 respectively. For more information about the abbreviations used for policies, refer to Table 8.4. When reusing this ERBP, it should be noted that this ERBP is meant to improve job filling in a context that meets

the abovementioned interest record and sets. However, if the context is slightly different from this interest record and related sets, the ERBP can be tailored with some recruitment policies and mechanisms to fit that context.

8.5.3 Problem

Figure 8.10 shows a diagram of the enterprise recruitment problem that the ERBP tries to solve. This problem is associated with the context in which exists, i.e. the context diagram in Figure 8.9. The RPD model refines the context diagram, defining the existing state of the problem situation including the interest levels and interest sets constituting the interest record used by the RRs to fill the job vacancies in this ERBP. The RPD model in Figure 8.10 shows that the problem is largely related to the interest sets of recruiter and applicant which are (2.75) and (2.75) respectively. These interest sets appear on the right corner of each RR in Figure 8.10. The interactions within these two realms which form these interest sets are shown in red colours. The red colours denote the criticality of interactions within the market season according to the recruitment policies applied by the recruiter and applicant realms (refer to Table 8.6). The resulting interest sets from those interactions negatively influence the overall interest record (3.20) to fill a job vacancy. Hence, the low interest record as well as its constituting interest sets and levels provoke a set of threats that might influence filling of job vacancies. Some of the key threats are, as follows:

- Delay in recruitment announcement after the qualification time may lead to loss of competition for high quality applicants.
- In light of many job options available for applicants, the recruiter and other RRs must be accessible otherwise applicants are more likely to miss or ignore a job opening.
- Textual information may not be enough to enable an applicant to assess job fit. This may cause an applicant being not interested to apply or retain in a job opening.
- Manual-based recruitment including application, inspection, examinations, and so on is very prone to delay. This requires the extension of recruitment time.
- The extended time of recruitment interaction may delay response to applicants' inquiries so they might withdraw.
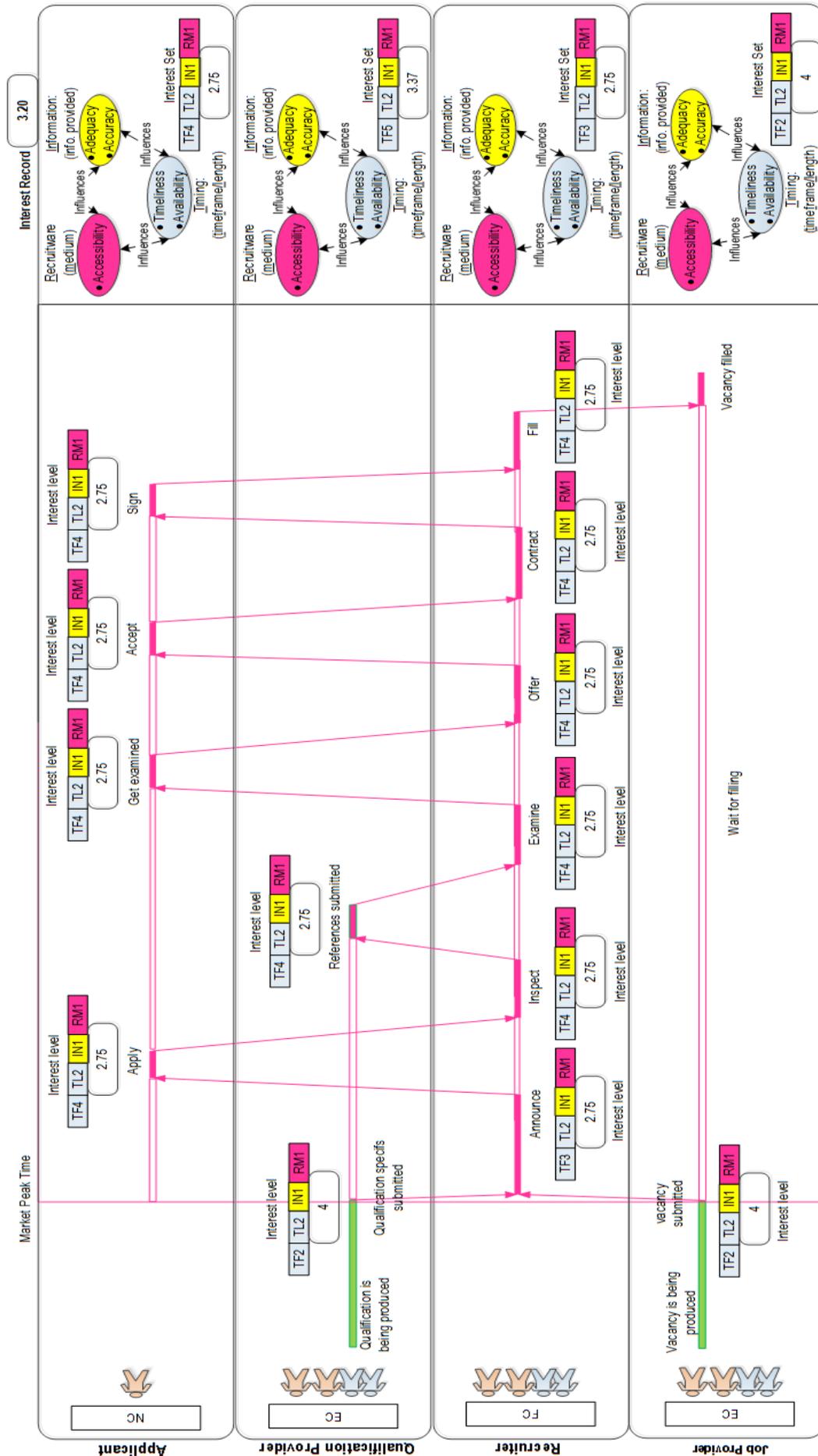
Figure 8.10 The Recruitment Problem Definition (RPD) Diagram

- Remote sites of job opening may need long time spent on travel which makes applicants away of competition for jobs. This concern may stops them from application.

- Delay in response to job offers by applicants may cause recruiter to cancel these offers.

- Time pressure because of market season makes it difficult to recover when some errors occur. This, in turn, may cause rejection.

- Applicants need more time available to decide and act, while the RRs needs less time to fill a job vacancy.

8.5.4 Consequencies

With the RPD model of the problem, there are some threats that may stop filling of a job vacancy. This risk is also related with some undesired outcomes. The outcomes related to this risk can be the following:

- Less number of applicants obtained.
- Inappropriate pool of applicants to select from.
- Cost of withdrawal and rejection.
- Many calls for recovery.
- Bad reputation in the market.
- Loss of competition.
- Fail to build good relationships with the RRs.

8.5.5 Known Cases

In the thesis, the good example that has been faced in which the problem and its related consequences were suffered was the SA enlistment case study. In this case study, aligning the enlistment opening with the end of school year (i.e. market season) to attract post-secondary students led to a bundle of bad outcomes. Because of market seasonality and the extended time for enlistment, some of these outcomes were: a large number of withdrawals, failure to fill job vacancies, long timeframe for enlistment, failure to form an appropriate pool of applicants, and delay in filling.

8.5.6 Solution

The solution of the ERBP problem implies four abstraction models: the RPD, the ERD, the FRD, and the ERSS. The RPD model describes the as-is state of problem situation. The ERD transforms the as-is model into the aspired state of situation (i.e. the aspired state of filling job vacancies) by defining new recruitment policies to change the as-is model including the interest levels, interest sets, and interest record. The FRD transforms these new policies into recruitment mechanisms. Finally, the ERSS will refine the recruitment mechanisms by moving into the e-solution context (i.e. specifications of e-recruitment solution).

8.5.6.1   Recruitment Problem Definition Model

In this RPD model, the purpose is to define the current state of problem situation that this ERBP intends to solve. This includes the various policies and interest levels applied by the RRs in the current state of situation. It also shows the overall interest record used to fill the job vacancy in this ERBP based on the interest sets of RRs. This model is shown above in Figure 8.10. For the problem definition, refer to Section 8.5.3.

8.5.6.2   Early Requirements Definition Model

In this ERD model, new recruitment policies and interest levels to transform the existing state (i.e. as-is) of situation into another aspired one are applied. This is shown in Figure 8.11. As can be seen in that figure, to solve the problem defined in the RPD model and improve the quality of vacancy filling and reduce the risk of the related threats found in the problem new interest record is obtained (3.5). The interest sets of both recruiter and applicant are improved by (3.25) and (3.30) respectively. This improvement is achieved by shifting most of the interactions of the recruiter and applicant from on-market season paradigm to pre-market season paradigm. This implies parallelising these interactions with the interactions of job provider (i.e. vacancy production lifecycle) and qualification provider (qualification production lifecycle). This will enforce new policies to be applied in every RR.

The shift to pre-market season paradigm will reduce the risk of many threats found in the problem previously defined. It will reduce the risk of delay (timeliness) which is intolerant in the market season. On the other hand, this paradigm will allow the extended time of interaction. This, in turn, will improve time availability for thinking and acting, and solve the problem of accessibility with RRs in the absence of electronic-based medium of interaction.
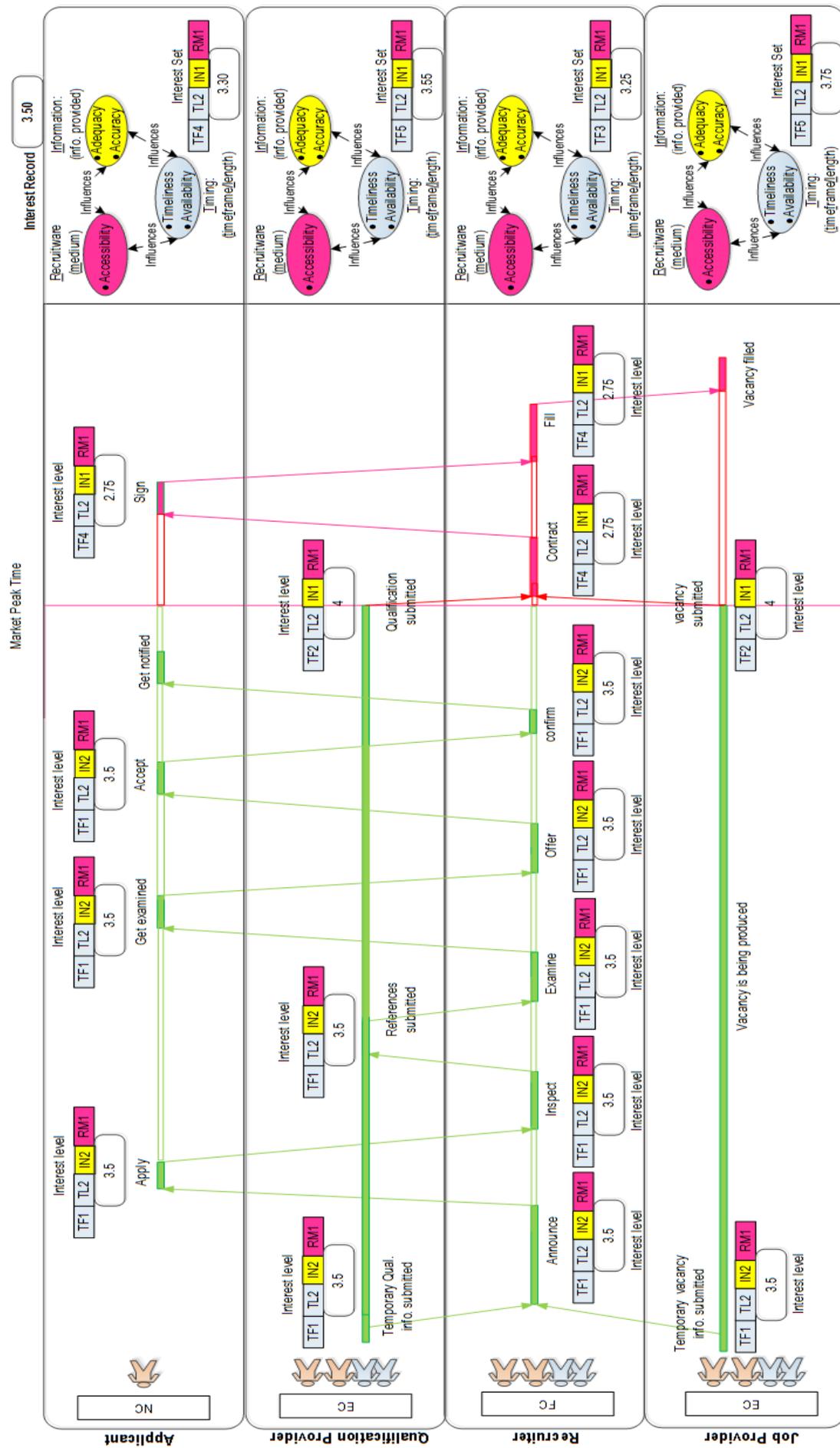
Figure 8.11 The Early Requirements Definition (ERD) Diagram

However, parallelising interactions of RRs in light of their dependencies on each other at a specific time might require some predictive or substitutive information provided towards the provision of the required ones. For example, the recruiter depends on the grade obtained at the end of qualification production lifecycle to hire a job applicant. When parallelising, a temporary grade (predicted one) towards the final grade can be used by the recruiter. Another example, the recruiter also depends on the job provider in providing full information of the vacancy to be filled at the beginning of job opening. Because some information might be not ready (e.g. job location) when parallelising, substitutive or predictive information can be provided towards the completion of information required. Given the fact that these substitutive/predictive information can change during the qualification or vacancy production lifecycles, these information are inaccurate. This inaccuracy increases when the time of provision is far from the time of completion or confirmation. In addition to this, the subsequent information exchanged between the two time events (i.e. provision and confirmation) which are dependent on these substitutive information will be all conditioned until the right information are given.

8.5.6.3   Functional Requirements Definition Model

The FRD Model captures the functional aspects of recruitment process with a view describing how the predefined recruitment policies in the ERD model can be transformed into recruitment mechanisms. In this model, the specific functional requirements and the behaviour of the involved process are represented using BPMN model. See Figure 8.12.

8.5.6.4   E-Recruitment Solution Specifications Model

The ERSS model isolates the context software solution (machine) from the context of business (environment) with distinction of the recruitment activities (mechanisms) carried out in each context. To represent this, a *Shared BPMN model* inspired by the *shared RAD* (Fouad et al., 2011) is used. See Figure 8.13
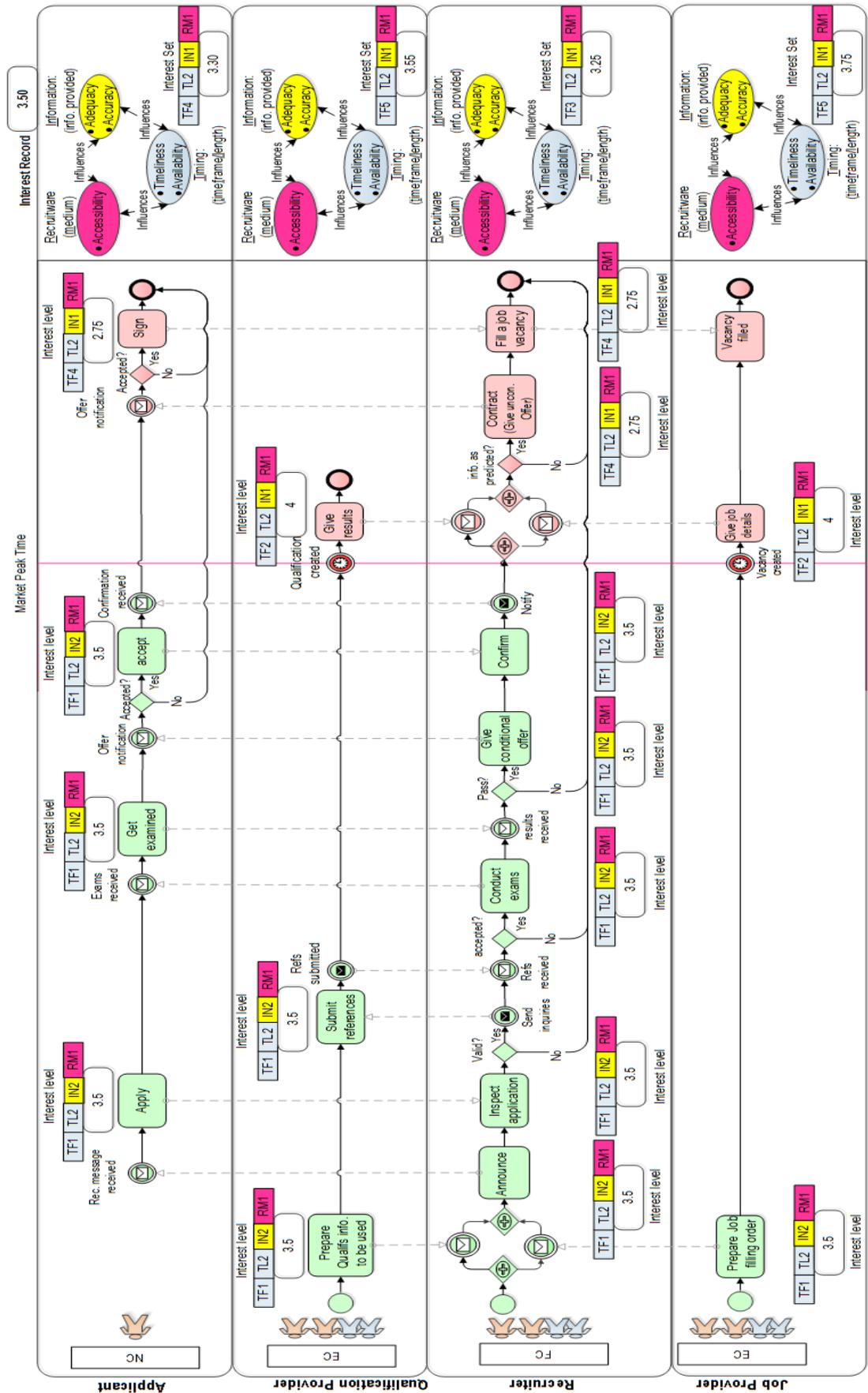
Figure 8.12 The Functional Requirements Definition (FRD) Diagram
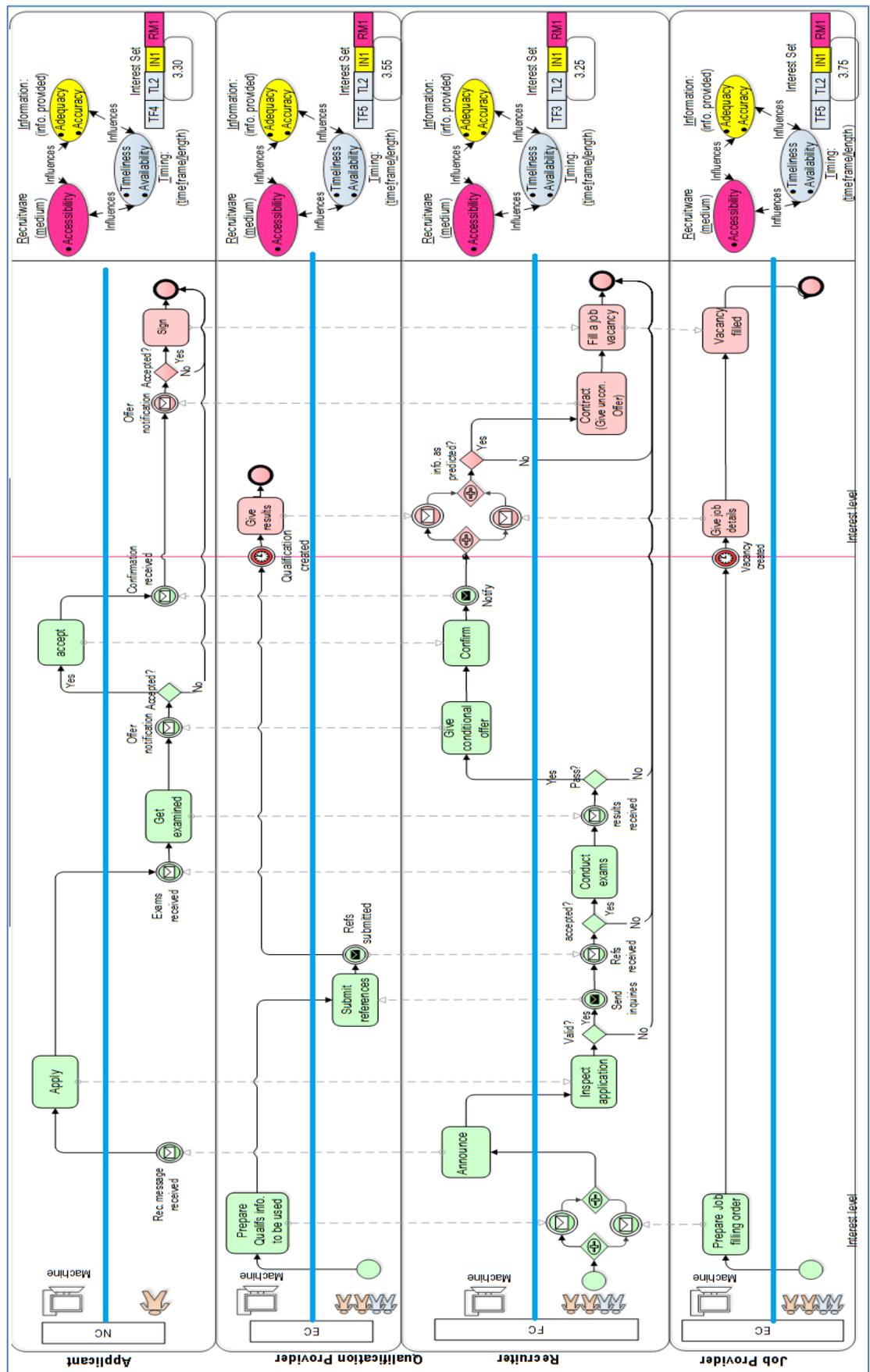
Figure 8.13 The E-Recruitment Solution Specification Model

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8.5.6.5 Considerations

The ERBP solves the risk of the threats found in the problem that are related to some interest dimensions and their features : information (adequecy and accuracy fo information provided), recruitware (accessibility of interaction medium), and timing (availability with the timeframe, and the timeliness of interaction). In addition to this, the considerations section should provide a qualitative evaluation of the solution showing its implications on the other interest dimensions of recrutiment and their features. For example, the solution in this ERBP can have implications on many interest features such as friendeliness of recruitment staff, visibility of RR, reliability of recruitment process, and so on. By refering to the Onto-RPD aretfact developed, these quality features can be evaluated when the ERBP is applied.

8.5.6.6 Known Uses

The UK Undergraduate Universities and Colleges Admission Service (UCAS) is currently applying a similar solution of the one offered in this ERBP to fill their vacancies.

8.6 Summary

One key problem that impedes the realisation of the value of e-recruitment solution is the lack of well-documented best practices. Hence, the recruitment analysts have difficulty in reusing and applying them when facing a recruitment problem. The review of recruitment-related literature has shown that there are some recruitment best practices (RBPs) that are documented in some ways. However, none of them have considered and documented all the elements of an enterprise recruitment. This chapter responded to this gap by combining, in one cohesive Enterprise Recruitment Metamodel (ERM), the major elements of a real-world enterprise recruitment problem with the elements of a template for documentation.

By the means of this ERM, the identification of an enterprise RBPs is facilitated. The recruitment stakeholders and analysts will be provided with the guidelines of: the context of the ERBP, the description of the problem to be solved together with the threats, possible solutions, considerations, and examples of known uses. When a problem faced, the recruitment analysts could reuse the ERBP to provide a top-down strategy based on the models defining the solution in different levels of abstraction. They could also tailor the ERBP's recruitment policies, mechanisms, and e-recruitment solution specifications based on the context of the problem faced.

To support the feasibility ERM, an enterprise recruitment best practice based on pre-market peak time recruitment was documented using the ERM. The resulting ERBP gave insights into the promising contributions of the ERM in structuring and documenting ERBPS towards better sharing and reusing of them. However, this ERBP is still in the infancy phase. According to American Productivity and Quality Centre (1997), a best practice should undergo four steps to be 'best': good idea, good practice, local best practice, and industry best practice. Hence, this ERBP is still a good idea which has not been applied yet to assess its reusability. This opens routes for the future work: (1) to apply this ERBP in different recruitment contexts and domains to prove that it is "best'; and (2) to reflect on these applications for improving the ERM.

Another future work could be the design of a methodology based on the ERM to facilitate the definition and the reuse of ERBPs. This, in turn, would need a framework through which ERBPs can be defined, and a set of tools to support the construction of recruitment information systems.

Chapter 9: Conclusions and Future Work

9.1 Introduction

This chapter summarises the thesis and its main contributions. The research quality is then discussed, followed by recommendations for future work.

9.2 The Summary of Thesis and Contributions

This section presents a summary of the thesis, followed by its contributions.

9.2.1 Summary

The thesis is driven by the failure experienced by the Author in realising the value of a real e-recruitment project in the Secureland Army. After a thorough analysis of this project in reference to the related literature to define the challenges and root causes of the failure, a number of problems are explicated. The problems are presented in Chapter 1. These problems represent knowledge gaps in the research literature which contribute to the practice (i.e. the difficulty of realising the value of e-recruitment) which might have led to the failure in the SA's e-recruitment project. Hence, the overall goal of this thesis was to design artefacts for solving those problems and improving the realisation of e-recruitment benefits.

The overall goal of this thesis was highlighted as:

> *To develop a problem-oriented conceptual model (POCM) for conceptualising and defining recruitment problem viewpoints from an enterprise perspective facilitated by an ontology (Onto-RPD) to elaborate on these viewpoints towards a comprehensive recruitment problem definition, and hence to propose a systematic approach based on the above artefacts for deriving and analysing requirements into the specification for an e-solution. Consequently, this research leads to incorporating the resulting artefacts within an enterprise recruitment metamodel proposed for structuring and documenting the knowledge of Enterprise Recruitment Best Practices (ERBPs).*

This goal was addressed through the following sub-goals:

- To develop a high-level problem-oriented conceptual model (POCM) to capture the various recruitment problem viewpoints (i.e. root concepts) and their relationships. By means of this model, a variety of recruitment problem

definitions (i.e. problem types) from different enterprise perspectives can be obtained.

- To support the POCM with an ontology (Onto-RPD) that explains the root problem concepts and links them with the other related concepts in the problem space. This helps to capture the problem domain knowledge of real-world recruitment problems.

- To develop a systematic RE approach (POCM-RAA) informed by the POCM and its related Onto-RPD to derive requirements towards e-recruitment solution. This POCM-RAA provides systematic guidance using the viewpoints of POCM to structure requirements elicitation and analysis.

- To develop an Enterprise Recruitment Metamodel (ERM) that facilitates structuring and documentation of ERBPs towards a better realising of the value of enterprise e-solutions, and sharing and reusing. The ERM provides a model-driven environment and combines all elements that must be considered when share or reuse the ERBPs. To do this, the elements of the artefacts developed above are integrated with the elements of a template defined for documentation. This, in turn, enables a complete documentation of an ERBP.

The POCM and its related Onto-RPD were developed incrementally using Action-Research conducted on three case studies: the SA enlistment case study, British Army (BA) enlistment case study, and UK Undergraduate Universities and Colleges Admission Service (UCAS). These two artefacts were evaluated through a focus group of 10 experts with full experience in recruitment and representing different recruitment-related domains such as Human resources, marketing, university staff recruitment, university admission, psychology, and so on. The evaluations show that the two artefacts can support the requirements prescribed in section 3.4.2.

The POCM-RAA brought together the POCM and Onto-RPD artefacts with well-established techniques of RE to systematically transform recruitment problem domain knowledge embedded in these artefacts into e-recruitment solution specifications. The approach delivers a set of viewpoints-oriented questions that guide different stakeholders to capture knowledge of a real-world problem and systematically transform it through different levels of abstractions. This guidance was applied through a running example to show its applicability. The POCM-RAA

showed that it can help to structure the requirements elicitation and analysis towards e-recruitment solution specification.

The ERM supports the identification of ERBPs and provides the recruitment analysts with the guidelines of how to reuse them. The ERM is applied using a running example of pre-market season recruitment. The ERM demonstrated its ability to document ERBPs using model-driven enterprise environment. Although the application of ERM is still in an infancy stage, it opens routes for structuring and documenting the ERBPs.

9.2.2 Contributions

The thesis contributes to the knowledge the following:

- A new approach to define recruitment problem using interest-related concepts used as a basis for developing the thesis artefacts.
- Conceptualisation of recruitment problem, using the POCM and its corresponding ontology, for defining the various recruitment problem viewpoints and elaborating them with the key related concepts and features of the problem space.
- A systematic guidance using POCM-RAA, of how the POCM and its related Onto-RPD artefacts can be utilised using the other established approaches of RE for realising the value of e-recruitment solutions.
- An Enterprise Recruitment Metamodel (ERM) used to drive the structuring and documentation of ERBPs based on the artefacts developed and a specific template defined for this purpose.

The thesis provides a valuable contribution into the understanding of recruitment problem from different enterprise perspectives and transforming this understanding into the RE domain for realising the value of e-recruitment solutions. The author developed a high-level Problem-Oriented Conceptual Model (POCM) suited for conceptualising and synthesizing the various problem root concepts of recruitment problem and their relationships, supported by an ontology (Onto-RPD) that explains and elaborates the POCM towards a thorough recruitment problem definition

The research conducted on three recruitment case studies using design science approach supported by Action-Research method came up with a new approach to define recruitment problem. This definition of recruitment using the concept of *interest* and its related features

serves as a foundational basis for building the POCM and its Onto-RPD. These two artefacts provide means of a better understanding and analysis of how recruitment problem may arise, develop, and change over time from an *interest* point of view. The POCM encapsulates the various recruitment problem viewpoints (interest dimensions), each of which being a partial recruitment problem definition as seen from a particular perspective. Thus, it enables representing and reasoning about different, possibly conflicting, aspects of recruitment interests arising from different enterprise recruitment entities.

The POCM-RAA is developed to systematically guide transformation of the knowledge of recruitment problem informed by the POCM into recruitment requirements in a form that is compatible with established RE methods. This transformation is performed through different levels of abstraction towards e-recruitment specification. This POCM-RAA can be easily used by relevant stakeholders including recruitment analyst and engineers.

The ERM provides a route for documenting Enterprise Recruitment Best Practices (ERBPs) using a model-driven enterprise environment to support sharing and reuse. Using the elements of the thesis artefacts developed as well as a template defined for documentation, the ERM combines all elements that must be considered when documenting, sharing and reusing ERBP.

9.3 Research Quality

The development and evaluation of the artefacts developed in this thesis underwent a number of research studies. The overall research framework by which all the artefacts were developed was design science (Johannesson and Perjons, 2014). This framework provided a well-structured approach consisting of four phases through which the artefacts were designed and evaluated. These phases are: explicate problem, define requirements, design artefact, demonstrate artefact, and evaluate artefact. For each phase, there were inputs, outputs, and research techniques used to transfer the input into outputs. In this section, the research quality of each of these phases is discussed.

9.3.1 Research Quality of the POCM and Onto-RPD artefacts Development

The problem for which the POCM and its Onto-RPD were developed was explicated in Chapter 1: sub-problem 1.1 and 1.2 (Section 1.2.1). These were: ill-defined scope of recruitment problem and ill-representation of recruitment problem respectively. These problems denote knowledge gaps in the research that impede the value realisation of e-recruitment projects. The discovery

of these knowledge gaps was achieved through an extensive review of the previous work conducted on the SA e-enlistment project and the related literature such as recruitment and e-recruitment, enterprise architecture, problem definition and representation, and requirements engineering.

After the problem was explicated, a set of requirements were defined. These requirements were used as a basis to evaluate the resulting artefacts and also to guide the construction process of them and any refinement steps. Based on the literature review, the research selected a number of requirements to develop the POCM and Onto-RPD.

For constructing the POCM and Onto-RPD artefacts, the Action-Research (A-R) method (Baskerville and Wood-Harper, 1996) was adopted. The A-R consists of many A-R cycles and hence provides an incremental way to design the POCM and Onto-RPD artefacts. Through these A-R cycles, three case studies are analysed, and accordingly three tentative POCM and Onto-RPD versions are produced. In each A-R cycle, the POCM and Onto-RPD are refined based on the new problem concepts and relationships defined. The choice of research techniques used in each cycle is dependent on the resources available for each case study. In the 1st cycle, the research is inspired by the SSM to capture the various recruitment problem worldviews embedded in the SA enlistment case, and build the corresponding problem conceptual models. To do this, various problem analysis techniques (e.g. CATWOE, RCA, and W5H) and problem definition encapsulation guidelines (e.g. POG formula, PAIIB, and open and axial coding) are applied. Hence, the 1st tentative POCM and Onto-RPD artefacts are produced. The 1st versions of POCM and Onto-RPD were used as a basis on which the concepts extracted from the other case studies are mapped and refined. Using Dedoose software, the concepts extracted from the excerpts from the British Army enlistment case study and UCAS case study were mapped to their counterparts in the tentative POCM and Onto-RPD. In case of new concepts, the POCM and Onto-RPD are incrementally adjusted to incorporate them. The

The final version of POCM and Onto-RPD were demonstrated to the experts involved in the evaluation phase. The artefacts were evaluated using focus group. Ten experts from different recruitment-related domains (e.g. HR, marketing, psychology, and management) were invited. These experts were academic staff and research students from Bournemouth University.

The strength points of the research conducted for developing the POCM and Onto-RPD are, as follows:

- Design science framework provides a well-structured and smooth approach to develop artefacts.

- The Action-Research method (plan, act, observe, and reflect) was used to incrementally develop the artefacts.

- The method of developing the artefacts was not a process of consolidating partial vocabularies from the literature. Nor was it a matter of creating neologisms. Rather, the artefacts were developed through bottom-up analysis of problem definitions expressed by involved stakeholders using methods associated with the development of grounded theory.

- The research was based on three real-life case studies.

- The case study research is open to many research techniques to be used with it.

- The research adopts the constructivist view of problem which links the problem concepts to the real life. Hence, the SSM is used.

- The Dedoose software facilitated the mappings between concepts from different case studies.

The weakness points of the research can be, as follows:

- The artefacts were only evaluated by 10 experts from Bournemouth University. This reflects the need to evaluate the artefacts in different industries.

- The lack of formality with the artefacts. However, problems are conceptual in their nature, they involve a relationship of conflict between reality and someone's belief (Smith, 1989). Thus, formal models cannot encompass the richness of problem definition.

- There might be some concepts and relationships missing in the artefacts. This can be justified that the real-world problem is very complex having a huge account of concepts and relationships which are hard to be represented in one model. Therefore. The research is restricted to the problem concepts that often appear in daily problem definitions.

- There might be a need to apply these artefacts in different case studies from heterogeneous domains. This seems logical, however, the thesis is limited to time and cost for such application.

9.3.2 Research Quality of the POCM-RAA Artefact

The problem that the POCM-RAA is meant to solve was explicated in Chapter 1: sub-problem 1.2 (Section 1.2.1). The problem was: the lack of integrative RE to transform knowledge of recruitment problem to the e-recruitment solution. Hence, the POCM-RAA links the POCM into the extended MDA developed by Fouad et al. (2011). The ex-MDA (Fouad et al., 2011) supports a RE process in the problem domain using well-established RE techniques. Driven by the framework, the POCM-RAA consists of a four-phase process: recruitment problem definition, early requirements definition, functional or behavioural requirements definition, and e-recruitment solution specifications. To enable a smooth transformation from recruitment problem definition to the e-recruitment specifications, a number of modelling techniques within each phase are suggested. Informed by the POCM, the approach delivers question-based guidance using the POCM's problem viewpoints to structure and the RE. A bundle of questions related to the elements of POCM and its quality features are derived from the literature. Hence, requirements are generated by considering the pertinent questions with each problem viewpoint. The application of POCM-RAA using running example of the SA enlistment problem in cooperation with a *WhatsApp's SA* stakeholders group gave good insights into the feasibility of POCM-RAA. The weakness point is that the difficulty to communicate the intricacies of real-world recruitment problem to the business audiences with little or no background in the social science.

9.3.3 Research Quality of the ERM Artefact

The problem for which the ERM artefact was developed was explicated in Chapter 1: problem no.2 (Section 1.2.2). The problem was: the lack of knowledge about how enterprise RBPs can be successfully modelled and documented. To solve this problem, the artefacts developed for addressing real-world recruitment problems are integrated with a template defined to model all elements that must be considered when documenting ERBPs in a specific context. The ERM was supported by a number of diagrams to describe it. The benefits of the ERM are that it helps recruitment analysts to identify an ERBP and the context in which functions. It supports the analysts in selecting and applying ERBPs in the right places. The weak point in this research was that the ERM is still in an infancy stage so that it requires an extended research to prove its feasibility. Another limitation is related to the ERBP titled 'pre-market season recruitment'. A BP undergoes four steps to be 'best' (American Productivity and Quality Centre, 1997): good idea, good practice, local best practice, and industry best practice. The 'pre-market season recruitment' is still considered as a good idea which needs many applications in practice.

9.4 Research Beneficiaries

The artefacts that are built in this thesis can be benefited from both recruitment-related business and software communities. From a business perspective, the beneficiaries can be, as follows:

- The whole spectrum of enterprise recruitment stakeholders (e.g. HR managers and staff, universities and college admission staff, and recruitment partners) can use the domain-independent POCM and Onto-RPD to generate recruitment problem domain knowledge from an enterprise perspective.

- Recruitment stakeholders can the POCM and Onto-RPD to define the deep structure of a recruitment problem by tracing the causal chain of the presenting problem stimulus.

- Recruitment business analysts can use the Onto-RPD to identify the wide range of relevant stakeholders for involvement in requirements elicitation and analysis.

- Recruitment business analysts can use the POCM-RAA to transform the domain knowledge to the e-recruitment solution through different abstraction levels which enables the realisation of e-recruitment solution benefits.

- Recruitment stakeholders including recruitment analysts and engineers can use the ERM to define an enterprise recruitment problem, its solution, and the context in which it exists which enables a better selection of ERBPs for reuse.

From a software perspectives, the beneficiaries can be, as follows:

- Recruitment software engineers and designers can use the POCM-RAA to connect software design with the recruitment problem domain.

- Recruitment software engineers and modellers can use the POCM-RAA to automatically generate the design models and requirements from those models of the problem domain.

9.5 Future Work

The thesis has focused on developing four artefacts: POCM, Onto-RPD, POCM-RAA, and ERM. An immediate suggestion for future research is to apply these artefacts using multiple case studies to prove their feasibility. This can provide valuable and unique insights into the usability and applicability of them. It can also be used to investigate the artefacts in depth and provide a deep understanding of the complexity and subtlety of real-world recruitment problems.

Another direction of future work is to extend the artefacts in order to fit different domains. The POCM and Onto-RPD artefacts can be customized according to the requirements and needs of a specific domain by identifying and including domain-specific recruitment problem concepts. This could also be the case for the ERM with different contexts of enterprises. In research quality section above, a number of potential drawbacks are identified with the artefacts related to:

- The need of extensive resources and research materials.
- The complexity of the artefacts: POCM, Onto-RPD, POCM-RAA, and ERM, stems from the nature of real-world recruitment situations.
- The implications of such complexity on requirements such as perspicacity, abstraction, and minimality.

These drawbacks offer suggestions for future work. The implications on requirements abovementioned need to be taken seriously. It can be addressed by complementing the artefacts with suggested solutions of representing the real-world problems that enhance these requirements.

Other directions of future work may also include formalising and automating these artefacts with some languages or software tools. They may also refine and further evaluate the design science method used for developing the artefacts. This can be enhanced by examining the requirements of the design with practitioners in industry, and can include them in the design process.

9.6 Summary

The chapter outlined the thesis and its contributions to the knowledge. It also discussed the quality of research conducted for developing the thesis artefacts and finally proposed directions for future work.

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Appendices

Appendix 1: The Sample of Questionnaire Used in Developing POCM and Onto-RPD Artefacts (English Version)

Copy of SecureLand survey

Welcome to My Survey

Thank you for participating in this survey. The aim of survey is to identify the problems in enlistment process at SecureLand from an applicant perspective, and to evaluate the impact of these problems upon the potential, actual and previous applicants. There are 13 questions which might take you around 20 minutes.

For further information or inquiries please feel free to contact me on: salamro@bournemouth.ac.uk

Your feedback is highly appreciated.

Saleh Alamro
PhD Candidate

Supervisors:
1. Dr. Huseyin Dogan
2. Prof. Keith Phalp

Faculty of Science and Technology
Bournemouth University,
Poole,
United Kingdom

Copy of SecureLand survey

Survey Terminology

Definitions:

Applicant - A student who has finished/ about to finish the third year at secondary school (year-12 at basic education).

Application Information - such as entry requirements, location, time, reception, etc.

Assessment information - such as tests, interviews, physical assessment, sites, etc.

Enlistment - Self-joining the military for service as non-officer member.

Enlistment Process - the process by which an individual becomes non-officer member in the military which starts with application and ends up with an applicant being allocated a positon.

Enlistment Activities - includes announcement, application, assessment, offering and hiring.

Enlistment Staff - such as HR officer, enlistment officer, assistant officer, enlistment employee, etc.

Employer - the military organisation an enlisted individual works for.

Employer infor. (characteristics) - such as name, mission, activities, structure and units, jobs provided, etc.

Hiring Information - such as contracting, signing, embarkation, etc.

Job info. (attributes) - such as rank, salary, benefits, type of activity, military unit, location, etc.

Enlistment notifications - such as notifications of job opening, application acceptance, asessment pass, offering, hiring, etc.

Post-hire information - such as training, environment of work, promotion, movements, retirements, etc.

Copy of SecureLand survey

Survey Audience

Reminder:
This survey is intended for the following categories:
1. A potential / actual / previous applicant who (intends to) applies / applied to enlistment using his secondary school certificate.
2. An enlistment staff who participates / has participated in enlistment process.

1. What type of respondent are you?

○ Likely to apply for enlistment (potential applicant).

○ Currently applying for enlistment (actual applicant).

○ Previously applied for enlistment (previous applicant).

○ Enlistment staff

Copy of SecureLand survey

Types of Previous Applicant

2. Being a previous applicant, please select your current state.

○ Hired.

○ Rejected.

○ Self-dropped out.

Copy of SecureLand survey

Timing of Drop-out

3. Being self-dropped out or rejected, at which stage did this happen?

○ At announcement stage

○ At application stage.

○ At assessment stage.

○ At offering stage.

○ At hiring stage.

○ At post-hire stage

Please comment why?

[   ]

Copy of SecureLand survey

Demographic information

4. What is / was your grade in secondary school?

○ Excellent (>=90)

○ Very good (>=80 and <90)

○ Good (>=65 and <80)

○ Accepted (<65)

5. In which region of the country do you live?

○ Middle Region

○ West Region

○ East Region

○ North Region

○ South Region

○ West North Region

6. Where is / was the school or institute you intend to apply for / apply / applied through?

○ Middle Region

○ West Region

○ East Region

○ North Region

○ South Region

○ West North Region

○ Currently not known

Copy of SecureLand survey

Motivations to the Miliary

7. To what extent are / were you encouraged by the following to join the military? (Please rank 1 being the most important and 13 being the least important; or select N/A for the statements not applied)

	Direct participation in protecting the country.	☐ N/A
	Job security.	☐ N/A
	Encouraged by relatives and friends.	☐ N/A
	Perceived fairness	☐ N/A
	No interest to complete university/college education	☐ N/A
	The reputation of military sector.	☐ N/A
	The reputation of recruitment process.	☐ N/A
	The familiarity with military work.	☐ N/A
	Competitive and attractive jobs.	☐ N/A
	Diversity in regions, corps, jobs, and people.	☐ N/A
	Job requirements are easy to meet.	☐ N/A
	Fast track to the job	☐ N/A
	Transparency	☐ N/A

Copy of SecureLand survey

Prioritising Important Information

8. Evaluate the following based on the importance of each when you apply / applied for enlistment. (Please rank 1 being the most important and 8 being the least important; or select N/A for irrelevant statements).

	Job activity.	☐ N/A
	Job title.	☐ N/A
	Job salary.	☐ N/A
	Work hours.	☐ N/A
	Job benefits.	☐ N/A
	Job rank.	☐ N/A
	Job location (geographical site).	☐ N/A
	Job qualification	☐ N/A

Copy of SecureLand survey

Adequacy of Information Conveyed

9. Rank the following statements with regard to the adequacy of information provided at enlistment opening.

I feel that the information provided are / were sufficient with respect to:

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
Employer characteristics	○	○	○	○	○

Please comment upon your choice or explain why?

Job attributes	○	○	○	○	○

Please comment upon your choice or explain why?

Application info.	○	○	○	○	○

Please comment upon your choice or explain why?

Assessment info.	○	○	○	○	○

Please comment upon your choice or explain why?

Offering info.	○	○	○	○	○

Please comment upon your choice or explain why?

Hiring info.	○	○	○	○	○

Please comment upon your choice or explain why?

Post-hire info.	○	○	○	○	○

Please comment upon your choice or explain why?

Enlistment notifications	○	○	○	○	○

Please comment upon your choice or explain why?

Copy of SecureLand survey

Perceptions of Timing of Information Provision

10. Rank the following statements with regard to timing of information provided during enlistment process.

I am / was satisfied about the time at which the following information are conveyed:

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
Employer information.	○	○	○	○	○

Please comment upon your choice or explain why?

| Job attributes. | ○ | ○ | ○ | ○ | ○ |

Please comment upon your choice or explain why?

| Application info. | ○ | ○ | ○ | ○ | ○ |

Please comment upon your choice or explain why?

| Assesment info. | ○ | ○ | ○ | ○ | ○ |

Please comment upon your choice or explain why?

| Selection and offering info. | ○ | ○ | ○ | ○ | ○ |

Please comment upon your choice or explain why?

| Hiring information. | ○ | ○ | ○ | ○ | ○ |

Please comment upon your choice or explain why?

| Post-hire Info. | ○ | ○ | ○ | ○ | ○ |

Please comment upon your choice or explain why?

| Enlistment notifications. | ○ | ○ | ○ | ○ | ○ |

Please comment upon your choice or explain why?

Copy of SecureLand survey

Capturing Perceptions of Current Enlistment Process

11. Rank the following statements with regard to current enlistment process.

I am / was satisfied because.....

	Strongly Disagree	Disagree	Neither Disagree Nor Agree	Agree	Strongly Agree
The time is/was available to decide and act for enlistment.	○	○	○	○	○
The site where I apply and get assessed is/was accessible.	○	○	○	○	○
The enlistment staff are/were helpful and friendly.	○	○	○	○	○
The enlistment staff are/were regionally diversed.	○	○	○	○	○
I am/was sure that the employer and Job represnt a good fit.	○	○	○	○	○
I am/was sure that I get offered with the job I apply for.	○	○	○	○	○
I am/was free to self-drop out of consideration whenever I want.	○	○	○	○	○
I can apply for different job choices available.	○	○	○	○	○
I can re-apply for different job choices.	○	○	○	○	○
I can track my application and get feedback.	○	○	○	○	○

Copy of SecureLand survey

Investigating the impact of key elements of recuitment

12. Rate the importance of the information (described in each row) in influencing an applicant's interest towards the actions (described in each column).

Please select (0) being not important, (1) being moderately important, or (2) being very important:

	To apply for enlistment	To stay until job offering	To accept job offer	To sign for a job
Employer characteristics	☐	☐	☐	☐
Job attributes	☐	☐	☐	☐
Application information	☐	☐	☐	☐
Assesment information	☐	☐	☐	☐
Selection and offering information	☐	☐	☐	☐
Hiring information	☐	☐	☐	☐
Post-hire information	☐	☐	☐	☐
Notifications	☐	☐	☐	☐

13. Rate the importance of the following items (described in each row) in influencing an applicant's interest towards the actions (described in each column).

Please select (0) being not preferred, (1) being less preferred, or (2) being most preferred:

	To apply for enlistment	To stay until offering	To accept job offer	To sign for job
Recruiter behaviour	☐	☐	☐	☐
Site of job opening	☐	☐	☐	☐
Job alternatives	☐	☐	☐	☐
Site alternatives	☐	☐	☐	☐
Process alternatives	☐	☐	☐	☐
Length of enlistment process	☐	☐	☐	☐
Responsiveness	☐	☐	☐	☐

Please comment upon your choices or explain why?

Copy of SecureLand survey

The End Of Survey
Thank you for participation

Appendix 2: A Sample of the Questionnaire Translated and Filled in Arabic

المقدمة

..... مرحباً بك في هذه الدراسة

في البداية اود ان اشكرك على مساهمتك في هذه البحثية هدف هذا المسح الميداني حول المشاكل المرتبطة بعمليات الاستقبال والتجنيد في القوات العسكرية في الدولة مدار البحث، وقيـــاسـتأثيراتها على المتقدم. تحتوي هذه الدراسة على 13 فقرة والتي قد تستغرق مايقارب 20 دقيقة لاجابتها

لمزيد من المعلومات او الاستعلام الرجاء التواصل مع الباحث على البريد الالكتروني

(salamro@bournemouth.ac.uk)

تعاونكم محل تقديرنا ....

الباحث
صالح عبدالعزيز العمرو
طالب دكتوراه

المشرفين
د. حسين دوفان
أ. م كيث فالب

كلية العلوم والتقنية
جامعة بورمث
المملكة المتحدة

مصطلحات البحث

.... مصطلحات الدراسة

المتقدم المستهدف في الدراسة طالب ثانوي الراغب بالالتحاق بالمجال العسكري بعد اتمام شهادة الثانوية

معلومات التقديم: مثل شروط التقديم ومكان الاستقبال والتوقيت واجراءات التقديم والفرز

التجنيد اختيارك الذاتي للالتحاق بالخدمة العسكرية كمجند برتبة فرد

عملية التجنيد: هي العملية التي بموجبها يصبح الشخص رسميا ضمن افراد القوات العسكرية وتبدأ بالتقديم وتنتهي بالتسجيل الرسمي كطالب عسكري

اجراءات التجنيد تضم التقديم والفرزوالتقييم والترشيح والقبول والتسجيل الرسمي كطالب عسكري

موظف التجنيد: احد المسئولين او العاملين في التجنيد من الضباط والافراد مثل ركن ادارة او ضابط افراد او ضابط تجنيد وتدريب او ضابط صف تجنيد

الجهة المعينة السلاح او الادارة التابع لها المجند

معلومات جهة التعيين:مثل اسم السلاح ومهمته ووظائفه وتشكيله ووحداته وطبيعة الوظائف الخاصة به

معلومات التعيين:مثل معايير التعيين و اعتبارات التعيين على الوحدات واصدار القرار والمباشرة

معلومات الوظيفة:مثل الرتبة والراتب والمزايا والبدلات ونوع النشاط والوحدة التابعه لها والمنطقة واخرى

مركز الاستقبال: المدرسة العسكرية او المعهد او اي جهة اخرى مسئولة عن تنفيذ اجراءات التجنيد

معلومات الترشيح والاختيار:مثل طرق الترشيح و معايير الاختيار واعتبارات الاختيار

.... تذكير

عينة الدراسة تستهدف التالي

* متقدم محتمل (انوي التقديم

* متقدم حالي

* متقدم سابق

* احد الاعضاء المسئولين او المشاركين في التجنيد

1.

اود ان اشارك في هذه الدراسة كـ :ـ

◯ متقدم حالي

◉ متقدم سابق

☑ (احد المسئولين او المشاركين بعملية التجنيد (ركن ادارة, ضابط اقراد,ضابط تجنيد، ضابط صف تجنيد، ضابط تدريب، اخرى

* متقدم جامعه على التجنيد متى الانسحاب والتقديم مع كلية
الضباط ب.
* حديثاً اعمل ضابط تجنيد ضمن فريم التجنيد المكتف في
احد المدارس.

حالة المتقدم السابق

2.

اذا كنت متقدم سابق, الرجاء حدد وضعك الحالي:ـ

◯ معين

◯ مستبعد

☑ منسحب

توقيت الانسحاب او الاستبعاد

3.

اذا كنت منسحب او مستبعد , الرجاء حدد في اي مراحل عملية التجنيد تم ذلك :ـ

- ⚪ في فترة الاعلان عن التقديم
- ✔ في فترة التقديم
- ⚪ في فترة التقييم والاختبارات
- ⚪ بعد القبول المبدئي
- ⚪ بعد القبول النهائي
- ⚪ بعد بداية التدريب

الرجاء اذكر السبب

[handwritten text in Arabic]

معلومات عامة

4.

حدد تقديرك العام :ـ

- ⚪ ممتاز
- ✔ جيد جدا
- ⚪ جيد
- ⚪ مقبول

5.

حدد المنطقة التي تسكن فيها وقت التقديم على التجنيد

- ✔ الوسطى
- ⚪ الغربية
- ⚪ الشرقية
- ⚪ الشمالية
- ⚪ الجنوبية
- ⚪ الشمالية الغربية

6.

حدد المنطقة التي يوجد بها مركز الاستقبال او المدرسة او المعهد والذي (سوف تقدم/ اوقدمت) على التجنيد من خلاله :ـ

- ⚪ الوسطى
- ⚪ الغربية
- ⚪ الشرقية
- ⚪ الشمالية
- ✔ الجنوبية
- ⚪ الشمالية الغربية
- ⚪ غير معروفة الان

الدوافع للعمل العسكري

7.

الى اي مدى تجد العوامل التالية تدفعك نحو الالتحاق بالعمل العسكري؟ (الرجاء ترتيبها 1 الاعلى تأثيراً 13 الاضعف تأثيراً او اختر غير مؤثرة) -

		غير ☐ مؤثرة
✓ المشاركة المباشرة في الدفاع عن الدوله	٩	
الامان الوظيفي	٢	غير ☐ مؤثرة
تشجيع الاهل والاصدقاء	٤	غير ☐ مؤثرة
تكافؤ الفرص	٩	غير ☐ مؤثرة
عدم الرغبه باكمال الدراسه الجامعية	٣	غير ☐ مؤثرة
سمعة القطاع العسكري	٧	غير ☐ مؤثرة
سمعة عمليات الاستقبال والتجنيد		غير ☑ مؤثرة
التأقلم مع العمل العسكري		غير ☑ مؤثرة
الوظائف جاذبة ومنافسة		غير ☑ مؤثرة
التنوع في المناطق والاسلحة والوظائف والاشخاص	٨	غير ☐ مؤثرة
سهولة متطلبات الالتحاق	٥	غير ☐ مؤثرة
خيار اسرع للوظيفه	٦	غير ☐ مؤثرة
الشفافيه والوضوح في التجنيد		غير ☑ مؤثرة

320

ترتيب العناصر الهامة عند التقديم

8.

الى اي مدى العناصر التالية تهمك عند التقديم على التجنيد؟ (الرجاء ترتيبها 1 الاكثر اهمية 8 الاقل اهمية او اختر غير مهمة) ـ

		غير مهمة
نشاط الوظيفة	٧	☐
مسمى الوظيفة	٦	☐
راتب الوظيفة	٢	☐
ساعات الدوام الوظيفي	٨	☐
بدلات ومزايا الوظيفة	٣	☐
رتبة الوظيفة	١	☐
موقع الوظيفة (المنطقة)ـ	٤	☐
مستقبل الوظيفة	٥	☐

كفاية المعلومات المعطاة

9.

قيّم العبارات التالية بخصوص اكتمال المعلومات المعطاة للمتقدمين من حيث الكم والجودة :ـ

	لا اوافق بشده	لا اوافق	محايد	اوافق	اوافق بشده

المعلومات الخاصة بجهة العمل كافية

الرجاء وضح سبب اختيارك

معلومات عن القوة غير متوفرة وكذلك معدلات السوق أنشطته ارتفاعاته وبما فيه غير متوفرة

المعلومات الوظيفية المعطاة كافية

الرجاء وضح سبب اختيارك

غير كافية لا يعرف عن الوظيفة ... المعلومات الكافية م معلومات كثيرة مفقودة مثل أيضا الوظيفة مقابل يشمل عنايه القصار الدورة غير ذلك

معلومات اجراءات التقديم كافية

الرجاء وضح سبب اختيارك

غير واضحة اجراءات الاختيار والترشيح وكذلك التدريب والتعيين

معلومات الاختبارات وطرق التقييم كافية

الرجاء وضح سبب اختيارك

غير كافية ولا يوجد شفافية

معلومات اجراءات الاختبار للمرشحين كافية

الرجاء وضح سبب اختيارك

غامضة وغير معروفة بلا أمر يستطيع عرض ذلك .

معلومات الترشيح ومتطلباته كافية

الرجاء وضح سبب اختيارك

معلومات التدريب بعد القبول النهائي كافية

الرجاء وضح سبب اختيارك

لا يوجد معلومات غير يمكنه الفصل الدورة بياناتها

خدمة الاشعارات كافية

الرجاء وضح سبب اختيارك

لا يوجد شعبية اتصال غير الهاتف مع مبعوثة التواصل مهم .

تقييم مستوى الرضا عن توقيتات المعلومات

10.

اعتمادا على توقيتات المعلومات الرجاء قيّم العبارات التالية :ــ

| | أوافق بشدة | أوافق | محايد | لا أوافق | لا أوافق بشدة |

توقيت اعطاء معلومات جهة العمل مناسب
الرجاء وضح سبب اختيارك

نيما يخص السـلاح نُنقد أنا الوظيفة لـد .

توقيت اعطاء المعلومات الوظيفية مناسب
الرجاء وضح سبب اختيارك

غير مكتمل في البداية فمثلا المكان الوظيفي كطبقة بشكل الوظيفة ليذكرون
يأخذ بداية التسجيل

توقيت اعطاء معلومات اجراءات التقديم مناسب
الرجاء وضح سبب اختيارك

توقيت اعطاء معلومات اجراءات الاختبارات والتقييم مناسب
الرجاء وضح سبب اختيارك

هذه المعلومات غير متوفرة مطلقاً

توقيت اعطاء معلومات اجراءات الاختبار والترشيح مناسب
الرجاء وضح سبب اختيارك

لا يمكن الاطلاع من المدرب خير الخامسة لطرقة ترشيحه لماذا ؟
ثم لية اختياـــ طبيعتك أيضاً رتدأعلم

توقيت اعطاء معلومات اجراءات التسجيل الرسمي مناسب
الرجاء وضح سبب اختيارك

المتقدم رسميا .

توقيت اعطاء معلومات اجراءات التدريب بعد القبول مناسب
الرجاء وضح سبب اختيارك

غير متاحة نظراً لضرورة الإبدار المباشر لهذا النوع منزالله ربى غير
المحتوى لدى أنفسة المترب

توقيت الاعلانات والاشعار مناسب
الرجاء وضح سبب اختيارك

نيما يخص المسارات التقديم في البداية مراحلهم أساس العمليات
القبول ، المراجعة . الرئيسي لم نكمل في ذلك بـ كام صفان يأمر
كبير ما جعلنا نفقد الثقة في التعيينات .

تقييم الفاعلية لعملية التجنيد الحالية

11.

قيّم العبارات التالية فيما يتعلق بعملية التجنيد الحالية :ـ

العبارة	لا أوافق بشدة	لا أوافق	محايد	اوافق	اوافق بشدة
وقت عملية التجنيد مناسب ويتيح التفكير واتخاذ القرار		✓			
موقع الاستقبال قريب من المتقدمين	✓				
طاقم العمل في مركز الاستقبال يقدم الخدمة بشكل متعاون	✓				
طاقم العمل في مركز الاستقبال متنوع من جميع المناطق				✓	
المتقدم يستطيع تحديد ما اذا كانت الوظيفة تناسبه ام لا			✓		
المتقدم يستطيع التنبؤ بتعيينه بالوظيفة المطلوبة	✓				
المتقدم يملك الخيار للانسحاب متى ما اراد				✓	
اكثر من فرصة وظيفية يمكن للمتقدم التقديم عليها					✓
هناك فرص بديله متاحة للمتقدم للتحول اليها عند الحاجة			✓		
يستطيع المتقدم متابعة طلبه والحصول على معلومات وقتيه		✓			

* التقديم في وقت توزيع الشهادات يخلق مشكلة في تحديد الحياة المراد التقديم عليها ونظراً لقصر الوقت المتاح قد يستعجل المتقدم ويكون خياره غير موفق.
* التقديم كان في المنطقة الجنوبية وكان بعيد جداً غير مكان اقامتي.
* كان هناك اعداد ضخمة وكبيرة جداً لا يقاس استيعابها في اول ايام التقديم مما اضطرنا لتكون لمدة ايام للتقديم.
* لا يوجد معايير محددة ومعروفه مسبقاً للحضور لمركز الاستقبال.
* لم استطيع ان اقول ان المركز يحوي طاقماً متنوعاً من جميع المناطق.
* مناسبة الوظيفة من خلال المعلومات المعطاة نسبي، وهنا هناك بعض المعلومات مفقوده غير معلن.
* في ظل عدم توفر معلومات الوظيفة لا يقاس التنوع من الاساس في الوظيفة.
* نعم يتاح الانسحاب ولكن شرط بدفع تكاليف بعد القبول وبدء التدريب.
* يوجد عدد كبير للمتقدم ميسر في تواجدها البر لتواجدهم تبقى المشكلة في التسيير في وقت التقديم والزحام للمراكز.
* الوقت لا يسعف في التحول والتقديم محدد طاقة اخرى.
* لا يوجد وبصحة تواصل مع المتقدم والمركز غير الحضور اكثر من مرة وهذا غير مريح بعد المسافة.

تحديد تأثير عناصرالعملية على المتقدم

12.

قيّم أهمية المعلومات التالية في تحقيق الأهداف في الأعمدة المقابلة :- (مثال: <u>المعلومات الوظيفية</u> تجعلك <u>تتخذ قرارك بنفسك بخصوص التجنيد</u> ـ قيّم درجة الأهمية).

غير مهمة (0) ـ متوسطة الأهمية (1) ـ مهمة جدا (2).

	تشجعك للاستمرار بعد التسجيل والتعيين	تشجعك للمواصلة بعد القبول المبدئي	تشجعك للمواصلة حتى القبول المبدئي	تشجعك للتقديم على التجنيد
معلومات جهة العمل	٢	٢	٢	٢
المعلومات الوظيفية	٢	٠	٢	٢
معلومات اجراءات التقديم	١	١	٢	٢
معلومات اجراءات الاختبارات والتقييم	١	١	١	٢
معلومات اجراءات الاختبار للمرشحين	٢	١	٢	٢
معلومات التسجيل ومتطلباته	١	١	١	٢
معلومات اجراءات التدريب بعد التسجيل	٢	٢	١	٢
خدمة الاشعارات	١	١	٢	٢

13.

قيّم العبارات في كل صف مقابل درجة التأثير في كل عمود حسب التالي:-

غير مرغوب (0) ـ مقبول (1) ـ مرغوب جدا (2).

	تدفعك للاستمرار بعد التسجيل والتعيين	تشجعك للمواصلة بعد القبول المبدئي	تشجعك للمواصلة حتى القبول المبدئي	تشجعك للتقديم على التجنيد
سلوك وتصرفات طاقم الاستقبال	٢	٢	٢	١
موقع مركز الاستقبال والتقديم	١	٠	٢	٢
البدائل الوظيفية للتقديم	١	٠	١	٢
بدائل موقع مركزالاستقبال	١	١	٢	٢
بدائل عملية في حال الضرورة	١	٢	٢	٢
طول مدة التقديم	١	١	٢	٢
سرعة الاستجابة والتواصل	٢	٢	٢	٢

الرجاء وضع سبب اختيارك

إجابة الأسئلة ب، ج، والمشكلة في سؤال ⑭ و⑫ (١٢)

هناك عدة مشاكل يجب مراعاتها وذلك بصفتي مسؤول عن عملية التجنيد وتقدم سير بعض نوادي الخبرة في المجال كما في ممارستي صديق الدوريين .

مشاكل المتقدم : تتركز حدة في الشأن في :

* بعد أماكن مراكز الاستقبال عن عن الطلبة وذلك يعود أن ضرورة تنوع الطلبة من جميع المناطق في ظل أيضاً قلة الإمكانات المادية لتوفير بدائل معاينة لهما يتبعه في تؤثر وبالتالي تؤثر سلباً على جغرافية المناطق حيث ستحتاج للتدريب المعقد من متن المدرية ذاتها لعراقة .

* وتيرة التقديم غير مناسبة : التقديم في خضم التنا من الكبير جداً خريجي الثانوية العامة يخلق بيئة بيئة للدايم معرض تنظيم أوتأثر على عملية التقديم بدسيايخ مرضنا على الطلبة المتميزين .

* حساسية المعلومات : لدي تغيير توفير المعلومات بشكل كامل عن الأسئلة والقوائم واشتيفتي المحتملة لسرية المعلومات وبحدود تداولها . لذلك لابد من التدرج في أعطاءها مع حالة المتقدم في عملية التجنيد .

* معلومات المواقع والوحدات غير متوفرة .

نظراً لطول مدة التجنيد بما في ذلك التقديم والتدريب يجعل من الصعوبة شرح الوحدات شائعة قدرة طويلة مما يؤثر سلباً على حاضر في تؤاتنا بدسيايخ وحدودية العرضة المتاحة والاستراتيجية العسكرية المتبعة

* عدم القدرة على تقديم الرسائل لوظيفة معينة ورتبة التقديم يعود أيضاً لخصية العمل العسكري وكثرة التحركات والدورات الدورية الطارئة .

مشاكل المدارس العسكرية :

* أحد أكبر المشاكل التي تعانيها الدراسة هو عدم وجود تنسيق وتنظيم توكي يتيح لجميع القيادات استقبال الطلبة . جميع شرائح وهنا نقوم في أماكنة توحيدهم ودنا السفر والعبار .

* وحدودية الإمكانات تجعل المدارس لاستقبال الأعداد الكبيرة من الطلبة في وقتة متناسب أو استخدام القضية في تنظيم استقبالهم وترتيبها مواعيد لذلك .

* ضرورة تدريب طاقم التجنيد في المدارس من الصعد ومهارات التعامل مع الأخرى بما في ذلك الفاعلية في المجال النفسي والاجتماعي .

* لا يوجد أداة مرنة تقوم بربط المدارس مع بعض وإتاحة الاستفادة من البدائل الموظيفة المتاحة والتقديمه بند المدا يجب في حال كمثر صعب أماكنها أخرى .

شأن اخرى تتعلق بعملية الفرز والترشيح ،

متطلبات التعيين المعروضة من المدرس، من جيث المثال التنوع
المناطقي للمتقدمين يؤدي لعدد من المشاكل وتعود الى :

* صعوبة تحصيم التنوع في كل بعد من المنطقة التي تؤجر بها
المدرب من المتقدمين من المناطق الاخرى البعيدة .

* هذه القيود تفرض لعدم الوضوح والشفافية في عمليات الفرز
والترشيح .

* قد يتم التضحية بمعدلات عالية وطلاب متميز بيد لعرض تحضيم
التوزيع المناطقي .   في معايير الترشيح

* صعوبة ادارة العملية والأوزان لتحضيم هذا التنوع .

* اختلاف النسب بعد تقدم العملية واسحاب تشيم
من الطلبة وقد يحضر ذلك الى مابعد القيود المبدئي
في مرحلة الترشيح .

* هذه التدخلات البشرية تجعل عملية الفرز والترشيح كلها
بيئت طاردة للمتقدمين توحي بعدم النزاهة والحياة .

* الطلبة الاشراك قد لا يتمكنوه من التعيين في مناطقهم
لعدم توفير وظائف لهم في مناطقهم وهذا لا يعلم معرفته
الا في اواخر مبل مرف من العملية .

* الاسباب تربط العمل وتقرب مده التعيين نظراً لعمليات
التغطيي واستمداد عام الأمناطق .

Appendix 3: The composition of the WhatsApp Stakeholder Focus Group in both Design Science Phases

The Composition of the WhatsApp Stakeholder Focus Group in the Phase of "Explicate Problem":

Job	No.	Experience in the SA Enlistment Practice
Head of the IT Directorate	1	More than 10
HR Managers in Corps	2	Approximately 18 & 16
HR Managers in Military Schools	3	Approximately 10, 10, & 8
School Enlistment Staff	4	Approximately 12, 10, 7, & 5
Business Analyst	1	More than 3
	Total of Participants　　11	

The Composition of the WhatsApp Stakeholder Focus Group in the Phase of "Design and Develop Artefact":

Job or Role as A Stakeholder	No.	Experience in the SA Enlistment Practice
Head of the IT Directorate	1	More than 10
HR Managers in SA HR	2	Approximately 22 & 16
HR Managers in SA Corps	2	Approximately 18 & 16
HR Managers in Military Schools	4	Approximately 15,10, 10, & 8
School Enlistment Staff	10	Approximately 25-4
Recently Enlisted Soldiers	6	Approximately 3-1
Public Schools	3	Approximately 20, !5 & 9
Military Hospital Staff	3	Approximately 17, 10 & 2
Criminal Record Agency (CRA)	1	Approximately 13
Civil Affairs Agency (CAA)	1	Approximately 10
Total of Participants　　33		

Appendix 4: A template used for capturing the aspects of the SA Enlistment Process
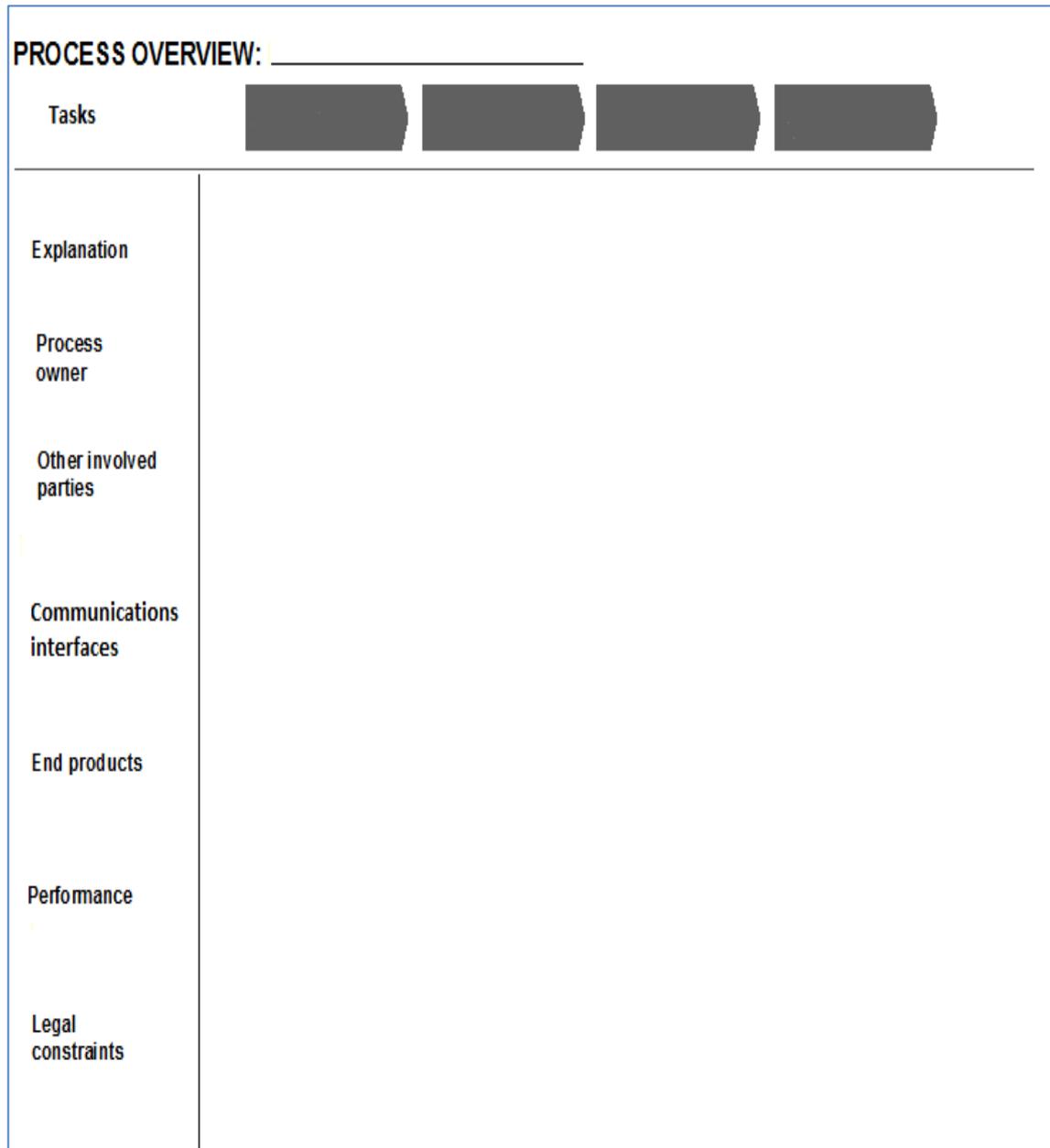
(Source: (SecureLand, 2013b))

Appendix 5: Statistics collected and calculated from the SA enlistment outcomes (SA Statistics Agency, 2012).

Year	Avg. of applications submitted (A)	Avg. of job vacancies needed (B)	Target number of cadets (C=B*150%)	No. of graduates from spec. course (D)	Total withdrawals (fail + actual withdrawals) (E=C-D)	Failed graduates in spec. course (F)	Actual withdrawal before graduation (G=E-F)	Error rate (H=(D-B)/B)	Withdrawal rate before graduation (I=G/C*100)	No. of withdrawals after graduation (J)	Withdrawal rate after graduation (K=J/D*100)	Avg. of KSAs	Avg. of regional diversity	Avg. of process time	Percentage of failed Cadets (L=F/C*100)
2008	9986	5930	7979	5639	2340	198	2142	(-)0.0491	26.85	121	0.021	75.57	55.60	45	2.48
2009	10203	5426	7425	5156	2269	147	2122	(-)0.0498	28.58	179	0.034	72.60	51.85	44	1.97
2010	10687	5169	7175	5059	2116	115	2001	(-)0.0213	27.89	98	0.019	74.13	53.70	46	1.60
2011	11006	5680	8077	5550	2527	123	2404	(-)0.0229	29.76	137	0.024	70.90	52.13	48	1.52
2012	11298	5500	7904	5482	2422	102	2480	(-)0.038	31.38	109	0.020	72.34	53.45	52	1.29
Average	10636	5541	7712	5377	2335	137	2198	(-)0.0293	28.49	644	0.0250	81.91	53.95	52	1.78

Appendix 6 – CATWOEs and Problem Models of the SA Enlistment Situation

1. Enlistment Announcement Problem

Element	Problem-Oriented Questions and Answers
C: Customers	▪ Who is affected by the issue? - *Applicant, military school (reception staff)*
A: Actors	▪ Who is involved in the issue? Who does cause the problem(s)? - *Enlistment announcer, announcement agent, applicant, military school*
T: Transformation Process	▪ How does the problem manifest itself (signs/symptoms)? - *Less no. of highly qualified and regionally diverse applicants obtained* ▪ What are the inputs (causes)? Where do they come from? - *Incomplete enlistment opening order at origin; limited announcement methods (mainly newspaper); bad timing, less time available; less accessible, and less usable enlistment message; less accessible site to apply; limited resources; information disclosure restrictions (e.g. security, diversity-oriented selection, etc.). (Head of military school, announcer, announcement agent)* - *No message received, incomplete enlistment message (e.g. lack of job information, lack of employer info. lack of enlistment activities info.), perceptions (e.g. short time of job application, remote location of application, etc.), and uncertainty (e.g. is the job interesting? Is it the best choice? Will I get offered? Are there any alternatives (jobs, military schools to apply, application locations, timings, cancellation, etc.)?), incorrect or bad job expectations, and no value perceived, applicant dissatisfaction (applicant)* ▪ What is the transformation that lies at the heart of the problem? Why does the problem occur? - *Conflict between target applicants' needs and military school's needs.* ▪ What are the outputs (effects)? Where do they go to? - *No or less applicant's interest to apply (applicant)* - *Less no. and quality of applicants attracted (military school)*
W: Worldview	▪ What is the big picture into which the problem fits? What is the real problem you are working on? - *Applicant attraction, marketing, advertising* ▪ What is the wider impact of the problem? - *Less number and quality of applicants obtained*
O: Owners	▪ Whose problem is it? Who owns the problem being investigated?

	- *Military school*
E: Environmental Constraints	▪ What are the constraints and limitations that will impact the problem and its solution? - *Employer image, enlistment strategy (whom to recruit, where, when, etc.), competitors, partners' needs, applicants' needs, job design, timings, budget, government and SA's HR policies and regulations*

Enlistment Opening Announcement Problem Model

2. Reception and Inspection Problem:

Element	Problem-Oriented Questions and Answers
C: Customers	▪ Who is affected by the issue? - *Applicant, military school (assessment staff)*
A: Actors	▪ Who is involved in the issue? Who does cause the problem(s)? - *Military school, reception and inspection staff*
T: Transformation Process	▪ How does the problem manifest itself?

	- *No. of withdrawals, no. of rejected applications, inappropriate pool of applicants received, cost, delay* ▪ What are the inputs (causes)? Where do they come from? - *Remote location of reception, restricted access for security, no induction or visit tour, rigid treatment, bad timing, less time available, manual screening, delay, less accessible site, less visible industry, unfamiliarity, no alternative opportunities (e.g. re-inspection, re-booking, different job choice, etc.) (applicant)* - *Incomplete application forms, incomplete docs., lack of resources (equipment, personnel), lack of resource management, long waiting time (military school, screening and inspection staff)* ▪ What is the transformation that lies at the heart of the problem? Why does the problem occur? - *Applicant concerns (e.g. does the job worth attention? Is it the best choice? Will I get passed? Are there any alternatives (jobs, military schools to apply, reception locations, timings, etc.)? incorrect or bad job expectations, no value perceived, applicant dissatisfaction* - *Military school concerns: how much applications shall we accept?, whether to allow re-application and re-inspection or not, how to manage time, shouldn't we be flexible, how to manage resources, where to conduct enlistment* ▪ What are the outputs (effects)? Where do they go to? - *Withdrawal, less motivation, continue with hesitation (applicant)* - *Inappropriate pool of applicants, rejected applications, cost, delay (military school)*
W: Worldview	▪ What is the big picture into which the problem fits? What is the real problem you are working on? - *Reception and inspection problem, equal opportunities* ▪ What is the wider impact of the problem? - *Less number of quality candidates, bad reputation of military school*
O: Owners	▪ Whose problem is it? Who owns the problem being investigated? - *Military school*
E: Environmental Constraints	▪ What are the constraints and limitations that will impact the problem and its solution? - *Enlistment announcement problem, enlistment strategy, employer image, type of applicant, time available, budget*

3. Examination and Assessment Problem:

Element	Problem-Oriented Questions and Answers
C: Customers	▪ Who is affected by the issue? - *Applicant, military school (selection staff)*
A: Actors	▪ Who is involved in the issue? Who does cause the problem(s)? - *External or internal examiners, applicants (test takers), test administrators*
T: Transformation Process	▪ How does the problem manifest itself? - *No. of withdrawals, no. of failed applicants, inappropriate pool of candidates obtained, call for recovery, cost, delay* ▪ What are the inputs (causes)? Where do they come from? - *Lack of information about exams, less informative exams, less usable test instruments, no clear criteria for assessment, no timely notifications, less time available to prepare, bad timing, timely available testing, long waiting time (due to call for recovery),*

	remote location, manual examination (e.g. paper-based), delay, less accessible site, no background about military sector, less visible industry, unfamiliarity with exams (e.g. physical fitness, team exercise), alternative opportunities (e.g. re-examination, other job choices, etc.) (applicant)
	
	- *No sample exams available, no chance for self-assessment and practice, different samples of paper-based exams, on-campus examination (centre-based), Incomplete exams, human-based assessment, lack of transparency, ill-test system design (i.e. irrelevant to job), lack of resources (e.g. test rooms), lack of infrastructure (e.g. web access) (military school, examination staff)*
	
	▪ What is the transformation that lies at the heart of the problem? Why does the problem occur?
	  - *Applicant concerns (e.g. does the job worth attention? Is it the best choice? Will I get passed? Will I get offered? Can I expect my success? Will it be fair assessment? Are there any alternatives (jobs, other military schools to be transferred to, reception locations, timings, etc.)? incorrect or bad job expectations, doubts, no value perceived, applicant dissatisfaction*
	  - *Military school concerns: effective and efficient selection device, internet-based examination, security (e.g. how to authenticate test taker's identity in web-based applications?), control and administration of exams, timing, cost, fairness (e.g. equal opportunities, digital divide), validity (e.g. how to design a selection device?), shall we allow re-assessment or not? How to manage time, how to be more flexible, how to manage resources, where to conduct assessment, innovative tests (e.g. work-sample assessment, simulators).*
	
	▪ What are the outputs (effects)? Where do they go to?
	  - *Withdrawal, failing in exams, continue with hesitation (applicant)*
	  - *Inappropriate pool for selection, failed applicants, cost, delay (military school)*

W: Worldview	▪ What is the big picture into which the problem fits? What is the real problem you are working on?
	  - *Examination and assessment problem, failure in assessment device analysis and design.*
	
	▪ What is the wider impact of the problem?
	  - *Inappropriate pool of candidates to select from (quantity and quality (including diversity), failure of choosing the right candidates*

O: Owners	▪ Whose problem is it? Who owns the problem being investigated?

	- *Military school*
E: Environmental Constraints	▪ What are the constraints and limitations that will impact the problem and its solution? 　- *Reception and inspection problem, enlistment strategy (where, when, how, etc.), type of applicant, job vacancy design, legal issues and regulations (e.g. equal opportunity, discrimination), time available, budget*

4. Selection and Offering Problem:

Element	Problem-Oriented Questions and Answers
C: Customers	▪ Who is affected by the issue? 　- *Candidates (essential and backup), military school (registration staff)*
A: Actors	▪ Who is involved in the issue? Who does cause the problem(s)? 　- *Selection staff, announcement staff, offering staff, military school supervisors*

T: Transformation Process	▪ How does the problem manifest itself?
	  - *No. of withdrawals, rejected offers, less qualified cadets, less regionally diverse cadets, call for recovery (backup), cost, delay*
	▪ What are the inputs (causes)? Where do they come from?
	  - *No systematic selection (preferential selection due to diversity considerations), no transparency, job information are hidden (e.g. job locations for diversity issues), no specific job information provided, limited notification methods (mainly telephone); delay for recovery call, less time available; less accessible site for inquiry, limited resources; information disclosure restrictions (e.g. security, diversity-oriented selection, etc.). (selection staff, announcer, announcement agent, offeror)*
	  - *No notification received, incomplete offer info. (e.g. all about being accepted as a cadet in a certain school), no clear criteria for selection, no post-registration info. (training) provided, (essential candidates and backup)*
	▪ What is the transformation that lies at the heart of the problem? Why does the problem occur?
	  - *Applicant concerns and perceptions (e.g. short time to decide, remote location to complete registration), uncertainty (e.g. is the job interesting? Is it the best choice? Will I be offered (backup)? Are there any job choices for backup), unfair selection, long waiting time for backup, incorrect or bad job expectations, and no value perceived, applicant dissatisfaction*
	  - *Military school concerns: how to overcome diversity-validity issue, legal selection, cost, fairness (e.g. equal employment opportunity, affirmative actions), validity (e.g. how to carry out selection, How to manage time?, how to be more flexible, how to manage resources, where to conduct assessment, systematic selection (e.g. no human intervention).*
	▪ What are the outputs (effects)? Where do they go to?
	  - *Withdrawal, offer rejection (applicant)*
	  - *less qualified cadets, less regionally diverse cadets, call for recovery (backup), cost, delay (military school)*

W: Worldview	▪ What is the big picture into which the problem fits? What is the real problem you are working on?
	  - *Selection and offering problem, unfair selection, fail to keep candidates interested*
	▪ What is the wider impact of the problem?
	  - *Fail to fill job vacancies by the number and the right candidates*

O: Owners	▪ Whose problem is it? Who owns the problem being investigated? - *Military school*

E: Environmental Constraints	▪ What are the constraints and limitations that will impact the problem and its solution? - *Examination and assessment problem, enlistment strategy (whom, where, when, how, etc.), type of applicant, job vacancy design, legal issues and regulations (e.g. equal opportunity, discrimination), time available, budget*

Selection and Offering Problem Model

5. Reference Checking and Inquiries

Element	Problem-Oriented Questions and Answers
C: Customers	▪ Who is affected by the issue? - *Offered applicants, military school (registration staff), military hospital, CAA, CRA, public schools*
A: Actors	▪ Who is involved in the issue? Who does cause the problem(s)? - *Candidates, military school (registration staff), military hospital, CAA, CRA, public schools*
T: Transformation Process	▪ How does the problem manifest itself? - *No. of withdrawals, cancelled applications, vacancy not filled, less qualified cadets, less regionally diverse cadets, call for recovery (backup), cost, delay* ▪ What are the inputs (causes)? Where do they come from? - *Incomplete inquiry order, incomplete reply, bad timing, less time available; delay in response, paper-based inquiry, manual handling of order, limited resources (e.g. staff); lack of infrastructure, lack of communication, lack of coordination, location, security, bad service, undesirable results of inquiry (military school (military (registration staff), military hospital, CAA, CRA, public schools).* - *In-person inquiry, remote site, incomplete info. about inquiry, delay (Candidates)* ▪ What is the transformation that lies at the heart of the problem? Why does the problem occur? - *Candidate concerns and perceptions (e.g. short time to act, remote location to complete registration), uncertainty (e.g. (e.g. Where to go? What is inquired about? Why? How? Shall I keep or withdraw? Will I be passed and registered? Are there any location choices for inquiry, privacy, , long waiting time, incorrect or bad job expectations, and no value perceived, applicant dissatisfaction* - *Inquiry agencies concerns: how to provide a good service? How to enable quick response? Fair treatment, equal opportunity, How to manage resources? How to be more flexible?* ▪ What are the outputs (effects)? Where do they go to? - *Withdrawal, absence (candidate)* - *Cancelled applications, rejected applications, call for recovery (backup), re-inquiry, cost, delay, bad quality of service, bad reputation (military school, Inquiry agencies)*
W: Worldview	▪ What is the big picture into which the problem fits? What is the real problem you are working on? - *Reference checking and inquiries problem* ▪ What is the wider impact of the problem?

	- Fail to fill job vacancies by the number and the right candidates (quality and diversity)
O: Owners	▪ Whose problem is it? Who owns the problem being investigated? *- Military school and Inquiry agencies*
E: Environmental **Constraints**	▪ What are the constraints and limitations that will impact the problem and its solution? *- Selection and offering problem, corporate strategy (whom, where, when, how, etc.), type of applicant and agencies involved, adjacent systems, goals and policies, legal issues and regulations (e.g. equal opportunity, discrimination), time available, budget*

Reference Checking and Inquiry
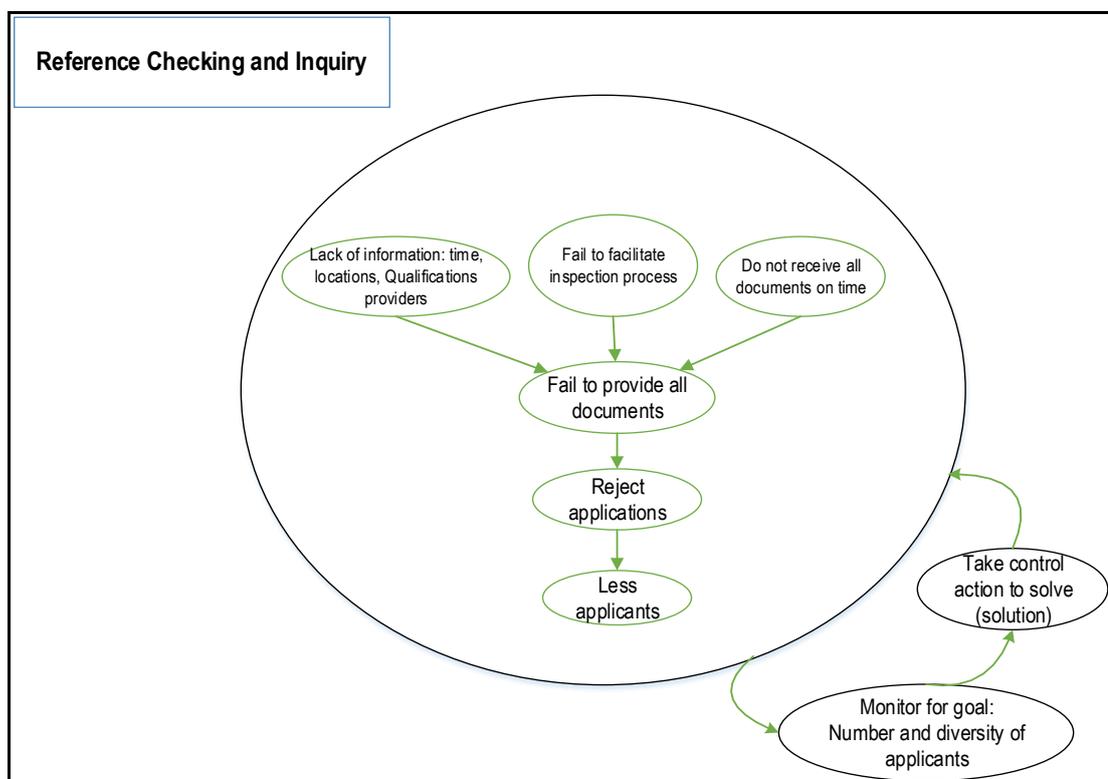
6. Finding Vacancies

CATWOE	Details
Customers	• Who is the receiving end or who the end consumers are? Military units • What problem do they have now or what problem they face? Determining the vacancies, modular organising, mobility, timing, lack of integrated HR, lack of coordination, diversity • How will they react to what you are proposing or how will they interact with the proposed solutions? • Who are they and how does the issue affect customers or how your decision will affect them?

	• Who are the winners and losers? • Who are the beneficiaries of the business process and how does the issue affect them?
Actors	• Who is involved in the project? HR staff, military units, military region commanders • Who is part of the solution or who will be involved in implementing solutions? • How will this solution affect them? • Who will be affected by the impact of the decisions that your company makes? • What will impact their success? • How might they react?
Transformation Process	• What the systems that are going to be affected are? • What processes will be affected by it? Determining and finding vacancies • Every decision that you make is going to affect another area of your business. • What process or systems are affected by the issue? • What is the transformation that lies at the heart of the system? • What is the process for transforming inputs into outputs? • What are the inputs? Where do they come from? Vacancies from HR for each military regions • What are the outputs? Where do they go to? Number of vacancies for each military regions--- Military Schools (Stakeholder 2) • What are all steps in between? • Defining multiple processes indicate a confusion in the transformation process. Timing issues with military schools HR activities.
World View	• What is the big picture and who are we affecting? Determining the vacancies, modular organising, mobility, timing, lack of integrated HR, lack of coordination, diversity…. • What particular issue is going to take place? • What is the wider impact that is going to have on people? • You want to ask yourself these different questions from different perspectives, this can help you to figure out whether or not you should make different decisions and why. • What is the big picture? Finding vacancies for all military regions

	• What are the wider impacts of the issue? Inability to determine the vacancies accurately • What is the bigger picture into which the situation fits? • What is the real problem you are working on? • What is the wider impact of any solution?
Owner	• Who will be responsible for the situation you are investigating? Military region commander • Who is going to play the role in finding the solution? • Who owns the process or situation you are investigating? • What role will they play in the solution? • Who is the real owner of the process or situation you are changing?
Environmental Constrains	• With any decision that your business makes who will be affected by it as it as it relates to the environment? • Who will be affected by limitations or constraints, and any impact that the answer may have as it relates to how well the project will succeed? • What are the constraints and limitations that will impact the solution and its success? Geographical regions, nature of military work

7. Vacancies Analysis and Design

CATWOE	Details
Customers	• Who is the receiving end or who the end consumers are? Military schools • What problem do they have now or what problem they face? Lack of information (salary, applicant descry, diversity of regions.)
Actors	• Who is involved in the project? HR staff from military units and military region, Military schools director
Transformation Process	• What processes will be affected by it? Job description • What are the inputs? Where do they come from? Information from: military units, military region and military schools • What are the outputs? Where do they go to? Jobs description--- Military Schools • Defining multiple processes indicate a confusion in the transformation process. Attracting applicants with military schools

World View	• What is the big picture and who are we affecting? lack of information about stakeholders, job attributes, timing • What is the big picture? Job description agreement • What are the wider impacts of the issue? Inability to determine the appropriate job description -->> less number of applicants
Owner	• Who will be responsible for the situation you are investigating? Military region commander
Environmental Constrains	• What are the constraints and limitations that will impact the solution and its success? Geographical regions, nature of military work

8. Send Vacancies

| CATWOE	Details
Customers	• Who is the receiving end or who the end consumers are? Military schools • What problem do they have now or what problem they face? Lack of information, timing, organisation structure (Capacity, accessibility), equipment of military schools, how to manage and control, culture.
Actors	• Who is involved in the project? HR staff from military units and Military schools
Transformation Process	• What processes will be affected by it? Send vacancies • What are the inputs? Where do they come from? Information about vacancies from: HR military units • What are the outputs? Where do they go to? Jobs description and number of vacancies- Military Schools • Defining multiple processes indicate a confusion in the transformation process.
World View	• What is the big picture and who are we affecting? Improved performance, quality management-military schools and staff • What is the big picture? • What are the wider impacts of the issue? Less attractiveness, less performance
Owner	• Who will be responsible for the situation you are investigating? Job provider
Environmental Constrains	• What are the constraints and limitations that will impact the solution and its success? Time and cost

Send Vacancies

Lack of information

Do not choose the right time to send or delay

organisation structure

Bad management

miscontrol

Less attractiveness

Less performance

Take control action to solve (solution)

Monitor for goal: Number and diversity of applicants
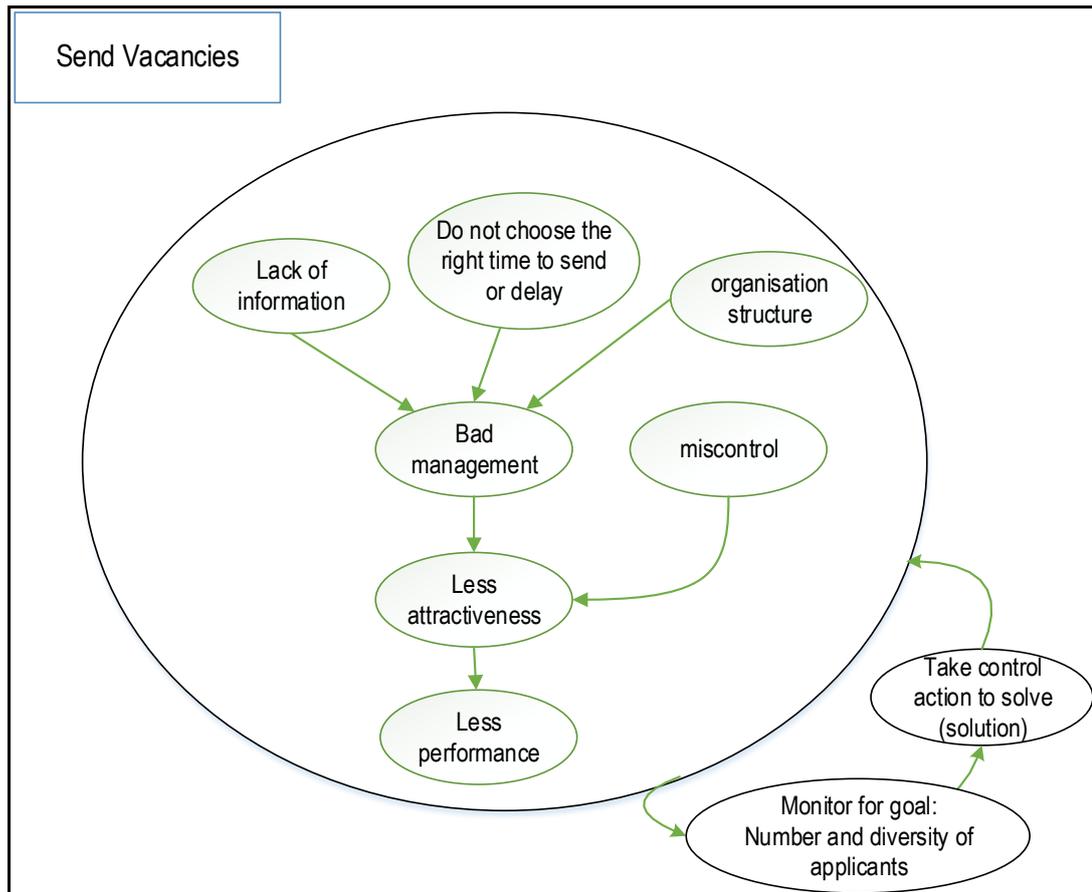
9. Jobs Offering

CATWOE	Details
Customers	• Who is the receiving end or who the end consumers are? Applicant
	• What problem do they have now or what problem they face? Lack of information, timing, organisation structure (Capacity, accessibility,), and announcement tools, culture, qualifications from schools and hospital. Is the job interesting? Is it the best choice? Are there internal and external job alternatives?
Actors	• Who is involved in the project? Examiners, government inspector, Military school director
Transformation Process	• What processes will be affected by it? Job announcement
	• What are the inputs? Where do they come from? Job description from military school director
	• What are the outputs? Where do they go to? Recruitment message and applicant form- applicants
	• Defining multiple processes indicate a confusion in the transformation process. Monitoring and control
World View	• What is the big picture and who are we affecting?

|	
	• Attracting, Advertising, marketing, • What is the big picture? • What are the wider impacts of the issue? Less number of applicants or quality of applicants
Owner	• Who will be responsible for the situation you are investigating? Military school, stakeholders (4)
Environmental Constrains	• What are the constraints and limitations that will impact the solution and its success? Competitors, reputation,

Offer Jobs and keep selected candidates interested

10. Contracting

CATWOE	Details

Customers	• Who is the receiving end or who the end consumers are? Applicant stakeholders (3) • What problem do they have now or what problem they face? Lack of information, timing, organisation structure (Capacity, accessibility,), announcement tools, culture, qualifications from schools and hospital. Is the job interesting? is it the best choice?, are there internal and external job alternatives?,
Actors	• Who is involved in the project? Announcer
Transformation Process	• What processes will be affected by it? Job announcement • What are the inputs? Where do they come from? Job description from military school director • What are the outputs? Where do they go to? Recruitment message and applicant form- applicants • Defining multiple processes indicate a confusion in the transformation process. Monitoring and control
World View	• What is the big picture and who are we affecting? • Attracting, Advertising, marketing, • What is the big picture? • What are the wider impacts of the issue? Less number of applicants or quality of applicants
Owner	• Who will be responsible for the situation you are investigating? Military school, stakeholders (4)
Environmental Constrains	• What are the constraints and limitations that will impact the solution and its success? Competitors, reputation,

Providing Contracts and trying to convince selected candidates to sign them

11. Offer Rejection

CATWOE	Details
Customers	• Who is the receiving end or who the end consumers are? Applicant stakeholders (3) • What problem do they have now or what problem they face? Lack of information, timing, organisation structure (Capacity, accessibility,), announcement tools, culture, qualifications from schools and hospital. Is the job interesting? is it the best choice?, are there internal and external job alternatives?,
Actors	• Who is involved in the project? Announcer
Transformation Process	• What processes will be affected by it? Job announcement • What are the inputs? Where do they come from? Job description from military school director • What are the outputs? Where do they go to? Recruitment message and applicant form- applicants • Defining multiple processes indicate a confusion in the transformation process. Monitoring and control
World View	• What is the big picture and who are we affecting? • Attracting, Advertising, marketing, • What is the big picture? • What are the wider impacts of the issue? Less number of applicants or quality of applicants

Owner	• Who will be responsible for the situation you are investigating? Military school, stakeholders (4)
Environmental Constrains	• What are the constraints and limitations that will impact the solution and its success? Competitors, reputation,

Withdraw application and offer rejection

12. Monitoring

CATWOE	Details
Customers	• Who is the receiving end or who the end consumers are? Applicant stakeholders (3) • What problem do they have now or what problem they face? Lack of information, timing, organisation structure (Capacity, accessibility,), announcement tools, culture, qualifications from schools and hospital. Is the job interesting? is it the best choice?, are there internal and external job alternatives?,
Actors	• Who is involved in the project? Announcer
Transformation Process	• What processes will be affected by it? Job announcement • What are the inputs? Where do they come from? Job description from military school director • What are the outputs? Where do they go to? Recruitment message and applicant form- applicants • Defining multiple processes indicate a confusion in the transformation process. Monitoring and control

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World View	• What is the big picture and who are we affecting? • Attracting, Advertising, marketing, • What is the big picture? • What are the wider impacts of the issue? Less number of applicants or quality of applicants
Owner	• Who will be responsible for the situation you are investigating? Military school, stakeholders (4)
Environmental Constrains	• What are the constraints and limitations that will impact the solution and its success? Competitors, reputation,

Appendix 7 – Examples from Problem Concepts Abstracted from the CATWOEs and Problem Models of the SA Enlistment Situation

1. Concepts Extracted from Examination and Assessment Problem

Concepts Extracted

External or internal examiners,
- Lack of information about examination,
- Notifications
- Tests: paper-based, computer-based, practice and trail, hard/easy, timing
- Interview: timing, friendliness, where, how, informative,
- Physical fitness: hard/easy, time, where, how, how long?
- Exam results is dealt with (procedure)? Fairness,
- Is the job still interesting? Shall I keep or withdraw from the job opening?
- Are there internal and external job alternatives?

Military School Director:
- Equipment, resources, management, cost, delay,
- Lack of information organisation structure (Capacity, accessibility, etc.),
- Examination tools, and culture of applicant?
- Are there internal and external job alternatives scheduling?

Applicant
- Assessment, timely constructing a pool of candidates, choosing the right candidates, keep applicant interested and fair examination, and we are affecting Candidates, director, and military school.
- Wider impacts of the issue: Less number or quality of candidates, withdrawal of candidates, failure of choosing the right candidates (also diversity)

Government inspector
- Governmental regulations (Equal Employment Opportunity, Affirmative Actions); reputation, competitors

| Who Cause the problem?	Defined as (The failure of/ need of)	What is it about? (Object)	Why is it a problem? (Goal)	How it manifest itself? (effect)
External or internal examiners	Failure of	Exam information	Adequacy, relevance, accurate	Applicant uncertainty: Shall I keep or withdraw?
	Failure of	Notifications	Timely	
	Need of	location	Close	

	Need of	Interview	Friendly, informative	Less no. of apps retained Inappropriate pool of candidates Less diversity obtained Delay Cost
	Failure of	Test equipment/tools: paper-based, computer-based	Usable, hard/easy, reliable fairness	
	Failure of	Job choices	Alternative	
	Failure of	Time of tests	Available	
	Failure of	resources		
Government inspector	Failure of	Law, regulations	Flexibility, fairness	Failure to adhering to
Military school director	Need of	resources	Capacity, reliable	Failure to attract right people, delay, cost, loss of competition,
	Need of	management	Control	
	Need of	Strategy	Clear	
	Need of	Structure	Flexibility, modularity, reliable accessibility	
	Failure of	Culture	Familiarity,	
	Failure of	Policies	Conformity	
	Need of	Reputation		
Applicant	Failure of	information	Sufficient, complete, relevant, accurate	Rejections, call for recovery, delay, cost, bad reputation
	Failure of	Timing	Timely	
	Need of	Exercise	readiness	
	Failure of	Culture	Familiarity	
	Failure of	KSAs	Reliable	

2. **Concepts Extracted from Jobs Offering Problem**

Concepts Extracted
Job Offeror - Lack of information - Timing, date of offering if appropriate or not? - Completed qualifications, medical checks from hospital, criminal record? - Attracting candidates and marketing, keep candidates interested, respect diversity when choosing candidates and we are affecting candidates, military units and regions - Competitions, reputation, **Candidates** - Is the job interesting? Is it the best choice? - Are there internal and external job alternatives? Comparison with other jobs offering - Attempting to convince selected candidates, Withdraw or cancelation, monitoring and control Examination results and list of successful candidates and waiting list and come from military school director or examiner - Withdraw or cancelation of applications and non-respect the diversity.

Who Cause the problem?	Defined as	What is it about?	Why is it a problem?	How it manifest itself?

|	(The failure of/ need of)	(Object)	(Goal)	(effect)
Enlistment Offeror	Failure of	Offer information	Adequacy, accurate	Applicant uncertainty: Shall I keep or withdraw? Less no. of apps retained Inappropriate pool of candidates Less diversity obtained Delay Cost
	Failure of	Notifications	Timely	
	Need of	Job location	accessible	
	Need of	Offer doc.	Informative, clarity, Usable, hard/easy, reliable fairness	
	Failure of	Job choices	Alternative	
	Failure of	resources	Reliable	
Candidates	Failure of	Acceptance notification	Sufficient, complete, relevant, accurate	Rejections, call for recovery, delay, cost, bad reputation
	Failure of	timing	Timely	

3. Concepts Extracted from Contracting Problem

Concepts Extracted
Contractor - Lack of information - Timing (availability to respond, timely, etc.) - Notification tools and culture. - Attracting and convincing selected candidates to sign and we are affecting candidates, military units and regions Candidates - Is the job interesting? - Is it the best choice? - Are there internal and external job alternatives? - Hirer - Wider impacts of the issue: Withdraw or cancelation of applications

Who Cause the problem?	Defined as (The failure of/ need of)	What is it about? (Object)	Why is it a problem? (Goal)	How it manifest itself? (effect)
Contractors (hirers)	Failure of	contract information	Accurate, clarity	Shall I sign or withdraw? Applicant dissatisfaction Less no. of recruits Less diversity Delay Cost
	Failure of	Notifications	Timely	
	Need of	contract doc.	Informative, clarity, Usable, hard/easy, reliable	
	Failure of	Job choices	Alternative	
	Failure of	resources	Reliable	
Candidate	Failure of	Signature	Sufficient, complete, relevant, accurate	Fail to fill vacancy
	Failure of	timing	Timely	

4. **Concepts Abstracted from Enquiries Problem**

Concepts Extracted
Applicants - Lack of information (how many documents needed? Where? Why?) - Timing - Remote location - Communication channels (accessibility) School, Hospitals, Governmental agency - Facilitate inspection process (reliability) - Help to choose the right candidates and accept applications and we are affecting applicants. - Reject applications - Limit applicants - How to attract applicants? - How to keep applicants and selected candidates interested in jobs? - How to convince candidates to sign contracts?

Who Cause the problem?	Defined as (The failure of/ need of)	What is it about? (Object)	Why is it a problem? (Goal)	How it manifest itself? (effect)
School, Hospitals, Governmental agency	Failure of	information	Accurate, clarity	Less application, less quality of applicants, less diversity, withdrawals, rejections, etc.
	Failure of	Notifications	Timely	
	Need of	Channel	Accessibility, usability, reliable	
	Failure of	Process	Reliable, corrective, resilient,	
	Failure of	resources		
Applicants	Failure of	Inquiry	Sufficient, complete, relevant, accurate	Fail to fill vacancy
	Failure of	Timeline, Deadline	Timely	

5. **Concepts Extracted from Withdrawal and Rejection Problem**

Concepts Extracted
Military schools (Job announcer, Job offeror, Job hirer) - How to attract applicants? - How to keep applicants and selected candidates interested in jobs? - How to convince candidates to sign contracts? - Remote location - Structure (flexibility) - Withdraw applications and cancelation, offer rejection - Apply, Re-apply and Re-offer processes. Applicant, Selected candidates - More job offer rejections and withdraw applications

- Reputation
- Culture
- Transparency
- Visibility
- Attractiveness

Who Cause the problem?	Defined as (The failure of/ need of)	What is it about? (Object)	Why is it a problem? (Goal)	How it manifest itself? (effect)
Military schools (Job announcer, Job offeror, Job hirer)	Failure of	information	Accurate, clarity, sufficiency,	Less application, less quality of applicants, less diversity, withdrawals, rejections, etc.
	Failure of	Notifications	Timely	
	Need of	Reputation	Familiarity, visibility, attractiveness	
	Failure of	Structure	Flexible, accessible	
	Failure of	Process	Reliable, quality, capable	
	Failure of	resources		
Applicants	Need of	Decision	Supportive	Fail to fill vacancy
	Failure of	Commitment	control	

6. Concepts Extracted from Monitoring Problem

Concepts Extracted
Applicants

Applicants

- Timing
- Organisation structure (Capacity, accessibility...)
- All processes (reliability, resilience, capability, quality, etc.)
- Announcement tools (accessibility, usability, etc.)
- Personnel (attractiveness, friendliness, informative, honesty, etc.0
- Culture (acceptability)

Military schools, Military regions, Governmental monitor, SA Commander
- Are inspections and examinations fair?
- Complain process?
- All process are going well and are fair?
- Respect all recruitment norms during all process.
- Constructing a good atmosphere for all processes success.
- Withdrawal applications and bad reputation.
- Timing and distant regions.

Who Cause the problem?	Defined as (The failure of/ need of)	What is it about? (Object)	Why is it a problem? (Goal)	How it manifest itself? (effect)
Military schools, Military	Failure of	Information	Accurate, clarity, sufficiency,	Withdrawal applications and bad reputation,
	Failure of	Notifications	Timely	

regions, Governmental monitor, SA Commander	Need of	Reputation	Familiarity, visibility, attractiveness	Fail to fill vacancy, cost, delay
	Need of	Culture	Familiarity, compatibility	
	Failure of	Structure	Capacity, accessibility	
	Failure of	Process	Reliable, quality, capable , fairness, legality,	
	Failure of	resources		
Applicants	Need of	Timing	availability	Less satisfaction, less interest, no application, rejection
	Failure of	process	Flexible, fair	

Appendix 8 – Examples from Evolutionary Development of 1st POCM and Onto-RPD Artefacts
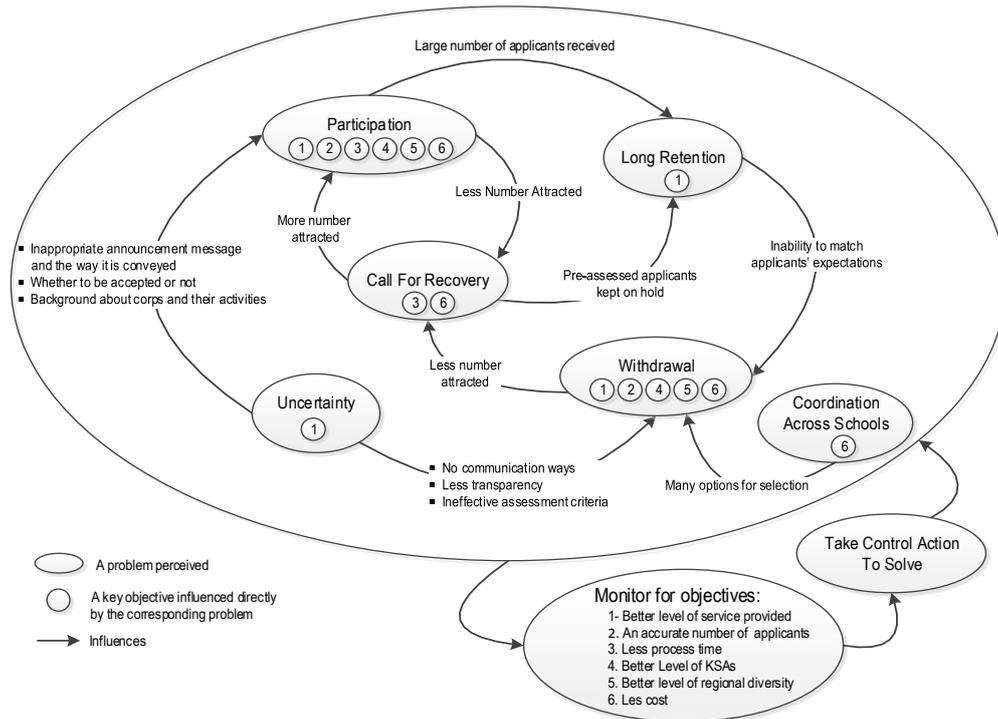
V.1 POCM Artefact in the 1st A-R cycle
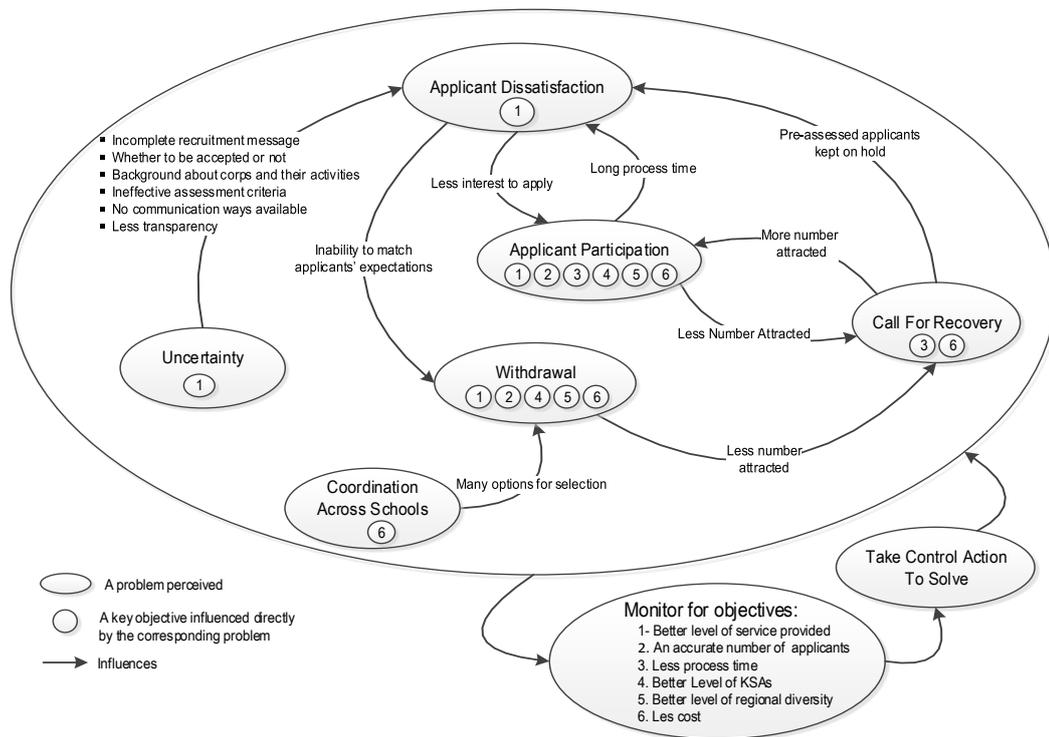
V.2 POCM Artefact in the 1st A-R cycle
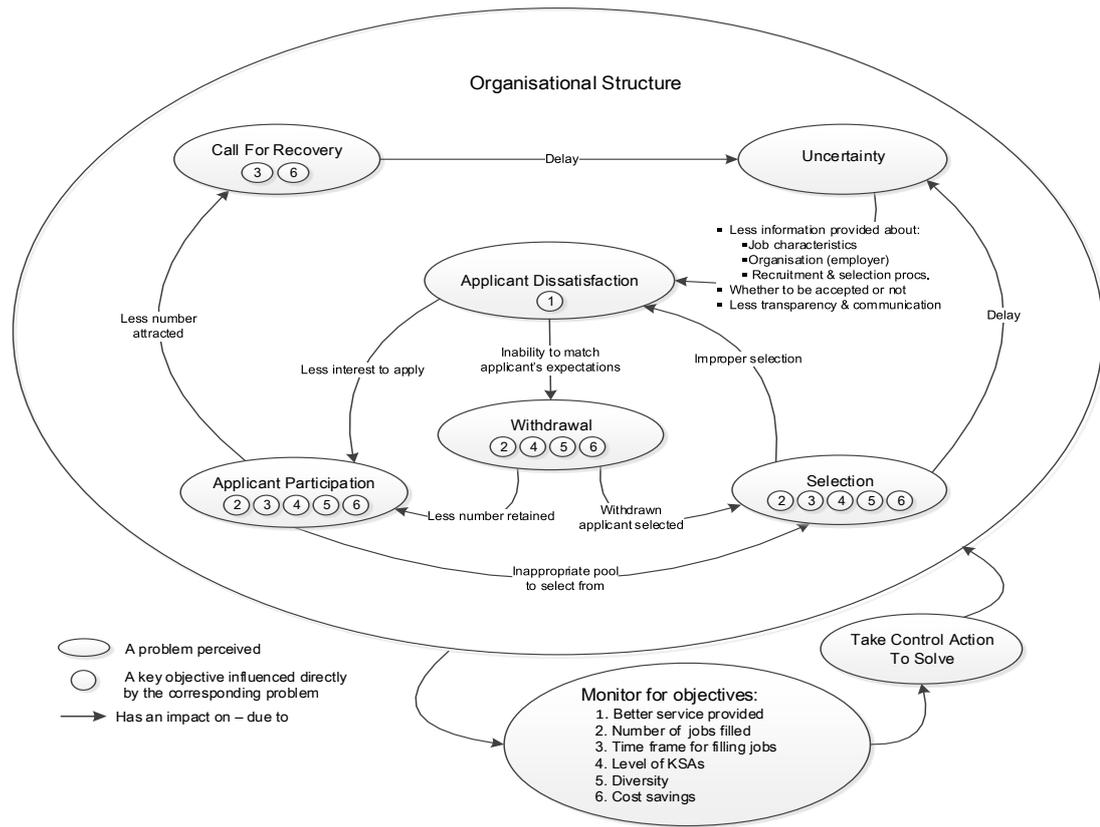
V.3 POCM Artefact in the 1ˢᵗ A-R cycle
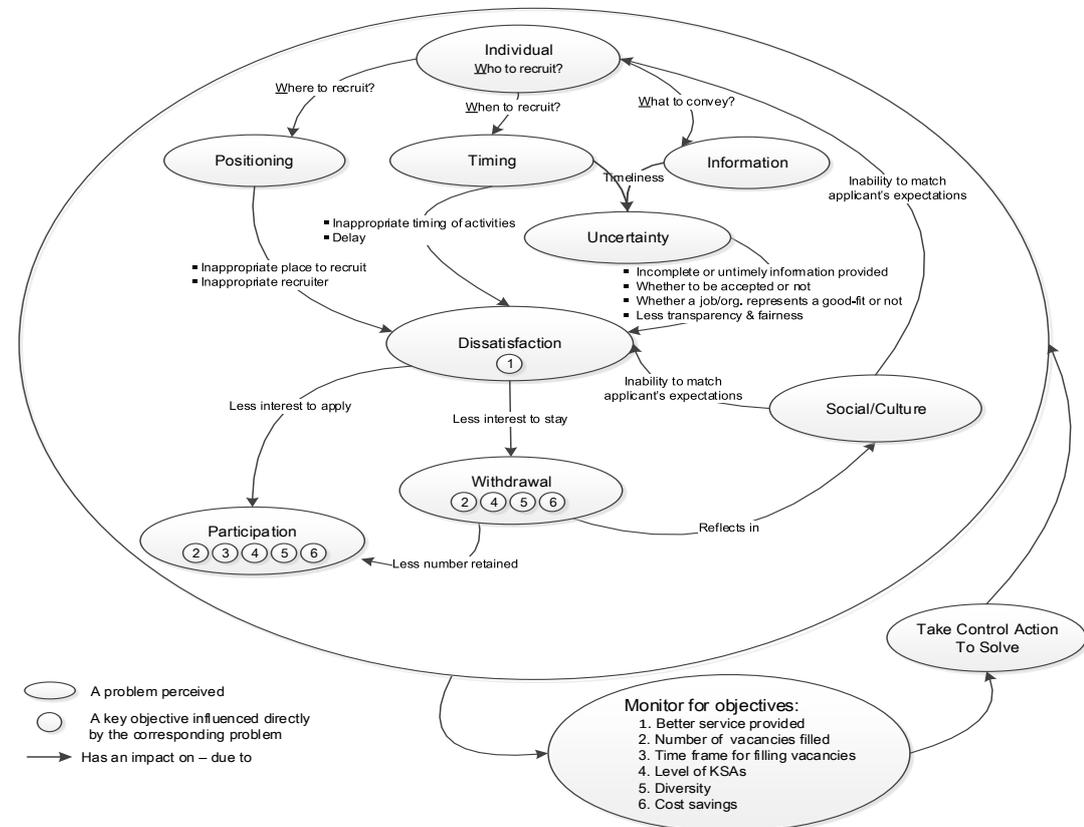
V.4 POCM Artefact in the 1ˢᵗ A-R cycle
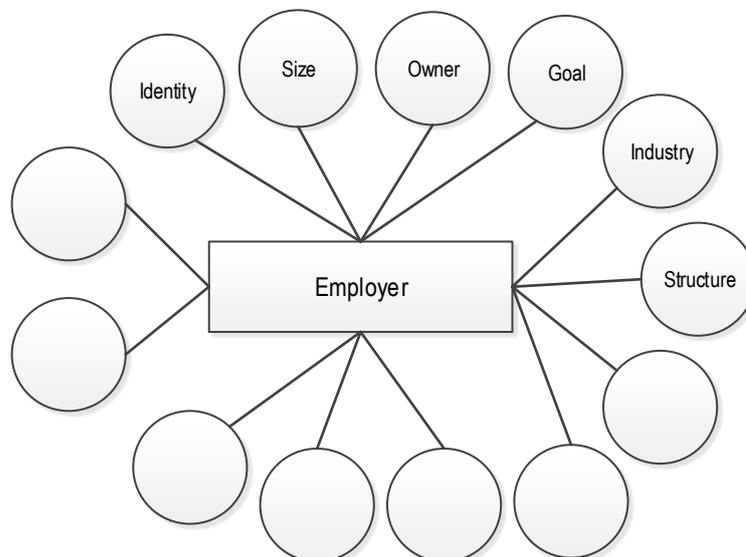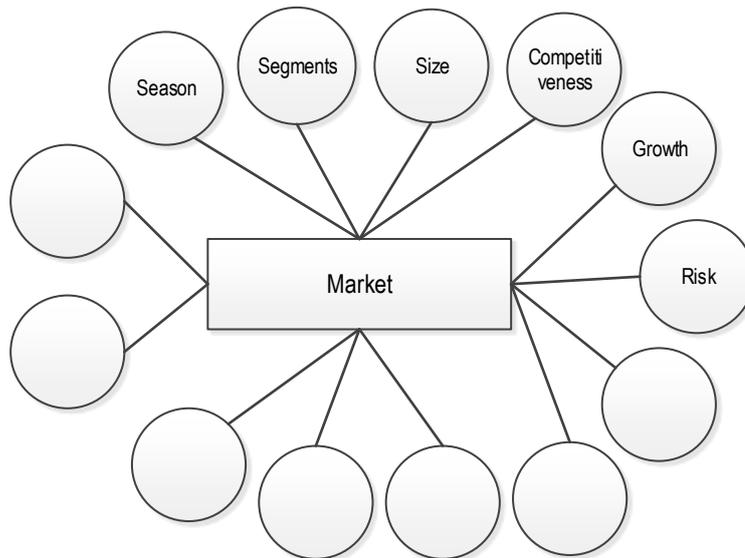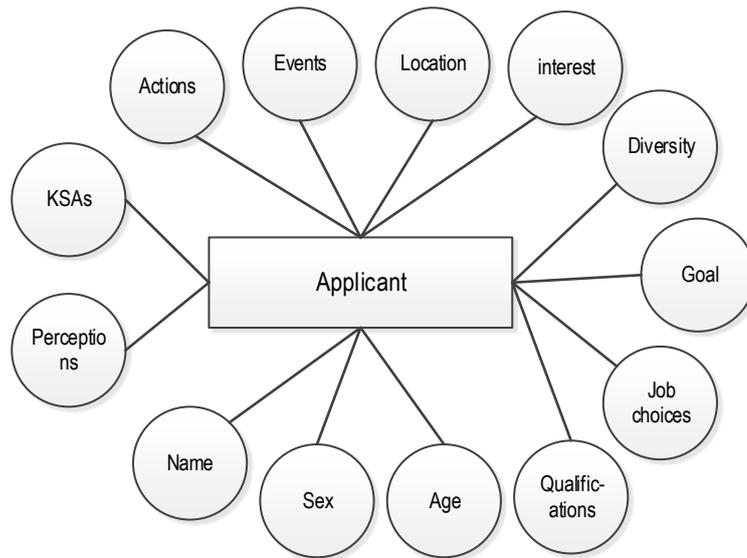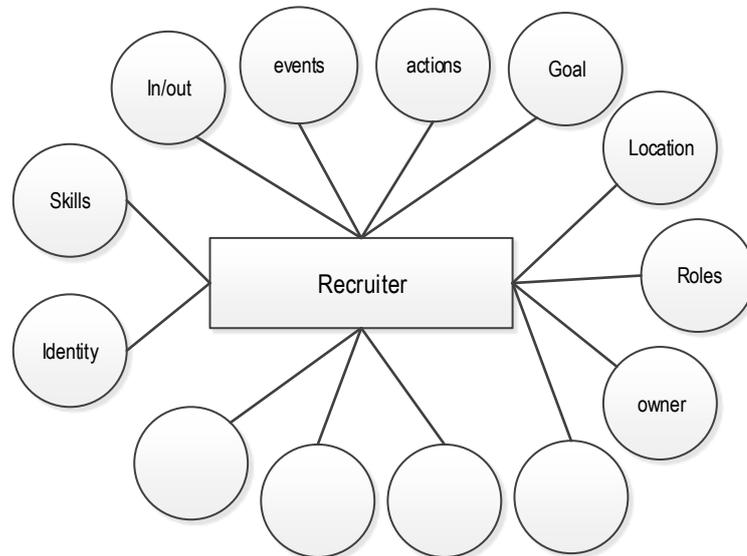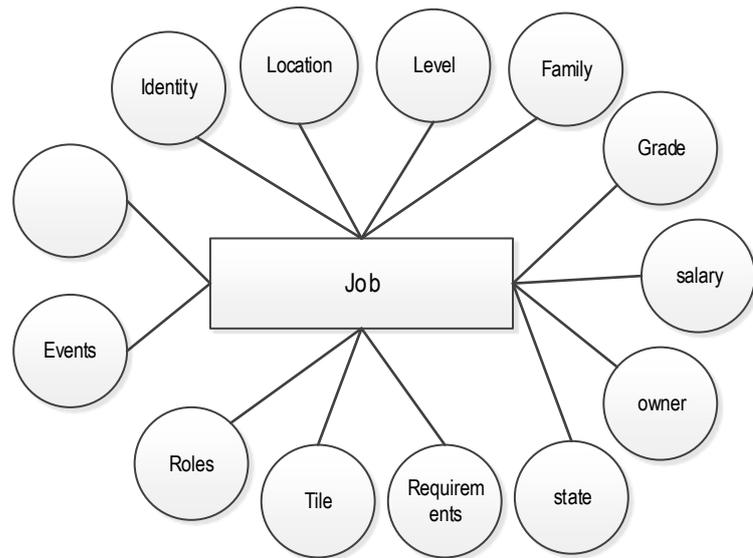
Some Results of Analysing the concepts of the SA Enlistment Problem Space for Building the Onto-RPD Artefact in the 1st A-R cycle
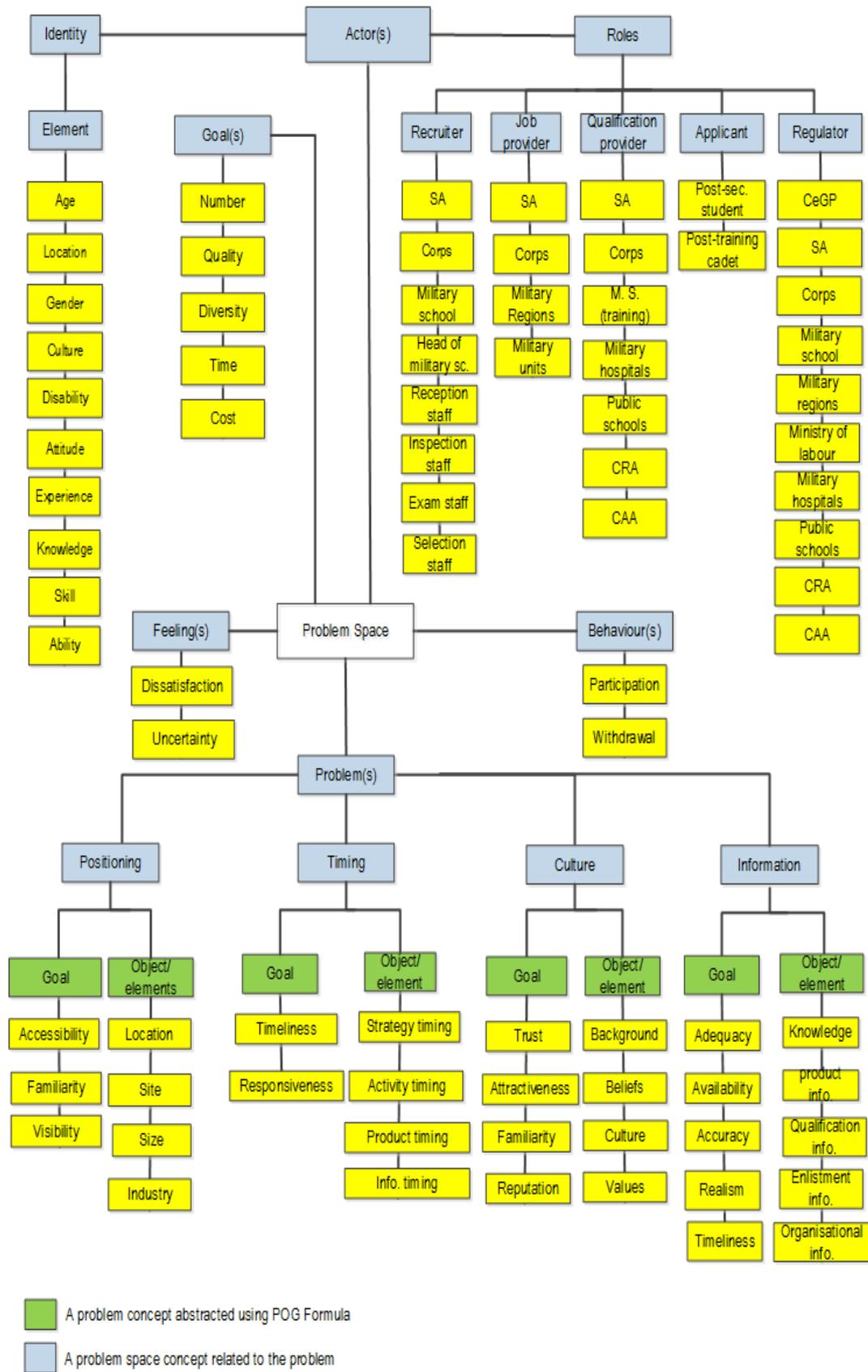
An Example of the Onto-RPD Artefact Produced based on the POCM in the 1st A-R cycle

Appendix 9 – Analysis Results of the Questionnaire Conducted on the SA Enlistment Case Study

Arabic Copy of Secureland Survey

أود ان اشارك في هذه الدراسة كـ :ـ

Answer Choices	Responses	
متقدم محتمل	39.64%	67
متقدم حالى	31.95%	54
متقدم سابق	10.06%	17
احد المسئولين او المشاركين بعملية التجنيد (ركن ادارة، ضابط افراد،ضابط تجنيد، ضابط صف ت	18.34%	31
Answered		**169**
Skipped		**0**
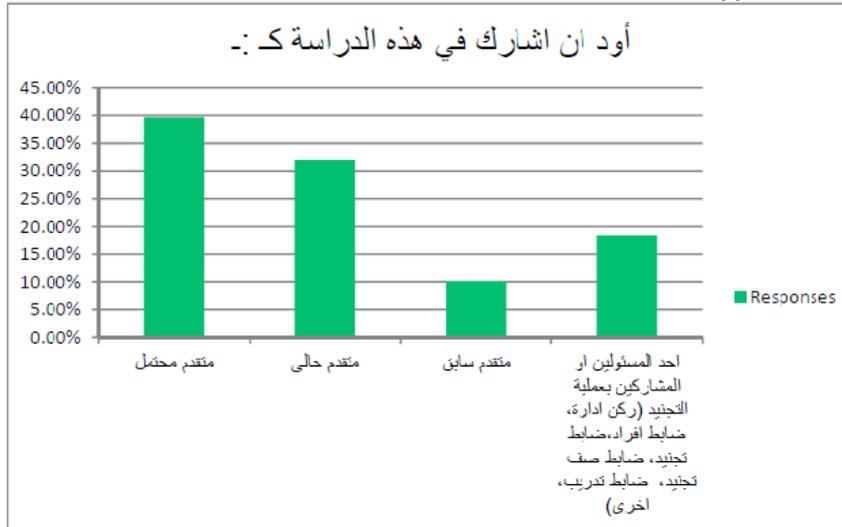
Arabic Copy of Secureland Survey

اذا كنت متقدم سابق

Answer Choices	Responses	
معين	35.29%	6
مستبعد	47.06%	8
منسحب	17.65%	3
Answered		**17**
Skipped		**152**

361
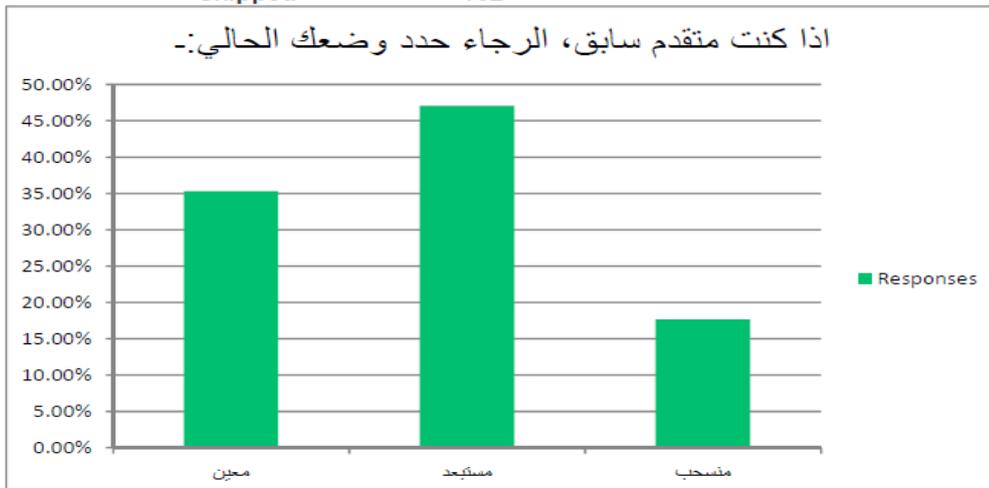
Arabic Copy of Secureland Survey

اذا كنت منسحب او مستبعد ، الرجاء حد

Answer Choices	Responses	
في فترة الاعلان عن التقديم	20.00%	2
في فترة التقديم	20.00%	2
في فترة التقييم والاختبارات	10.00%	1
بعد القبول المبدئي	30.00%	3
بعد القبول النهائي	0.00%	0
بعد بداية التدريب	20.00%	2
الرجاء اذكر السبب		0
Answered		**10**
Skipped		**159**

اذا كنت منسحب او مستبعد ، الرجاء حدد في اي مراحل عملية التجنيد تم ذلك :-
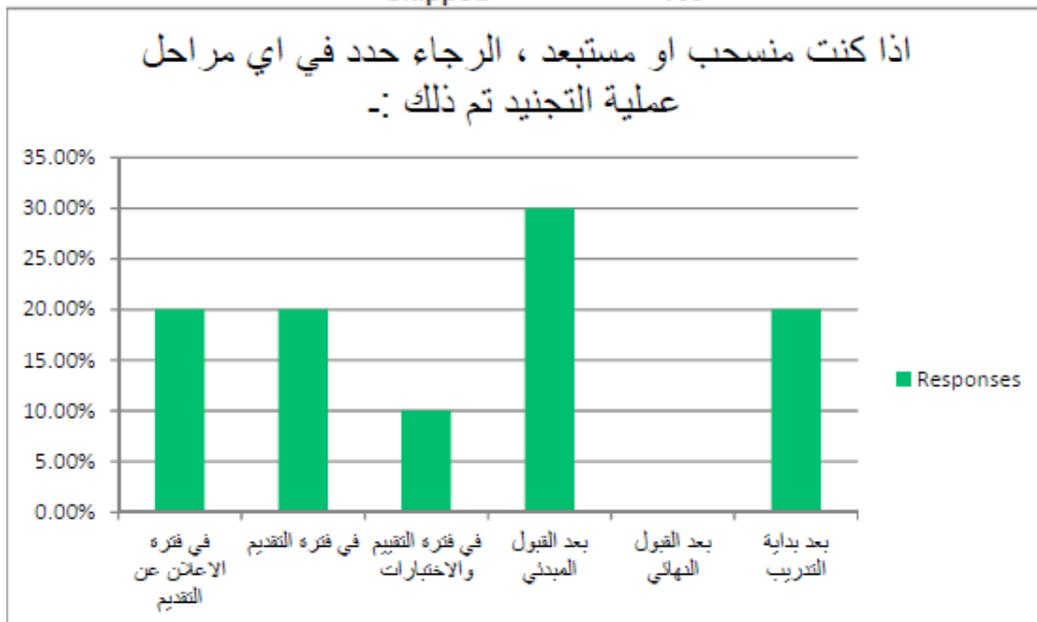
Arabic Copy of Secureland Survey

حدد تقديرك العام :-

Answer Choices	Responses	
ممتاز	21.97%	29
جيدجدا	40.91%	54
جيد	25.76%	34
مقبول	11.36%	15
Answered		**132**
Skipped		**37**

حدد تقديرك العام :-

362
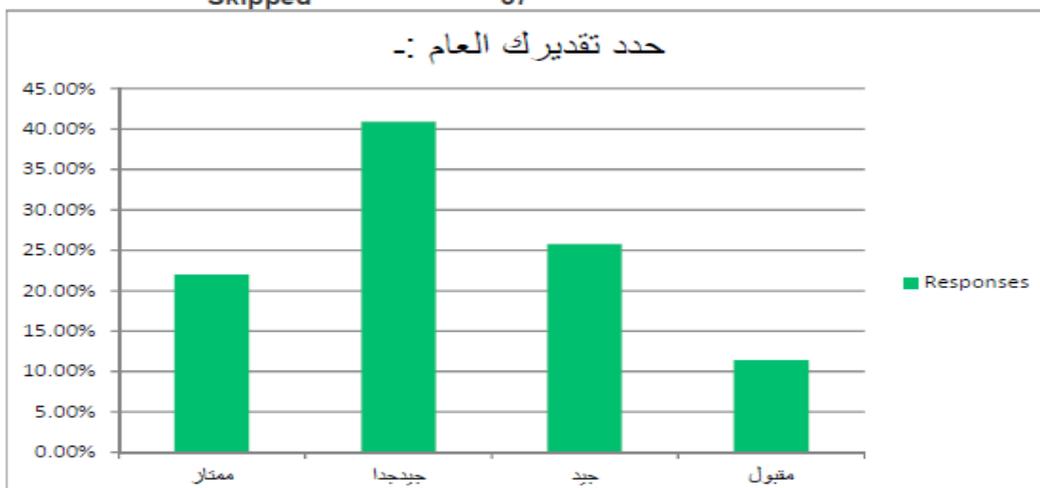
Arabic Copy of Secureland Survey

حدد المنطقة التي تسكن

Answer Choices	Responses	
الوسطى	25.19%	34
الغربية	23.70%	32
الشرقية	23.70%	32
الشمالية	9.63%	13
الجنوبية	8.15%	11
الشمالية الغربية	9.63%	13
Answered		**135**
Skipped		**34**

حدد المنطقة التي تسكن فيها وقت التقديم على التجنيد
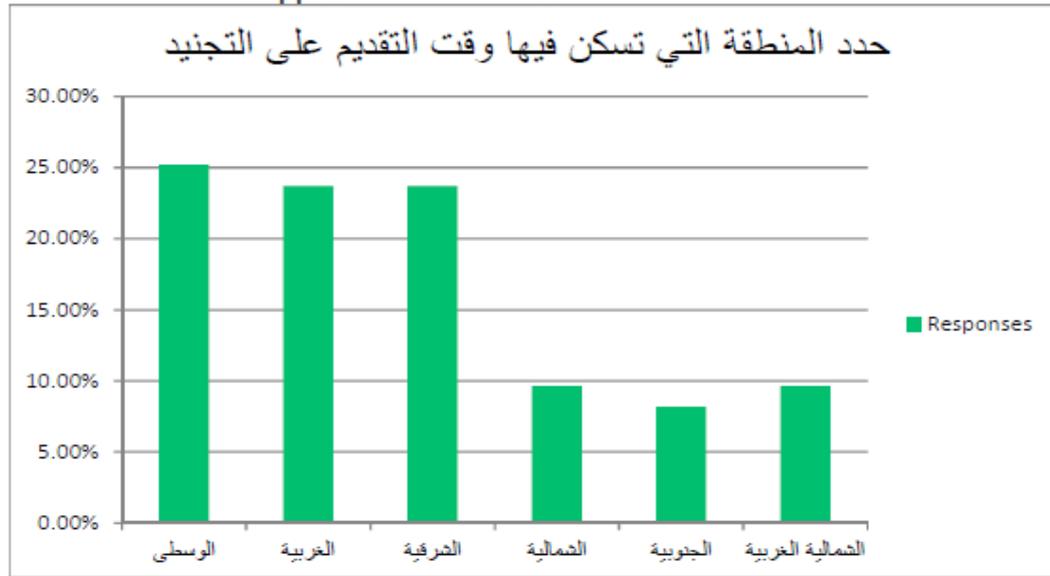
Arabic Copy of Secureland Survey

حدد المنطقة التى يوجد

Answer Choices	Responses	
الوسطى	27.07%	36
الغربية	15.04%	20
الشرقية	20.30%	27
الشمالية	18.05%	24
الجنوبية	16.54%	22
الشمالية الغربية	3.01%	4
غير معروفة الان	0.00%	0
Answered		**133**
Skipped		**36**

حدد المنطقة التى يوجد بها مركز الاستقبال او المدرسة او المعهد والذي (سوف تقدم / اوقدمت) على التجنيد من خلاله -:
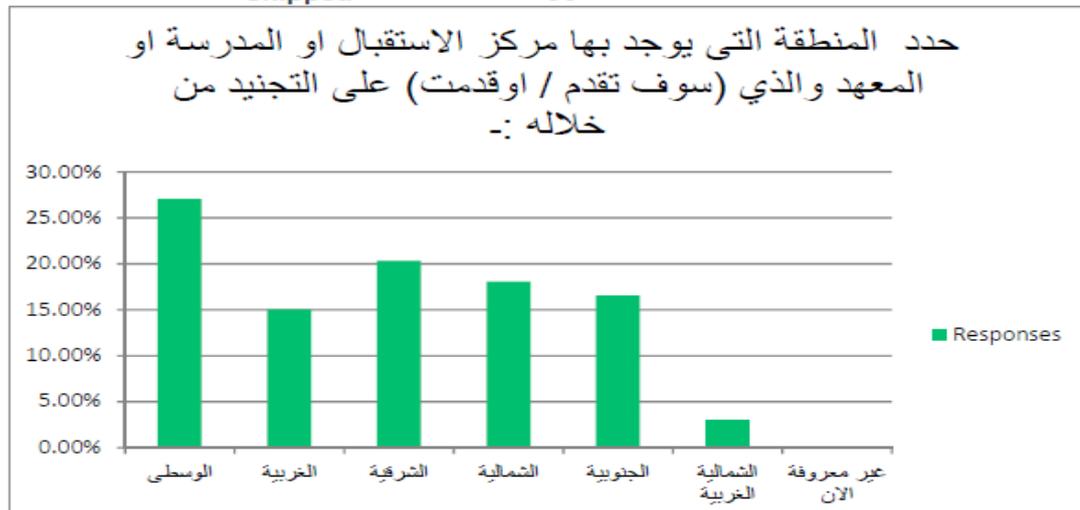
Arabic Copy of Secureland Survey

الى اي مدى تجد العوامل التالية تدفعك نحو الألتحاق بالعمل العس...

	1		2	
المشاركة المباشرة في الدفاع عن الدولة	79.75%	126	15.82%	25
الامان الوظيفي	8.86%	14	67.72%	107
تشجيع الاهل والاصدقاء	0.63%	1	5.70%	9
تكافؤ الفرص	0.00%	0	5.13%	8
عدم الرغبة باكمال الدراسة الجامعية	0.64%	1	0.00%	0
سمعة القطاع العسكري	0.00%	0	1.27%	2
سمعة عمليات الاستقبال والتجديد	0.00%	0	0.00%	0
التأقلم مع العمل العسكري	0.00%	0	0.00%	0
الوظائف جذابة ومنافسة	10.13%	16	4.43%	7
التنوع في المناطق والاسلحة والوظائف والاشخاص	0.00%	0	0.00%	0
سهولة متطلبات الالتحاق	0.00%	0	0.00%	0
خيار اسرع للوظيفة	0.00%	0	0.00%	0
الشفافية والوضوح في التجديد	0.00%	0	0.00%	0

الى اي مدى تجد العوامل التالية تدفعك نحو الألتحاق بالعمل العسكري؟ (الرجاء ترتيبها ١ الأعلى تأثيراً ١٣ الأضعف تأثيراً او اختر غير مؤثرة) ـ
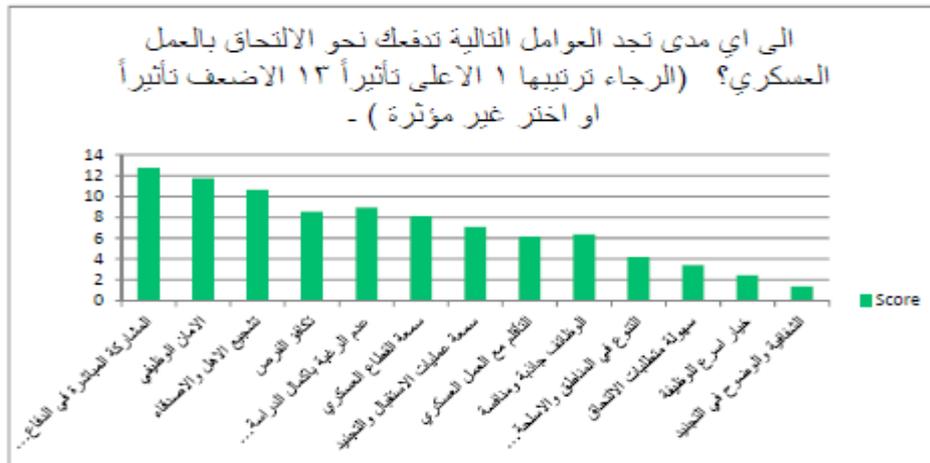
Arabic Copy of Secureland Survey

الى اي مدى العناصر التالية تهمك

	1		2		
نشاط الوظيفة	85.26%	133	5.13%	8	5.13%
مسمى الوظيفة	7.74%	12	80.00%	124	7.74%
راتب الوظيفة	2.56%	4	9.62%	15	76.92%
ساعات الدوام الوظيفي	0.00%	0	1.94%	3	7.74%
بدلات ومزايا الوظيفة	0.00%	0	1.95%	3	0.65%
رتبة الوظيفة	0.65%	1	0.00%	0	0.65%
موقع الوظيفة (المنطقة)-	1.94%	3	0.65%	1	1.29%
مستقبل الوظيفة	0.64%	1	0.64%	1	0.00%
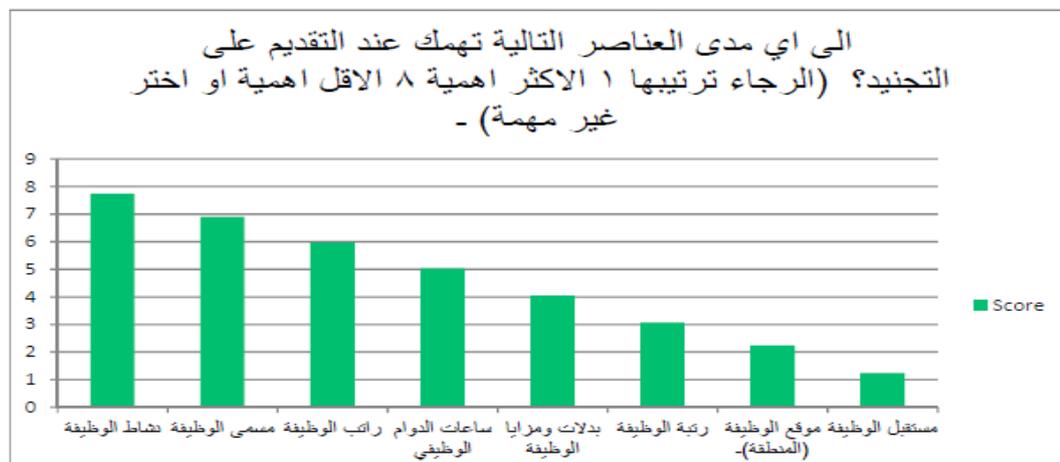
الى اي مدى العناصر التالية تهمك عند التقديم على التجنيد؟ (الرجاء ترتيبها ١ الاكثر اهمية ٨ الاقل اهمية او اختر غير مهمة) ـ

Arabic Copy of Secureland Survey

قيّم العبارات التالية بخصوص اكتمال المعلومات المعطاة لله

	لا اوافق بشدة		لا اوافق		محايد	
المعلومات الخاصة بجهة العمل كافية	41.18%	63	24.18%	37	7.19%	11
المعلومات الوظيفية المعطاة كافية	24.16%	36	34.23%	51	35.57%	53
معلومات اجراءات التقديم كافية	19.33%	29	46.00%	69	18.67%	28
معلومات الاختبارات وطرق التقييم كافية	35.37%	52	24.49%	36	27.21%	40
معلومات اجراءات الاختيار للمرشحين كافية	16.78%	24	48.95%	70	18.88%	27
معلومات التسجيل ومتطلباته كافية	16.78%	24	29.37%	42	41.26%	59
معلومات التدريب بعد القبول النهائي كافية	20.00%	28	46.43%	65	14.29%	20
خدمة الاشعارات كافية	43.75%	63	30.56%	44	19.44%	28
الرجاء وضح سبب اختيارك						

قيّم العبارات التالية بخصوص اكتمال المعلومات المعطاة للمتقدمين من حيث الكم والجودة -:
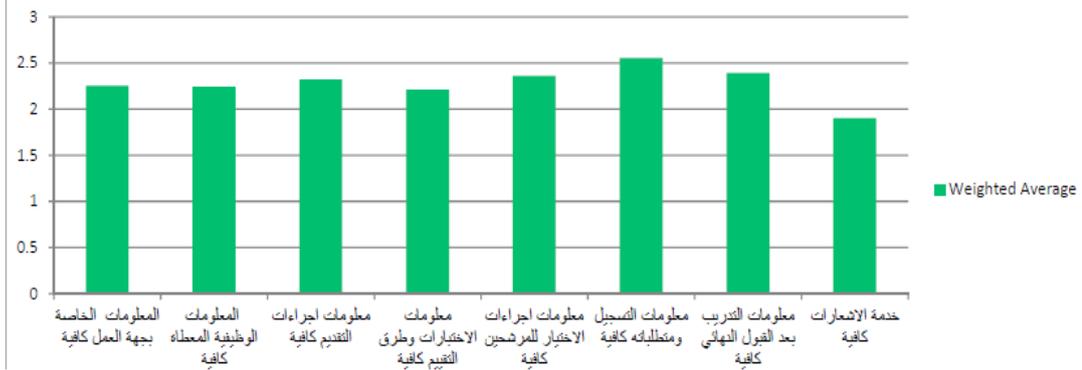
Arabic Copy of Secureland Survey

اعتمادا على توقيتات المعلومات الرجاء قيّم العبارات التالية :-

	لا اوافق بشدة		لا اوافق		ايد
توقيت اعطاء معلومات جهة العمل مناسب	35.76%	54	30.46%	46	5.30%
توقيت اعطاء المعلومات الوظيفية مناسب	14.09%	21	36.91%	55	44.97%
توقيت اعطاء معلومات اجراءات التقديم مناسب	18.92%	28	43.92%	65	22.97%
توقيت اعطاء معلومات اجراءات الاختبارات والتقييم مناسب	36.36%	52	25.17%	36	20.28%
توقيت اعطاء معلومات اجراءات الاختيار والترشيح مناسب	14.79%	21	54.93%	78	19.01%
توقيت اعطاء معلومات اجراءات التسجيل الرسمي مناسب	18.31%	26	28.17%	40	40.85%
توقيت اعطاء معلومات اجراءات التدريب بعد القبول مناسب	21.83%	31	50.70%	72	15.49%
توقيت الاعلانات والاشعار مناسب	37.86%	53	27.86%	39	20.71%
الرجاء وضح سبب اختيارك					

اعتمادا على توقيتات المعلومات الرجاء قيّم العبارات التالية :-
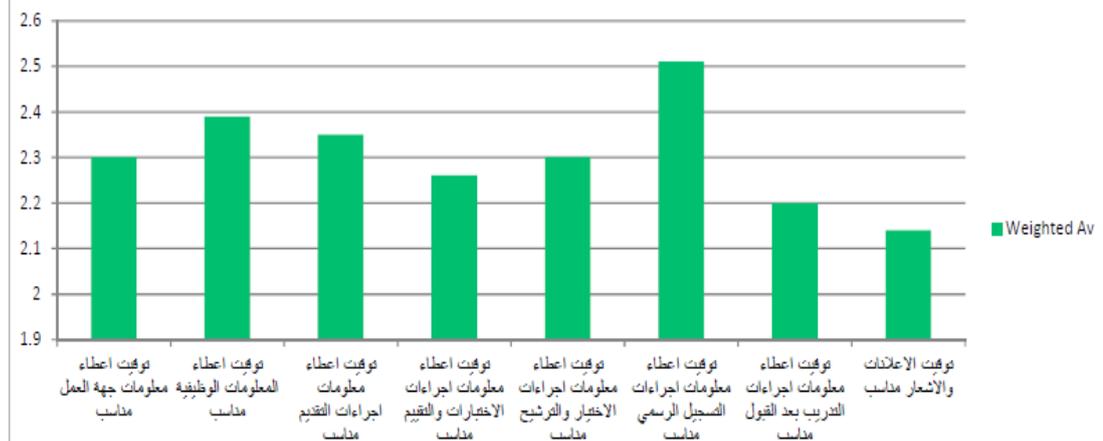
Arabic Copy of Secureland Survey

قيّم العبارات التالية فيما يتعلق بعملية التجديد الحالية :-

	لا اوافق بشده		إافق
وقت عملية التجديد مناسب ويتيح التفكير واتخاذ القرار	40.13%	61	26.32%
موقع الاستقبال قريب من المتقدمين	15.17%	22	40.69%
طاقم العمل في مركز الاستقبال يقدم الخدمة بشكل متعاون	16.33%	24	44.22%
طاقم العمل في مركز الاستقبال متنوع من جميع المناطق	32.62%	46	32.62%
المتقدم يستطيع تحديد ما اذا كانت الوظيفة تناسبه ام لا	17.48%	25	39.86%
المتقدم يستطيع التنبؤ بتعبيه بالوظيفة المطلوبة	17.78%	24	28.89%
المتقدم يملك الخيار للانسحاب متى ما اراد	16.55%	23	47.48%
اكثر من فرصة وظيفية يمكن للمتقدم التقديم عليها	40.91%	54	22.73%
هناك فرص بديلة متاحة للمتقدم للتحول اليها عند الحاجه	22.63%	31	48.91%
يستطيع المتقدم متابعة طلبة والحصول على معلومات وقتية	19.29%	27	26.43%
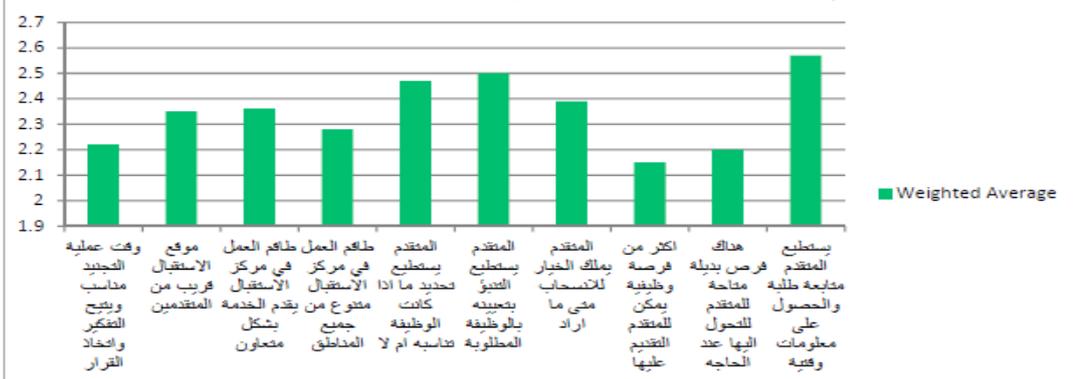
Arabic Copy of Secureland Survey

قيّم اهمية المعلومات التالية في تحقيق الاهداف في تشجيعك للتقديم على التجنيد

	0		1	
معلومات جهة العمل	2.38%	3	18.25%	23
المعلومات الوظيفية	2.68%	3	15.18%	17
معلومات اجراءات التقديم	0.00%	0	17.54%	20
معلومات اجراءات الاختبارات والتقييم	0.87%	1	17.39%	20
معلومات اجراءات الاختيار للمرشحين	3.54%	4	13.27%	15
معلومات التسجيل ومتطلباته	0.89%	1	14.29%	16
معلومات اجراءات التدريب بعد التسجيل	0.90%	1	14.41%	16
خدمة الاشعارات	0.90%	1	15.32%	17
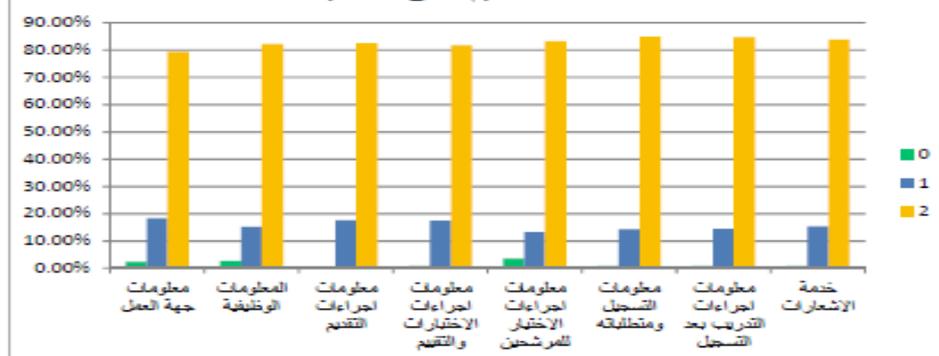
تشجعك للمواصلة حتى القبول المبدئي

	0		1	
معلومات جهة العمل	11.57%	14	10.74%	13
المعلومات الوظيفية	1.65%	2	14.88%	18
معلومات اجراءات التقديم	2.65%	3	19.47%	22
معلومات اجراءات الاختبارات والتقييم	0.88%	1	11.50%	13
معلومات اجراءات الاختيار للمرشحين	0.00%	0	18.42%	21
معلومات التسجيل ومتطلباته	5.41%	6	10.81%	12
معلومات اجراءات التدريب بعد التسجيل	2.65%	3	9.73%	11
خدمة الاشعارات	0.00%	0	11.93%	13

تشجعك للمواصلة حتى القبول المبدئي
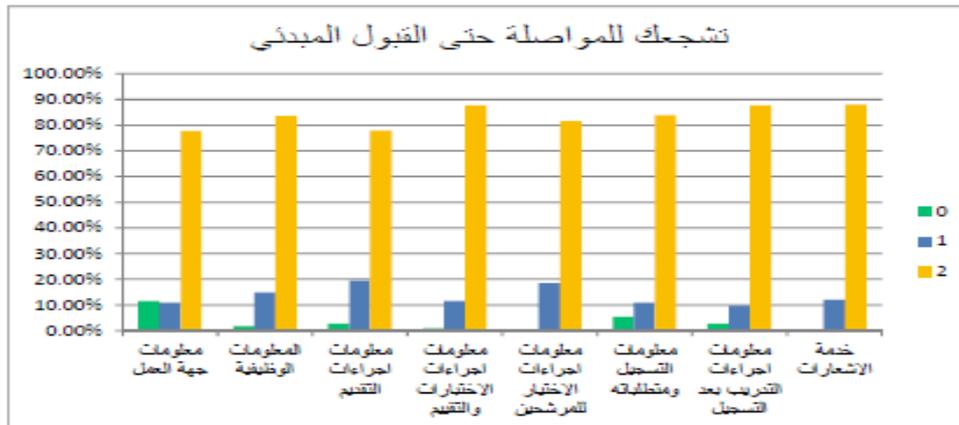
تشجعك للمواصلة بعد القبول المبدئي

	0		1	
معلومات جهة العمل	38.46%	45	44.44%	52
المعلومات الوظيفية	11.67%	14	53.33%	64
معلومات اجراءات التقديم	18.64%	22	27.12%	32
معلومات اجراءات الاختبارات والتقييم	35.78%	39	40.37%	44
معلومات اجراءات الاختيار للمرشحين	16.81%	19	58.41%	66
معلومات التسجيل ومتطلباته	13.64%	15	37.27%	41
معلومات اجراءات التدريب بعد التسجيل	34.58%	37	34.58%	37
خدمة الاشعارات	8.57%	9	60.00%	63

تشجعك للمواصلة بعد القبول المبدئي
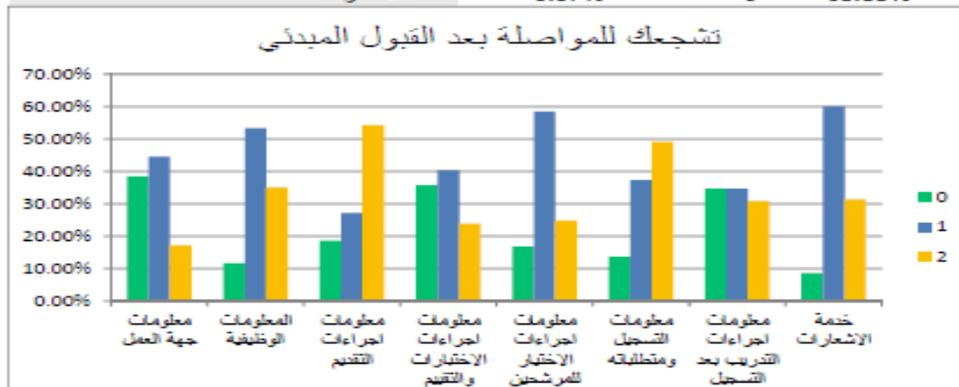
تشجعك للاستمرار بعد التسجيل والتعيين

	0		1	
معلومات جهة العمل	14.68%	16	28.44%	31
المعلومات الوظيفية	7.69%	8	60.58%	63
معلومات اجراءات التقديم	44.76%	47	30.48%	32
معلومات اجراءات الاختبارات والتقييم	16.82%	18	26.17%	28
معلومات اجراءات الاختيار للمرشحين	14.42%	15	53.85%	56
معلومات التسجيل ومتطلباته	39.62%	42	29.25%	31
معلومات اجراءات التدريب بعد التسجيل	3.92%	4	40.20%	41
خدمة الاشعارات	20.37%	22	51.85%	56

تشجعك للاستمرار بعد التسجيل والتعيين
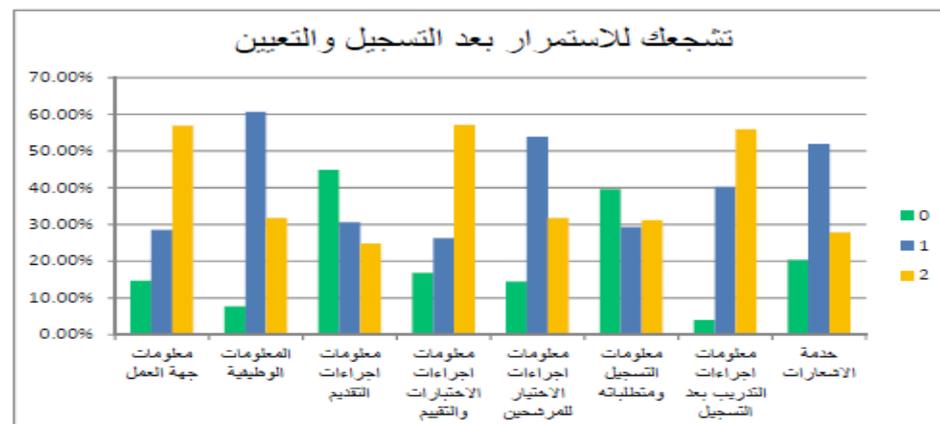
Arabic Copy of Secureland Survey

قيم العبارات في كل صف مقابل درجة الت

تشجعك للتقديم على التجنيد

	0		1		2
سلوك وتصرفات طاقم الاستقبال	0.86%	1	15.52%	18	83.62%
موقع مركز الاستقبال والتقديم	0.83%	1	19.01%	23	80.17%
البدائل الوظيفية للتقديم	0.88%	1	14.91%	17	84.21%
بدائل موقع مركزالاستقبال	0.93%	1	14.81%	16	84.26%
بدائل عملية في حال الضرورة	0.00%	0	18.35%	20	81.65%
طول مدة التقديم	0.00%	0	12.50%	14	87.50%
سرعة الاستجابة والتواصل	0.00%	0	43.75%	14	56.25%

الرجاء وضح سبب اختيارك

تشجعك للتقديم على التجنيد
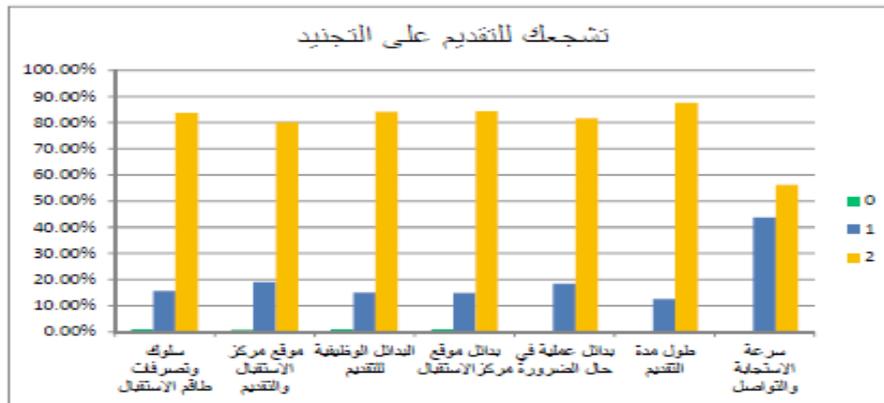
تشجعك للمواصلة حتى القبول المبدئي

	0		1		2
سلوك وتصرفات طاقم الاستقبال	1.77%	2	10.62%	12	87.61%
موقع مركز الاستقبال والتقديم	2.63%	3	16.67%	19	80.70%
البدائل الوظيفية للتقديم	2.65%	3	13.27%	15	84.07%
بدائل موقع مركزالاستقبال	2.65%	3	8.85%	10	88.50%
بدائل عملية في حال الضرورة	3.60%	4	9.01%	10	87.39%
طول مدة التقديم	0.94%	1	3.77%	4	95.28%
سرعة الاستجابة والتواصل	0.00%	0	16.13%	5	83.87%

الرجاء وضح سبب اختيارك

تشجعك للمواصلة حتى القبول المبدئي
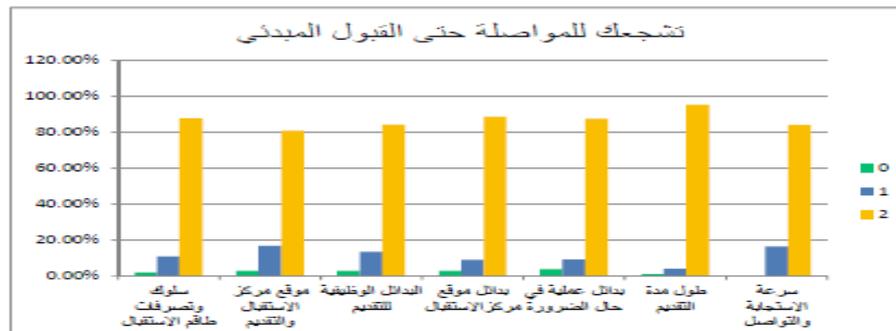
تشجعك للمواصلة بعد القبول المبدئي

	0		1		2
سلوك وتصرفات طاقم الاستقبال	13.39%	15	44.64%	50	41.96%
موقع مركز الاستقبال والتقديم	33.63%	38	40.71%	46	25.66%
البدائل الوظيفية للتقديم	19.30%	22	57.02%	65	23.68%
بدائل موقع مركزالاستقبال	19.63%	21	26.17%	28	54.21%
بدائل عملية في حال الضرورة	38.32%	41	34.58%	37	27.10%
طول مدة التقديم	9.09%	10	58.18%	64	32.73%
سرعة الاستجابة والتواصل	20.59%	7	52.94%	18	26.47%

الرجاء وضح سبب اختيارك

تشجعك للمواصلة بعد القبول المبدئي
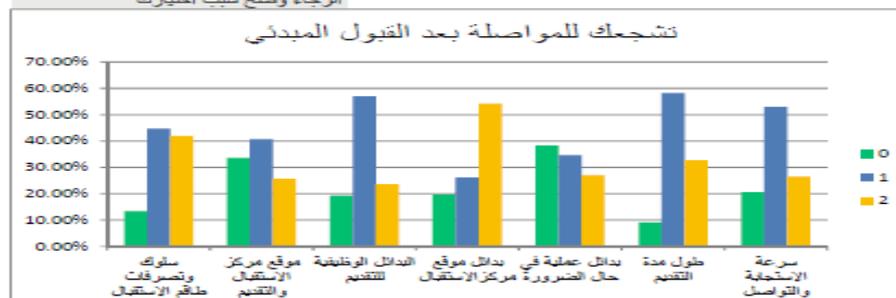
تدفعك للاستمرار بعد التسجيل والتعيين

	0		1		2
سلوك وتصرفات طاقم الاستقبال	43.24%	48	27.03%	30	29.73%
موقع مركز الاستقبال والتقديم	13.86%	14	32.67%	33	53.47%
البدائل الوظيفية للتقديم	12.75%	13	54.90%	56	32.35%
بدائل موقع مركز الاستقبال	39.62%	42	35.85%	38	24.53%
بدائل عملية في حال الضرورة	17.14%	18	31.43%	33	51.43%
طول مدة التقديم	8.16%	8	57.14%	56	34.69%
سرعة الاستجابة والتواصل	11.11%	4	27.78%	10	61.11%

الرجاء وضح سبب اختيارك
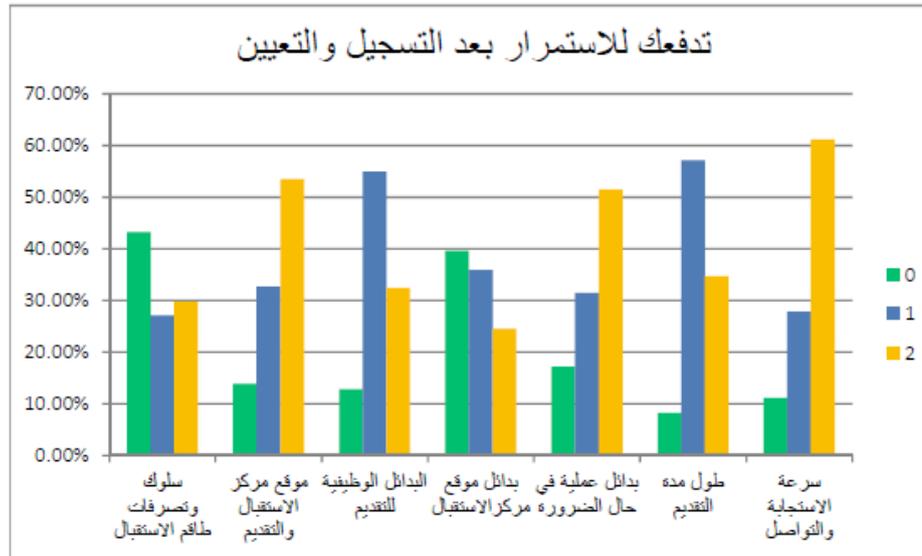
Appendix 10 – Textual Analysis of the Content of BA Enlistment Case Study

Objective and Outcomes	Problem Concepts	Problem Concepts	Problems Still Not Addressed
(1) Better service provided • The vision is "keen that young people see the armed forces as a first choice option when they think about careers" • The aim is "to create the conditions in which recruiting can flourish" • A large proportion join for negative reasons, including the lack of civilian career options • A survey in the Cardiff area in 2004 found that 40% of army recruits were joining as a last resort • The prospect of a forces career appeals progressively less as potential recruits grow into adulthood	**1.1 (Root 1) Process** • Over 200 different roles in the Army to apply • Different ways to join the Army (regular or reserve) in different ages by different entry requirements at any time • Pre- and Post-result application (e.g. conditional and non-conditional offers) • One application with multiple choices of corps or regiments • One Army Recruiting policy is a more coherent and effective recruiting process: putting applicants at the centre of the process; delegating responsibility for recruiting to the Regional Chain of Command; professional recruiting teams; and using technology to speed the processes and achieve broad coverage • The Armed Forces is engaged in a number of activities to minimise the impact of mobility and increase stability • Armed Forces are developing their youth strategies in order to raise awareness at an earlier age to secure similar levels of recruitment from a smaller target population • Efforts to attract young people to a forces career are intensifying and diversifying, particularly among those below recruitment age.	**1.1.1 (Root 2) information:** • Full information about the army including mission, structure, functions, etc. • General information about pay, bonuses, annual leave, length of legal obligation of service, promotion and pension. • General information about subsistence; overseas postings; travel; clothing; lodging; children's education allowance; relocation allowance; council tax refund; long service advance pay; domestic assistance; and service risk insurance. • Full information about recruitment and selection activities including online application, interview, medical check, selection tests, job offering and signing, training, and final assignment. • Full information about roles (jobs) in the army and each role is detailed with entry requirements, Realistic Job Preview (RJP), future promotions, skills learnt, qualifications achieved through. • Informed decision about future roles you can go on to do after serving a period of time	• The visibility of the Armed Forces' in civilian society has reduced over recent years • Demographic changes, improvements in civilian education opportunities, and negative publicity from Afghanistan and Iraq are among the main barriers to recruitment. • The act of early attestation marks the first day of the recruit's service and the point at which he/she becomes subject to military law • Some information that might persuade potential recruits to enlisting is not routinely volunteered (e.g. job location and potential overseas missions) • Less understanding of legal rights and obligations • Failing to inform potential recruits sufficiently about the risks associated with a forces career and vital rights and privileges • Unrealistic expectations before enlisting and less awareness of the 'down-sides' of the career • The terms of service are extremely confusing and subject to many probabilities, and the formal Notice Paper is difficult to understand • Greater advance information of potential postings or deployments is needed. • Greater stability and certainty needed about their work/life balance

Objective and Outcomes	Problem Concepts	Problem Concepts	Problems Still Not Addressed
(1) Better service provided • The vision is "keen that young people see the armed forces as a first choice option when they think about careers" • The aim is "to create the conditions in which recruiting can flourish" • A large proportion join for negative reasons, including the lack of civilian career options • A survey in the Cardiff area in 2004 found that 40% of army recruits were joining as a last resort • The prospect of a forces career appeals progressively less as potential recruits grow into adulthood	**1.1 (Root 1) Process (tools)** • Roles (jobs) in the Army are grouped into seven categories by the skills that are needed, and their place on the battlefield. • Role Finder helps finding the most suitable role to apply for based on different entries: age, gender, the area of army (regular or reserve), personal characteristics, skills and experience, and army trades intended. • The Army has introduced the Potential Soldier programme to confirm physical, mental, emotional and domestic readiness for the Army selection and training process • More information about army life can be communicated through talking online using live chat or visiting an Army Careers Centre where a careers adviser can help. • A Candidate Support Manager (CSM) is appointed in the National Recruiting Centre (NRC) • An interview with a Careers Adviser (CA) is conducted to confirm suitability and eligibility for the Army. • Offers are made towards an applicant's role options except job location • After conducting the selection tests a list of potential roles is provided. • Offers may or may not be the candidate's first choice	**1.1.1 (Root 2) information:** • Using online techniques to engage their target audience • Informed recruitment campaigns based on market research • Raised awareness and marketing through schools visits, literature and internet resources, and local cadet forces. **Information (Timing):** • Ongoing marketing campaigns • Successive provision of job characteristics offered during recruitment process • Opportunities to attend generic Army insight courses as well as insight courses for specific Regiments and Corps during the year. **1.1.2 Root (Structural):** • Army Career centres (recruiters) are spread everywhere in UK. • Training centres are based on which role you'll be doing and placed in specific locations	• General remuneration and allowances, i.e. not role-based, which are difficult to understand and determine eligibility and entitlement. • Only those who are well-informed about the army and its regiments can predict the location of job. • Joining the phase 1 training is not immediate but based on a grade given later • The location of job is informed at the end of recruitment process (i.e. after Phase 2 training course) • Career preferences are too generic at the beginning of application based on corps and regiments, and become more specific during the process related to the roles intended. • No option for the location of job

(2) Number of Jobs filled
- Low recruiting target
- It is not simply enough to have the right number of personnel
- 38% of Army recruits did not complete Phase 2 training
- Increased pinch points (serious manning shortfalls) in the Army.
- Pinch point trades have increased by 15.4% so that there are now 30 pinch point trades in the Army

2.1 Participation
- Minimum academic qualifications to become a soldier and the emphasis is on practical skills
- Some jobs require no formal academic qualifications; others call for certain GCSEs or A levels

2.1.1 Less interest to apply

R: Applicant dissatisfaction (1.1)

2.1.2 Less number retained

R: Withdrawal (2.3)

2.2 Process
- Inappropriate pool to select from (relationship between quantity and quality)
- Computer-based selection device (criteria) helps matching an applicant with the roles most suited
- Individual-based selection
- Timely selection process

2.2.1
Participation (2.1)

2.2.2 Withdrawn applicant selected

Withdrawal (2.3)

2.3 Withdrawal
- No longer to enlist as many recruits as possible but only those least likely to leave at early stage (e.g. young people and less advantaged)
- Strict military law against withdrawal after attestation
- Timed withdrawal linked with attestation

2.3.1

Inability to match applicant's expectations

- Depending upon those who are socially and economically vulnerable to enlist for negative reasons; and recruiting minors without adequate safeguards
- Some roles still demands high entry requirements
- Long waiting time to join Phase 1 training after selection

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(3) Time frame for filling jobs
- The whole application process can take around 3 – 5 months to complete, depending on the role you have applied for
- Having completed the Assessment Centre you'll be given a grade. This affects how long it will be before you are invited to start your initial training

3.1 Participation (large number attracted)
- Different timetables for applications with different tracks
- Predicated grades-based participation
- If you want to return to your studies and join later, or simply need more time to make a decision, there are opportunities before your training begins to take time out and restart the process at a later date, or to pull out altogether.

- Your start date will also depend on the number of places the Army has to offer for each specific trade

3.2 Process (Call for recovery / Clearing)
- Dedicated time for recovery (clearing) ends by more than one month after semester start

3.2.1 Less number attracted
R: Participation (2.1)

3.3 (Process) Selection
- High flexible selection in response to the timeframe allocated (see actions in 2.2)

3.3.1 Inappropriate pool to select from
- R: Participation (2.1)

(4) High qualified applicants (KSAs)
- The Army is built on the quality of its soldiers
- Recruitment selection standards have not been reduced and the quality of those joining remained high
- A proportion of recruits do not complete training for a variety of reasons (e.g. failing to reach the required standard)

4.1 Participation
- Self-select choice of competitive courses with clear qualifications
- The choice of jobs is endless, almost there's a job in the Army to match every
- So whether you want to develop your skills or learn new ones, you'll be able to find a role that suits you talent and preference
- The 'golden hello' payment helps recruiting top quality soldiers who already have good skills and qualifications they can use in their Army role

4.1.1 Less interest to apply
- R: Applicant dissatisfaction (1.1)

4.1.2 Less number retained (of high quality)
- R: Withdrawal (4.3)

(4) High qualified applicants (KSAs)
- The Army is built on the quality of its soldiers
- Recruitment selection standards have not been reduced and the quality of those joining remained high
- A proportion of recruits do not complete training for a variety of reasons (e.g. failing to reach the required standard)

4.2 Process (Selection)
- The higher A level is achieved the more likely an applicant get offered (e.g. no control on numbers of ABB+ or equivalent)
- Two offer choices to enhance confirmation (firm choice and insurance choice)
- Flexibility in selection type (individual-based or pool-based)
- Flexibility in selection timing
- No background-based selection actions (discrimination)

4.2.1 Inappropriate pool to select from (less quality participation)
R: Participation (4.1)

4.2.2 Withdrawn applicant selected
R: Withdrawal (4.3)

4.3 Withdrawal
- Timed confirmation or decline
- Systematic cancellation

4.3.1
Inability to match applicant's expectations
R: Applicant dissatisfaction (1.1)

(5) Diversity
- Failure to achieve most of its diversity targets, particularly with regard to the recruitment of people from ethnic minorities
- 60% of total ethnic minority strength comes from ethnic minorities from outside the United Kingdom
- Ethnic minority representation has been consistently increasing

5.1 Participation
- Widening participation (general marketing)
- Full information of financial support eligibility

5.1.1 Less interest to apply
R: Applicant dissatisfaction (1.1)

5.1.2 Less diverse number retained
R: Withdrawal (5.3)

5.2.1 Inappropriate pool to select from (less diverse participation)
R: Participation (5.1)
- Inability to match applicant's expectations (1.1)
- R: Applicant dissatisfaction (1.1)

- The geographical coverage of the schools visited to a degree comes down to footprint and resources
- The MoD notes that the number of outreach activities it can undertake is limited by finances and resources
- The armed forces still draw non-officer recruits mainly from among young people with low educational attainment and living in poor communities

- The differences in terms and conditions which exist amongst the Services are a cause of discontent
- In an era of increasing joint operations the MoD must give serious consideration to how different terms and conditions in the three Services could be better aligned.

(6) Efficiency and cost savings
- High wastage rates during initial training
- 38% of Army recruits did not complete Phase 2 training
- Wastage has a financial cost
- The consequence of wastage "means it is proving harder to sustain our target for gains to the trained strength".

6.1 Process
- (Participation (large number attracted)
- Clear entry requirements
- Apply with 3 enlistment options maximum

6.1.2 Less number retained

R: Withdrawal (6.4)

6.2 Call for recovery

6.2.1 Less number attracted

R: Participation (6.1)

6.3 Process (Selection)
- Only one offer choices to proceed with
- A direct offer with a short time to reply after results

6.3.2 Withdrawn applicant selected
R: Withdrawal (6.4)

6.4 Withdrawal
- Timed confirmation or decline
- Systematic cancellation

6.4.1

Inability to match applicant's expectations

R: Applicant dissatisfaction (1.1)

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Appendix 11 – Textual Analysis of the Content of UCAS Case Study

Goal and Outcomes	Problem Concepts Mapped to the Goal through the Influence of interest		
Fill vacancy • The highest number of placement recorded	**Type of Individual (Applicant):** • ABB+ level applicant (by degree) • Non- ABB+ A level students (by degree) • Applicants from all domiciles in UK (by location) • Women are higher than men at all types of institutions (by gender)	**Structure:** • Course providers are spread everywhere (accessibility, alternativeness) • A large set of course opportunities in different universities (alternativeness) • Applicant-based choice to apply (flexibility)	**Timing:** • A year-over timetable allows good management for unexpected events (availability) • Predefined deadlines to apply and reply (timeliness) • More time available to explore course options (availability) • Different timetables for applications with different tracks (availability, timeliness)
	Information: • Full access to information about providers, courses and entry requirements (adequacy, availability) • Clear recruitment activities (accuracy) • Full awareness of application transactions through Track scheme in case of unexpected events (accuracy) • Clear entry requirements (availability, accuracy)	**Process:** • Different tracks for application (Apply, Extra, and Clearing) with different timetables (Alternativeness, reliability) • High probability of high quality applicant (ABB+ or equivalent) being offered since they do not count towards the total number of places allocated (reliability, fairness) • Opportunities possible for non- ABB+ A level students (Alternativeness, fairness, resilience))	**Capital:** • Significant increases in the volume of applications incur additional costs (profitability) • Improved efficiency and cost savings using a centralized and fully controlled application service based on UCAS technology platform and systems provided (profitability)
	Tools: • Different modes of information delivery (accessibility) • UCAS is a technology platform for application (accessibility, usability,) • Improved reach of UCAS services across social classes and centre types (accessibility)	• Possible adjustment after exam results (Adjust service) (resilience) • Apply with 5 course options (Alternativeness)	**Culture:** • Many applicants need to make decisions about higher education at least six months before they receive their results (values) • No background-based selection actions (trust)

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Problem Concepts Mapped to the Goal through the Influence of interest

Goal and Outcomes

Fill vacancy
- The highest number of placement recorded
- Significant increases in the volume of applications

Type of Individual (Applicant):
- Acceptance rate of high A level applicants (ABB+ or equivalent) increased at all types of institutions, reaching a new high at higher tariff ones.
- More applicants from all domiciles in UK
- Entry rates for women are higher than for men at all types of institutions
- Entry rate for those holding A levels increases for all backgrounds but remains highly differentiated by background
- Offer rates increased for all backgrounds

Information:
- Widening participation (general marketing)
- Full information of financial support eligibility

Tools:
- A web-based access is provided by each HEI to all information needed about courses as well as entry requirements

Process:
- Predicated grades-based participation
- High flexible selection in response to the timeframe allocated
- Self-select choice of competitive courses with clear qualifications
- The higher A level is achieved the more likely an applicant get offered (e.g. no control on numbers of ABB+ or equivalent)
- Two offer choices to enhance confirmation (firm choice and insurance choice)
- Flexibility in selection type (individual-based or pool-based)
- Systematic cancellation
- Only two offer choices to proceed with(firm choice and insurance choice) until results posting

Timing:
- Prior-result application (predicted grades)
- Structured to meet the needs of applicants following the UK academic calendar
- Different timetables for applications with different tracks
- Dedicated time for recovery (cleaning) ends
- By more than one month after semester start
- Flexibility in selection timing
- Timed confirmation or decline
- A direct offer with a short time to reply after results

Culture:
- No background-based selection actions (discrimination)
- The fundamental concern that the attainment gap which restricts access to leading universities.
- Inefficient and cumbersome for HEIs because of the cumulative effect of predicted grades, insurance choices and Clearing

Problem Concepts Mapped to the Goal through the Influence of interest

Goal and Outcomes

Fill vacancy
- The highest number of placement recorded
- Significant increases in the volume of applications

Type of Individual (Applicant):
- ABB+ A level students
- non- ABB+ A level students

Process:
- Apply with 5 course options
- Possible adjustment after exam results (Adjust service)
- A year-over timetable allows good management for unexpected events
- Opportunities possible for non-ABB+ A level students
- High probability of high quality applicant (ABB+ or equivalent) being offered since they do not count towards the total number of places allocated
- Mismatch between applicant's choice and offer in compliance with offering a place for ABB+ level applicant
- Operational practice and admissions strategies employed by HEIs are varied and not transparent to applicants
- In case of no offer confirmed, a changed or deferred offer might be made by the course provider intended

Timing:
- Agility in dealing with applications with different qualifications
- More time available to explore course options
- Predefined deadlines to apply and reply
- A year-over timetable allows good management for unexpected events

Information:
- Full awareness of application transactions through Track scheme in case of unexpected events

Tools:
- Full access to information about providers, courses and entry requirements
- Clear recruitment activities
- High probability of high quality applicant (ABB+ or equivalent) being offered since they do not count towards the total number of places allocated

Culture:
- Many applicants need to make decisions about higher education at least six months before they receive their results (predicated grades)

Problem Concepts Mapped to the Goal through the Influence of interest		
Goal and Outcomes	**Type of Individual (Applicant):** • high A level applicants (ABB+ or equivalent)	**Process:** • Less fairer and transparent • Predicated grades based • Different tracks for application • (Apply, Extra, and Clearing) with different timetables • Two offer choices to enhance confirmation (firm choice and insurance choice) • The higher A level is achieved the more likely an applicant get offered (e.g. no control on numbers of ABB+ or equivalent) • The fundamental problem of the attainment gap which restricts access to leading universities. •
Fill vacancy • More applicants from all domiciles in UK • Entry rate for those holding A levels increases for all backgrounds	**Information:** • Clear entry requirements • Widening participation (general marketing) • Full information of financial support eligibility **Tools:** • Predicated grades-based acceptance	**Timing:** • Timed withdrawal and controlled in linkage with refund and loss of entry of the current academic year • Different timetables for applications with different tracks • Structured to meet the needs of applicants following the UK academic calendar • **Culture:** • No background-based selection actions (discrimination) • Offer rates increased for all backgrounds

Appendix 12 – Comparisons between the Three Case Studies (SA, BA, and UCAS)

Comparison between the Concepts of SA Enlistment Case Study and UCAS Case Study

Category	Enlistment Process	UCAS System
Information	No specific information provided about job characteristics (e.g. salary, location, specific type of job) ✓ Many job opportunities by multiple applications ✓ No communication and up-to-date information about application transactions (information-timing) ✓ Application oriented to invisible jobs subject to many probabilities (information-software)	Complete information about job (place) characteristics (e.g. course type, provider, location (campus), tuition fees) ✓ Many course options by one application ✓ Full awareness provided through UCAS (information) ✓ Specific course-oriented application (information-software)
Hardware	✓ No access to further information about jobs and application requirements (tools)	✓ A web-based access is provided by each HEI to all information needed about courses as well as entry requirements (tools)
Humanware	✓ Constraints (structure misfit) on location of applicant, job, and recruiter exist (people)	✓ Misfit is based on applicant choice (people relations)
Timings	✓ Adjustable and different timetables and deadlines ✓ Nearly 5 months process timetable starting in concurrence with result postings ✓ Less time to explore job opportunities (timeframe) ✓ Post-result application (process) ✓ High volume of applications received ✓ One-time application (process-time)	✓ Fixed and unified timetables with clear activities and deadlines ✓ A year-long process timetable preceding the academic entry ✓ Long time to explore course options (timeframe) ✓ Prior-result application (predicted grades) ✓ High volume of applications received ✓ Multiple tracks (apply, extra, adjust, and clearing) to apply with different timetables (process-time)
Software	✓ Whether to be accepted or not: no guarantee for offering a job (process0 ✓ Overlapped applications between many recruiters ✓ Call for recovery is seen problematic results in longer timetable, higher rate of withdrawals, less qualified applicants received ✓ Deadline-based withdrawal only	✓ Guaranteed conditional offer for an ABB+ level applicant when applying by a specific deadline (process-time) ✓ Well-managed application through UCAS ✓ Clearing is set for filling remaining places with less impact on timetable and already received applicants ✓ Deadline-based and applicant-based withdrawal

Comparison between the Concepts of SA Enlistment Case Study and UCAS Case Study (Continued)

	SA Enlistment	UCAS
Software	✓ Pool-based selection (process)	✓ Different types of selection (immediate single offer, pool-based, or both) (process)
	✓ Loose entry requirements (process)	✓ Flexible selection device (change in entry requirements based on the number received) (process)
	✓ High probability of being offered undesired job because of diversity considerations (software-humanware)	✓ Offers are confined to an applicant's course options
	✓ Only one conditional offer is given	✓ Offers are as many as course options matched
	✓ One conditional offer to proceed with linked with passing subsequent medical and identity checks (process)	✓ Two offers to proceed with: firm (representing the most preferred) and insurance (representing the most likely to match), both linked with achieving predicated grades (process()
	✓ No alternatives offered when unmet requirements (process)	✓ Course alternatives can be offered by the corresponding provider when essential offer are unmet (process()
	✓ One offer to be confirmed with possible overlap (process)	✓ One unconditional offer to be confirmed (process)
	✓ No chance for other possibilities when failing (process)	✓ Chances still exist: adjustment (when results better than expected while holding the current one granted) or clearing (when no offer to be confirmed))
Other Aspects	✓ Compressed recruitment activities	✓ Expanded over a year long
	✓ Hard to build a strong relationship with applicants over rivals	✓ Enough time to build such a relationship
	✓ Loss of timely support needed by other partners	✓ Allows enough time for support
	✓ No motivational effect of offers	✓ Motivational effects are highly considered
	✓ Fairer post-result application	✓ Less fair prior-result application
	✓ More efficient and better match of jobs	✓ Less efficient and less match of applicant to course

Comparison between the Concepts of BA Enlistment Case Study and UCAS Case Study

Category	BA Enlistment Case Study	UCAS Case Study
	High uncertainty	Low uncertainty
Information	✓ General information provided about the army including mission, structure, functions, etc.	
	✓ Career preferences are too generic at the beginning of application	✓ Full information about universities and courses
	✓ Many specific information missing about job characteristics (e.g. salary, location, specific type of job)	✓ Complete information about job (place) characteristics (e.g. course type, provider, location (campus), tuition fees)
	✓ Unrealistic expectations before enlisting and less awareness of the 'down-sides' of the career	✓ Guaranteed conditional offer for an ABB+ level applicant when applying by a specific deadline
	✓ Many job opportunities by multiple applications	✓ Many course options by one application
	✓ No communication and up-to-date information about application transactions	✓ Full awareness provided through UCAS
Software	✓ Informed decision about future roles you can go on to do after serving a period of time (information-software)	✓ Specific course-oriented application
	✓ On-going application (pre-post)	✓ Prior-result application (predicted grades)
	✓ Pre- and Post-result application (e.g. conditional and non-conditional offers)	✓ Guaranteed conditional offer for an ABB+ level applicant when applying by a specific deadline
	✓ Open application over the year	✓ A year-long process timetable preceding the academic entry
	✓ long time to explore job opportunities	✓ Long time to explore course options
	✓ High volume of applications received	✓ High volume of applications received
	✓ Different ways to join the Army (regular or reserve) in different ages by different entry requirements at any time	✓ Multiple tracks (apply, extra, adjust, and clearing) to apply with different timetables
	✓ Role Finder helps finding the most suitable role to apply for based on different entries	
	✓ One Army Recruiting policy	✓ Well-managed application through UCAS
	✓ Successive provision of job characteristics offered during recruitment process.	✓ Full provision of information at the start
	✓ Offers are made towards an applicant's role options except job location	
	✓ Deadline-based withdrawal only ✓ Timed confirmation or decline	✓ Deadline-based and applicant-based withdrawal

Comparison between the Concepts of BA Enlistment Case Study and UCAS Case Study (Continued)

Timing	✓ Adjustable and different timetables and deadlines	
	✓ Different timetables for applications with different tracks	
	✓ Training start date will also depend on the number of places the Army has to offer for each specific trade	✓ Fixed and unified timetables with clear activities and deadlines
	✓ Dedicated time for recovery (clearing) ends by more than one month after semester start	✓ Fixed time for clearing
Hardware	✓ A Candidate Support Manager (CSM) is appointed in the National Recruiting Centre (NRC)	✓ Full awareness provided through UCAS
	✓ An interview with a Careers Adviser (CA) is conducted to confirm suitability and eligibility for the Army.	✓ Well-managed application through UCAS
	✓ Full information about roles (jobs) in the army and each role is detailed with entry requirements, Realistic Job Preview (RJP), future promotions, skills learnt, qualifications achieved through.	✓ A web-based access is provided by each HEI to all information needed about courses as well as entry requirements
	✓ Using online techniques to engage their target audience	
Humanware	✓ Army Career centres (recruiters) are spread everywhere in UK.	✓ Course providers are spread over the UK
	✓ No chance for other possibilities when failing (process)	
	✓ The geographical coverage of the schools visited to a degree comes down to footprint and resources	
Other Aspects	✓ Compressed recruitment activities	✓ Expanded over a year long
	✓ Hard to build a strong relationship with applicants over rivals	✓ Enough time to build such a relationship
	✓ Loss of timely support needed by other partners	✓ Allows enough time for support
	✓ The 'golden hello' payment helps recruiting top quality soldiers	✓ Motivational effects are highly considered
	✓ Fairer post-result application	✓ Less fair prior-result application
	✓ No background-based selection actions	✓
	✓ More efficient and better match of jobs	✓ Less efficient and less match of applicant to course
	✓ Self-select choice of competitive courses with clear qualifications	✓ Specific course-oriented application

Appendix 13 – Evolutionary Development of 3rd POCM and Onto-RPD Artefacts
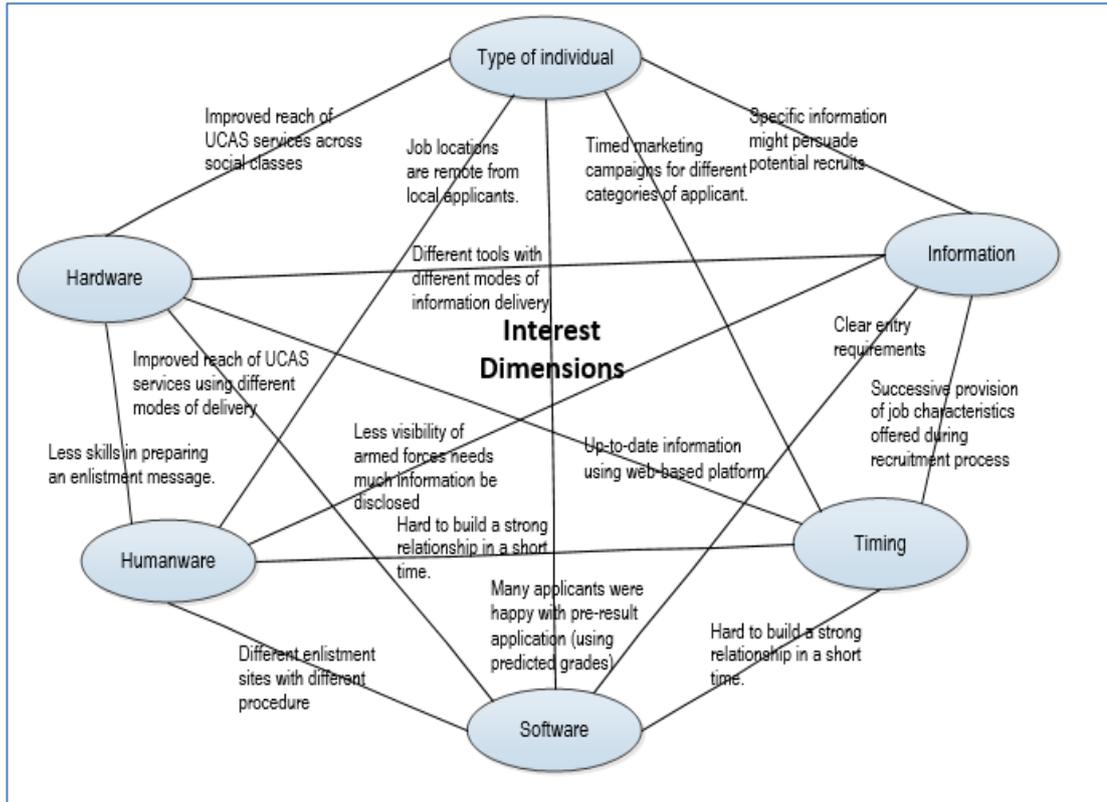
V.1 POCM Artefact in the 3st A-R cycle
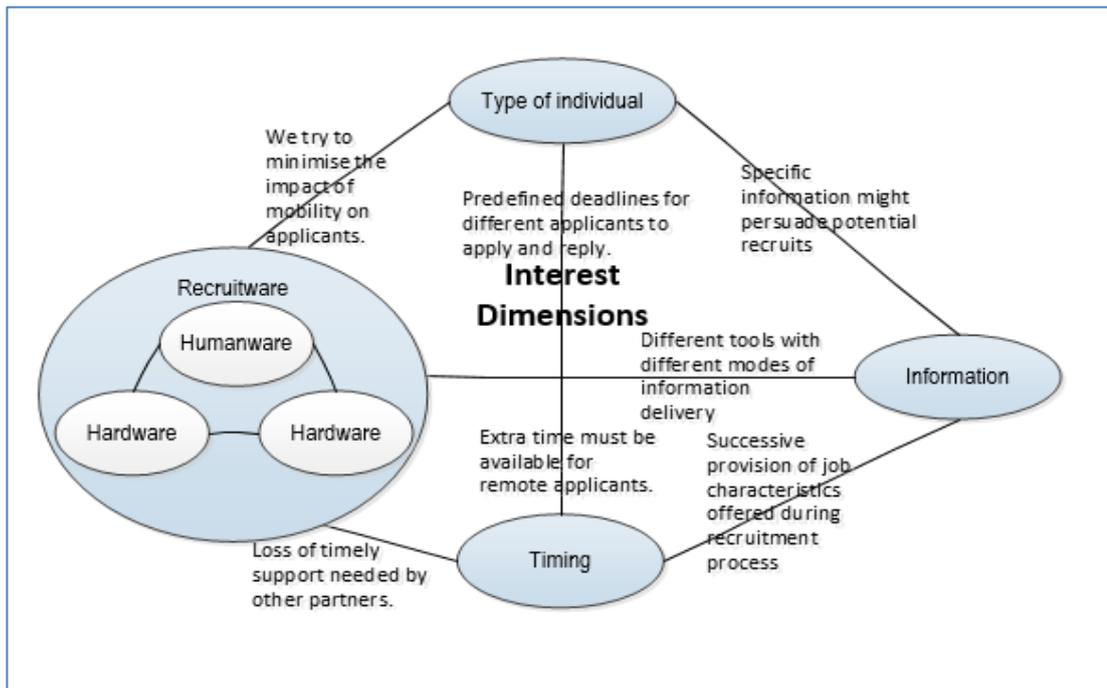
V.2 POCM Artefact in the 3st A-R cycle
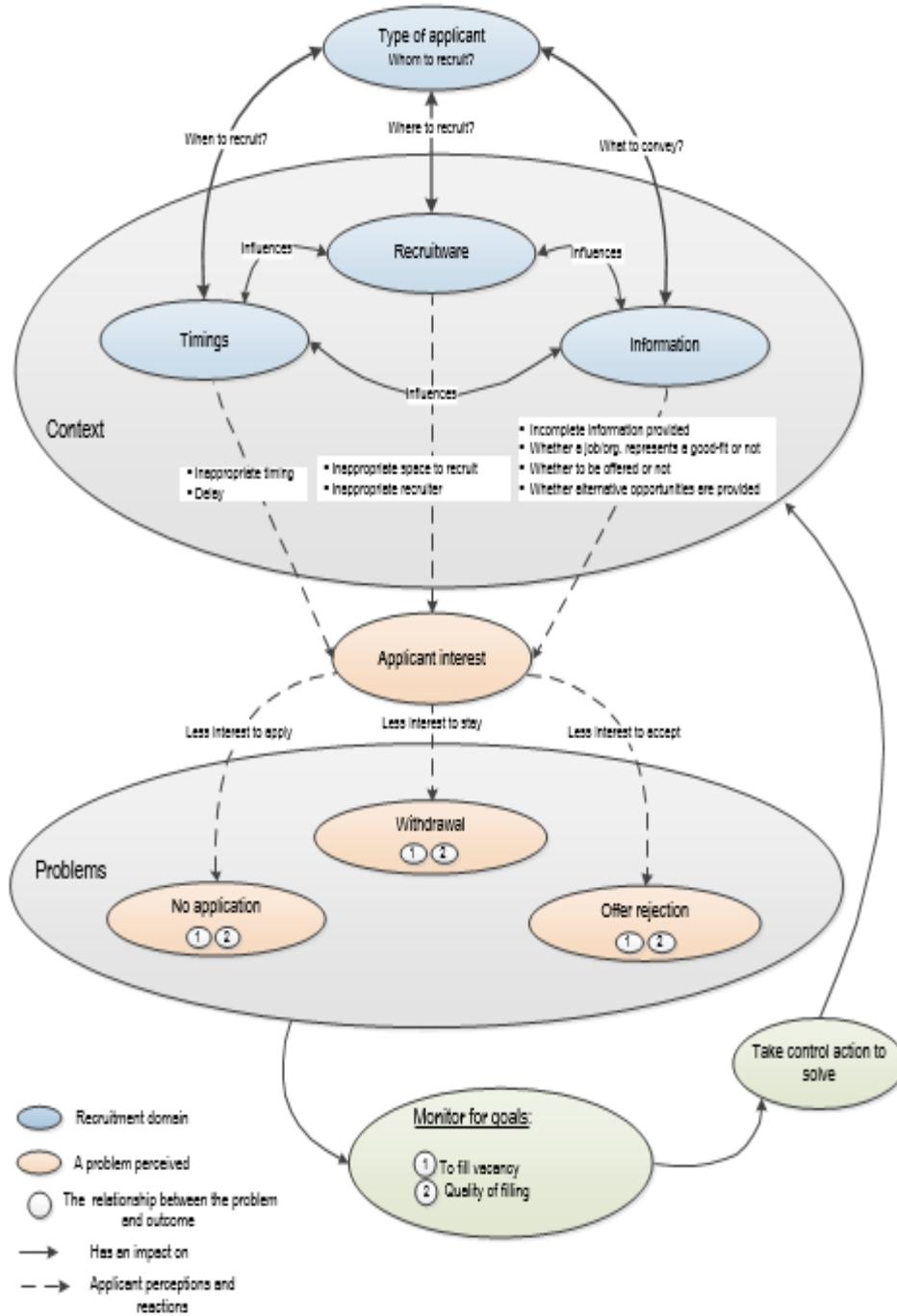
V.3 POCM Artefact in the 3st A-R cycle
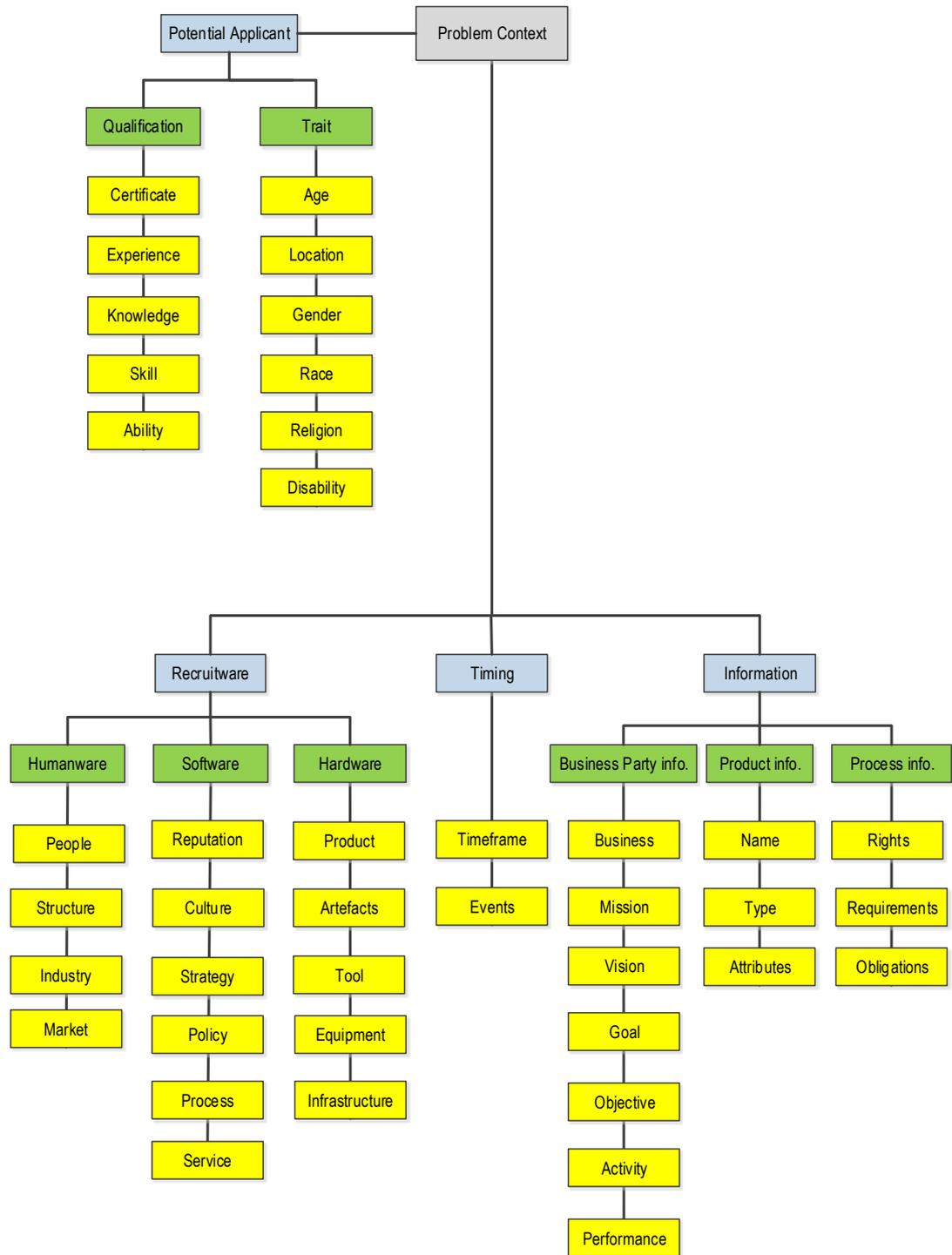
V.1 Onto-RPD Artefact in the 3st A-R cycle
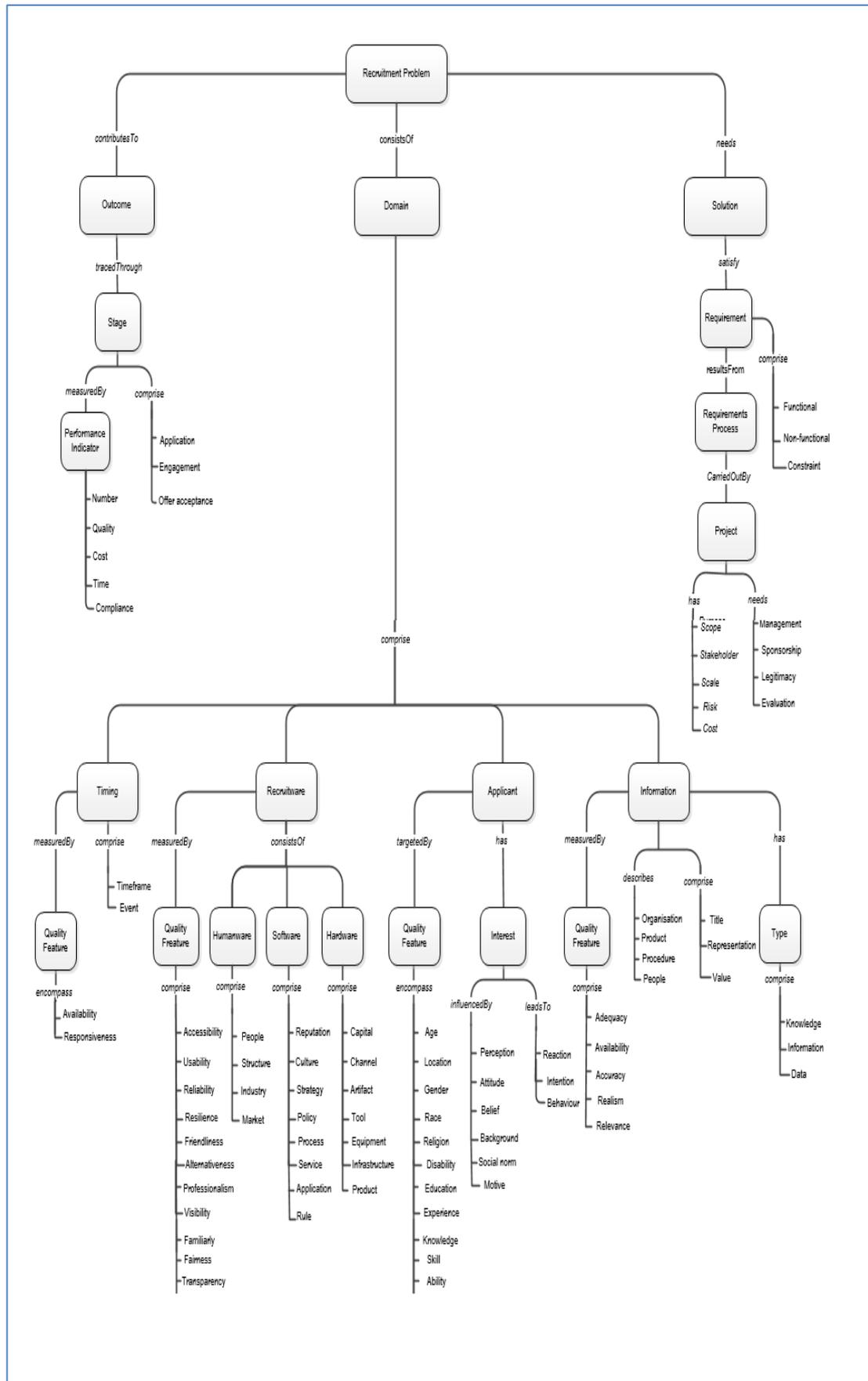
V.2 Onto-RPD Artefact in the 3st A-R cycle

Appendix 14 – A Poster Designed in The preparation Phase of Demonstration and Evaluation of POCM and Onto-RPD Artefacts.

Appendix 15 – A Letter Sent to the Participants to invite them to participate in the Demonstration and Evaluation of POCM and Onto-RPD Artefacts.

Dear Sir/Madam,

My name is Saleh Alamro. I'm a PhD candidate at the Faculty of Science and Technology, at Bournemouth University. As part of my PhD research at Bournemouth University, I am conducting an empirical study in the area of recruitment focusing on recruitment problem and presenting a Problem-Oriented Conceptual Model (POCM) and a complementary Ontology for Recruitment Problem Definition (Onto-RPD) to facilitate a better understanding and representation of a real-world recruitment problem from an enterprise perspective. I would like to cordially invite you to participate in my study since your profile and background makes me interested in your views on the research topic, and any further insights would be greatly appreciated.

Participation is anonymous, thus, no one will know what you have answered. This setting allows respondents to be free of any bias and hesitance when accepting to participate in the study. Your help is of high importance to provide a pragmatic view on recruitment problem in different industries

If you agree to participate in my study, you will be kindly asked to write a short description of a recruitment problem situation you ever faced. The recruitment problem cases provided will be reviewed and shared with the other respondents in this study being asked to state and define as many as recruitment problems related to these cases. Communication and assistance is possible at the time and means of your choice. After the definitional responses to the recruitment cases are collected, you are also invited to join us in focus group meetings. There will be almost two meetings. The first meeting will involve demonstrating of POCM and Onto-RPD artefacts and applying them to the recruitment cases provided and their related problem definitions and relationships. The second meeting will involve assessment for POCM and Onto-RPD artefacts against a set of requirements.

For the detailed information about the research and participation, please find the attached file and confirm your participation by replying back to me for arranging further details, if necessary.

Kind regards,
Saleh Alamro
PhD Candidate
Faculty of Science and Technology, Bournemouth University
Office number: Poole House, 521.
Mob: +44 7721668991
Email: salamro@bournemouth.ac.uk

Appendix 16 – Consent Form to Participate in Evaluation of POCM and Onto-RPD

Introduction and Purpose

My name is Saleh Alamro. I am a PhD candidate at BU, working with my advisors, Professor Keith Phalp and Dr. Huseyin Dogan in the Faculty of Science and Technology. I would like to invite you to take part in my research study, which concerns to provide a Problem-Oriented Conceptual Model (POCM) and a complementary ontology (Onto-RPD) to enable a better representation and understanding of a real-world recruitment problem.

Procedures

If you agree to participate in my study, you will be cordially asked to write a short description of a recruitment problem situation you ever faced. If you cannot provide any, you are still invited to join us in the next phases of this study. The recruitment problem cases provided will be reviewed and shared with the other respondents in this study being asked to state and define as many as recruitment problems related to these cases. Communication and assistance is possible at the time and means of your choice. After the definitional responses to the recruitment cases are collected, you are also invited to join us in two focus group meeting. The first meeting will involve a demonstrating of POCM and Onto-RPD artefacts and applying them to the recruitment cases provided and their related problem definitions and relationships. Based on this application, a set of semi-structured questions are to be answered to assess the overall feasibility of the artefacts. The second meeting will involve assessment for POCM and Onto-RPD artefacts against a set of requirements prescribed for quality. During the two meetings of focus group, you will be given sheets designed for the answers. The date and time of focus group sessions will be determined later based on the availability of respondents and places.

Benefits

In return to your effort and time, you will be given a free copy of the results as a small token of appreciation.

Confidentiality

Your data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used, unless you give explicit permission for revealing your organization or your name. Personal information is only used to administer the study. No personal data will be stored longer than necessary. Also, transcribed (anonymous) answers and data will be stored on my dropbox and I am responsible for them.

Compensation

You will be paid 20 Pound Amazon Voucher for taking part in this study.

Rights

Participation in research is completely voluntary. You are free to decline to take part in the project. You can decline to answer any questions and are free to stop taking part in the project at any time.

Questions

If you have any questions about this research, please feel free to contact me. I can be reached at 00447721668991 or salamro@bournemouth.ac.uk.

Consent

If you agree to participate, please reply by writing yes. You will be given a copy of this form to keep for your own records.

Appendix 17 – The Profiles of the Participants in the Evaluation of POCM and Onto-RPD

No.	Gender	Job/ Degree	BU Department	Recruitment experience	Type of Experience	Response
1	Female	DR	Part-time Lecturer in Marketing Consumer behaviour	14	Consultation	Yes /Confirmed
2	Male	PhD researcher	Marketing	10	Job marketing	Yes/ confirmed
3	Female	PhD researcher	Psychology	3	Recruitment interviews	Yes/ yes confirmed
4	Female	BU Undergraduate programme administrator	Recruitment	12	Enrolment	Yes/ Confirmed
5	Male	Academic HR	Management, recruitment	10	Staffing board	Yes/ Confirmed
6	Male	PhD researcher	Psychology	5	Recruitment advisory	Yes/ confirmed
7	Female	Marketing Manager for SciTech	Marketing	5	Enrolment marketing	Yes/ Confirmed
8	Male	PhD researcher	Science and technology at Bournemouth	7	e-recruitment	Yes/ Confirmed
9	Male	DR	Media college	8	Human-based media	Yes/ confirmed
10	Male	DR	Marketing	10	Marketing campaigns	Yes/ Confirmed
11	Male	DR	Management and HR	20	Consultation	Yes/ confirmed
12	Female	PhD researcher	Psychology	16	Consultation	Yes/ confirmed
13	Male	HR staff	HR department	8	Staffing	Yes/ Confirmed
14	Male	HR staff	HR department	3	Staffing	Yes/ Confirmed
15	Male	Academic HR	Management, recruitment	9	Recruitment planning and strategies	Yes/ confirmed
16	Female	PhD researcher	Human factors in Science and technology	4	Enrolment web design	Yes/ Confirmed

Appendix 18 – Focus Group Activities for POCM and Onto-RPD Demonstration and Evaluation

Focus Group Title: Demonstration and Evaluation of POCM and Onto-RPD Artefacts

The Purpose: To evaluate the overall contribution of the Problem-Oriented Conceptual Model (POCM) and its complementary Ontology for Recruitment Problem Definition (Onto-RPD) in representing and defining real-world recruitment problems, and to assess them against a set of requirements prescribed for quality.

Final outcome: The evaluation of the POCM and its supporting Onto-RPD.

Participants: 6 -10.

Evaluation Procedure: There will be two meeting sessions: demonstration session and evaluation session. Each session will take approximately 90 minutes with a break of 30 minutes in between. For each session, there will be a set of activities to be carried out in order, and questions to be discussed and answered, as follows:

Demonstration Session:

- ➢ *Presentation*:
    1. The research problem led to the development of POCM and Onto-RPD artefacts is presented.
    2. The POCM and Onto-RPD, and the concepts and materials (e.g. glossary, examples, etc.) related to them are explained.
    3. The four recruitment case studies and the previous respondents' comments on them will be presented.
- ➢ *Engagement and Exploration*: (Answer the question and try to relate it to the concepts in artefacts, or reversely use the artefacts to help to answer the question)
    4. For each recruitment case study, the following questions are to be asked:
        a. What are the problems/issues suffered from?
        b. What are the goals pursued? Why do the problems need to be solved?
        c. Who is the owner of the problem? Who does own/cause it?
        d. Which problem does need solving? Which one does matter more?
        e. When does the problem happen?
        f. Where does the problem happen?
        g. How does the problem happen?
- ➢ *Feasibility Assessment:*
    5. Based on the application of the POCM and Onto-RPD artefacts to each case study:

       a. Do you think the artefacts can support the following: (*Please specify why, or why not using the sheet provided*)

          i. Definition of key recruitment problem concepts embedded in a recruitment case study.

          ii. Inclusion and integration of many recruitment stakeholders' perspectives.

          iii. Capturing and representation of the problem structure in each case study and its relationships.

          iv. Better recruitment problem understanding and analysis towards solving recruitment problem.

       b. What changes (i.e. amendment/addition/removal) to the artefacts do you suggest? Why?

Evaluation Session:

➢ *The Overall Evaluation of the Artefacts:*

    6. Looking to the POCM and Onto-RPD artefacts and your work at the demonstration session:

       a. To what extent do you think the artefacts are: (*Please specify why, or why not using the sheet provided*)

          i. ***Comprehensive***: The degree to which the artefacts offer a complete view (i.e. concepts, sub-concepts, and relationships) of the real-world recruitment problem.

          ii. ***General***: The degree to which the artefacts have shared and sector-independent problem concepts/sub-concepts.

          iii. ***Consistent***: The degree to which the artefacts have correct and accurate definitions of concepts, sub-concepts, and relationships that reflect existing knowledge about the recruitment problem domain.

          iv. ***Abstract:*** The degree to which the artefacts represent a core set of primitives that can be partitionable in different levels

          v. ***Perspicacious***: The degree to which the artefacts are easily understood by the users so that it can be consistently applied in analysing recruitment problem.

          vi. ***Minimal***: The degree to which the artefacts contain the minimum number of objects (i.e., concepts and sub-concepts) necessary.

➢ *Exit question:*

    7. Are there any suggestions you would like to add in regard to the POCM and Onto-RPD artefacts?

Assisting research tools: Sheets, tape-recorder (if possible), notes recorder, etc.

Appendix 19 – A Letter Sent to the Participants to Confirm the Focus Group Meeting for Demonstration and Evaluation of POCM and Onto-RPD Artefacts.

Focus Group Confirmation Letter
22 April 2016

Dear _____,

Thank you for your previous participation in my research in regard to the evaluation of POCM and Onto-RPD artefacts. Continuing to the research, you are now invited to a focus group meeting. The meeting is two sessions. Each session will take approximately 90 minutes. The purpose of the first session is to share your ideas and opinions about the recruitment problems reported on the previous four recruitment case studies in a group. In this session, the recruitment problems reported on each case will be applied into, and discussed through the POCM and Onto-RPD artefacts in order to assess the feasibility of the artefacts in representing and defining real-world recruitment problems. The purpose of the second session is to evaluate the two artefacts in fulfilling a set of six requirements prescribed for quality. In each session, there will be a set of semi-structured questions to be answered. You will be in a group from 6 to 10 participants from different recruitment-related areas.

The date, time, and place of the focus group meeting are listed below.

DATE: Friday, 6 May 2016
Schedule: Session One (09:00 AM – 10:30 AM)
                 Break time   (10:30 AM – 11:00 AM)
                 Session Two (11:00 AM – 12:30 PM)
PLACE: BU Poole House (Room is to be confirmed)

For the research materials to be used in each session and the procedure to follow please find the attached files. If you need more information about the focus group or in case of that you are not able to attend for some reason please call (07721668991) or email me on (salamro@bournemouth.ac.uk).

Looking forward to seeing you in our focus group sessions.

Sincerely,

Saleh Alamro, PhD Candidate

Faculty of Science and Technology, Bournemouth University

Office number: Poole House, 521.

Mob: +44 7721668991

Email: salamro@bournemouth.ac.uk

Appendix 20 – A Sample of Templates Filled by the Participants in Demonstration and Evaluation Focus Group Sessions

Case Study No: Recruitment case 1

Main Research Activity		Support dimension	Corresponding Concepts on the Artefacts (POCM/*Onto-RPD*)
	a.	What are the problems /issues suffered from?	* The Job location is far from applicants * shortfalls in applicants * for located applicants do not like southampton * the strategy to recruit is ineffective
	b.	What are the goals pursued? Why do the problems need to be solved?	* Local talents * software engineers and marketing proffessionals * less cost when hiring local people * fill job vacancies
Engagement and Exploration 4 : Answer the question and try to relate it to the concept(s) in the artefacts, or reversely use the artefacts to help to answer the question	c.	Who is the owner of the problem? Who does own/cause it?	* company X * Talented applicants (local /software engineers and marketing proffessionals) * former residents in southampton.

	d.	Which problem does need solving? Which one does matter more?	* Location (***)
			   cost (*)
			   time (*)
			* competency of applicants (**)

	e.	When does the problem happen?	* Timely recruitment with local talents.
	f.	Where does the problem happen?	* UK * universities * southampton
	g.	How does the problem happen?	* company * unable to fill jobs with target applicants * the strategy is ineffective

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Case Study No: Recruitment. Case # 1

Main Activity	Support dimension	Comments On level of support (Why/Why not)
	i. Definition of the key problem concepts embedded in a recruitment case.	* I could see that all problems suffered are defined using the problem concepts and their quality features, the problems such as location (far) whom to recruit, where, when .
	ii. Inclusion and integration of many recruitment stakeholders' perspectives	* It is really cohesive and comprehensive. * Both software engineers and marketing professionals can find their problems' * Thanks for interest concepts.
Feasibility Assessment a. To what extent do you think the artefacts can support the following:	iii. Capturing and representation of the problem structure in each case study and its relationships	** the mappings from recruitments (e.g Location + accessibility to timing (e.g timeliness) can be easily traced. ** when to recruit (eg local /former residents /Remote) can be easily mapped to the problems with recruitment (e.g tools/location of advertisement).
	iv. Better recruitment problem understanding and analysis towards solving recruitment problem	* the POCM is really helpful in defining problem and tracing the root causes of it . * The full understanding of the structure with the recruitment problem of company X would surely facilitate problem solving and developing means towards a better solution .

Case Study No: ...Recruitment case 1... *(handwritten)*

Main Activity	Artefacts Elements	Supporting Examples	Recommendations (please use item no. to comment)		
			Amendment	Addition	Removal
	I. Major Problem Concepts: a) Whom to recruit ✓ b) Recruitware ? c) Information ✓ d) Timings e) Applicant Interest ? f) No engagement ? g) Offer rejection ✓ h) withdrawal i) Goal ? j) Solution ✓	*(Tip: pls refer to the word dictionary for definition and the ontology for related concepts of each problem element)*	b) The term is new e) interest rather than only applicant interest for more generalisation	i) Hope we much goals to be addressed	
Feasibility Assessment b. What changes (i.e. amendment/addition/re moval) to the artefacts' concepts and relationships do you suggest? Why?	II. Problem Domains and Relationships: a) Where/whom to use/ how to recruit ✓ b) What to convey ✓ c) When recruit ✓ d) Info-timing relationship ✓ e) Recruitware-timing relationship ✓ f) Info-recruitware relationship ✓	*location* a) e.g. "diversity" as "policy" determines whom to recruit; and a specific type of applicant "education" might determine *where/ whom to use/ how.* b) e.g. "knowledge" of market guides whom to recruit; and the high "qualified" determines the "accuracy" of what to convey. c) e.g. the "event" at which a type of applicant gets qualified may guide whom to recruit; and the latter determines the level of "responsiveness" needed. d) e.g. "availability" of info. relies on a "timeframe"; and info. transfer is an event. e) e.g. "less accessibility" of recruitment site needs extended "timeframe". ✓ f) e.g. "accuracy" of info. relies on "tools" used (e.g. web-based); and "knowledge" is needed for how to deploy recruitware. *public X university*	*Public advertisement* c). via in this case d) I could map the impact of location being close to information... size of information to time being communicated... reflect... be communicated...		

Case Study No... Recruitment case 1

Main Activity	Artefacts Elements	Supporting Examples	Recommendations (please use item no. to comment)		
			Amendment	Addition	Removal
	III. Applicant Interest Relationships: a) Info-Interest relationship ✓ b) Timing-Interest relationship ✓ c) Recruitware-Interest relationship ✓ d) Interest-Application/engagement/offer acceptance ✓	a) e.g. "adequacy" of job info. conveyed helps an applicant to perceive job-applicant fit b) "availability" of time encourages an app. to act *further* c) e.g. "friendliness" of recruitment staff encourages an applicant to perceive org-applicant fit d) The degree of app's interest obtained at a certain stage of recruitment determines app's behaviour	*and location e.g. Southampton*		
Feasibility Assessment b. What changes (i.e. amendment/addition/removal) to the artefacts' concepts and relationships do you suggest? Why?	IV. Outcomes-Goal relationships: a) No engagement-goal ✓ b) withdrawal-goal ✓ c) Offer rejection-goal ✓	a) e.g. if a recruiter fails to attract a pool of applicants with an appropriate number and quality for assessment then the risk of that vacancies remain unfilled or filled by less quality apps. is possible. b) e.g. if a recruiter fails to keep a pool of candidates for offering then the risk of that vacancies remain unfilled or filled by less quality apps. is more likely to happen. c) If a recruiter fails to influence offered applicants to accept/sign for jobs then the ultimate goal will not be achieved.		*you need to show mappings from all "outcomes" to all other Recruitment goals such as cost, time, so on.*	

Main Activity	Ontology Concepts	Supporting Examples	Recommendations		
			Amendment	Addition	Removal
		(Tip: pls refer to the glossary for definition)			
Feasibility Assessment b. What changes (i.e. amendment/addition/rem oval) to the artefacts' concepts and relationships do you suggest? Why?	V. Main Problem 　Concepts: a) Recruitment problem ✓ b) Applicant interest ? c) Problem context ? d) Problem dimension ✓ e) Information ✓ f) Recruitware ✓ g) Timing ✓ h) Applicant ✗ i) Hardware ✓ j) Software ✓ k) Humanware ✗ l) Solution ✗ m) Requirement ✗ n) Behaviour moved o) Outcome ✓ p) Benefit/loss ✓ q) Stage ✗ r) Mental process ✓ s) Input ✓ t) Output ✓ part of mental process u) Intention ✓ v) Performance indicator ✗ w) Type ✓ x) Quality feature ✓ y) Characteristic ✓		b) replaced by "interest" as a whole c.) The context does not contain players only"		n) applicants should be deleted i) problem-oriented model shall not include solution concept h) behaviour is the output of the mental process not intention

Main Question	Ontology Sub-Concepts	Supporting Properties	Recommendations		
			Amendment	Addition	Removal
	VI. Requirement	a. Functional ✗ b. Non-functional ✗ c. Constraint ✓			May define the solution not the problem
	VII. Problem dimension	d. Limitation ✗ e. Relationship ✓		e) this need to be add as a subconcept	
	VIII. Mental process (input)	f. Background g. Belief h. Social norm i. Perception j. Value ? + intention k. Attitude + behaviour			
Feasibility Assessment b. What changes (i.e. amendment/addition/removal) to the artefacts' concepts and relationships do you suggest? Why?	IX. Performance indicator	g. Number h. Quality i. Time j. Cost k. Compliance ?		These indicators to measure what? where are they?	
	X. Information (type)	l. Knowledge m. Information n. data			
	XI. Information (comprise)	o. Title p. Representation q. Value			
	XII. Information (describe)	r. Organisation s. Product t. Procedure u. People			
	XIII. Information (quality feature)	v. Adequacy w. Accuracy x. Realism y. Availability z. Relevance			

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Main Question	Ontology Sub-Concepts	Supporting Properties	Recommendations *(please use item no. to comment)*		
			Amendment	Addition	Removal
	XIV. Timing (comprise)	aa. Timeframe bb. Event			*[handwritten: ...(speed ...fast?)]*
	XV. Timing (quality feature)	cc. Availability dd. Responsiveness ✗	*did we care ful of the difference of responsiveness and TIMELINESS (when event)*		
	XVI. Applicant (characteristic)	ee. Personality ✗ ff. Qualification			
		gg. Age hh. Location ii. Race ? jj. Gender ? kk. Religion ? ll. Disability ? mm. Attitude nn. Interest	*→ added here → would as we used as Quality feature → qualification*		
	XVII. Applicant (quality feature)	oo. Education pp. Experience qq. Knowledge rr. Skill ss. Ability			
Feasibility Assessment b. What changes (i.e. amendment/addition/rem oval) to the artefacts' concepts and relationships do you suggest? Why?	XVIII. Hardware	tt. Capital uu. Channel vv. Tool ww. Equipment xx. Artefact yy. Infrastructure zz. Product			

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Main Question	Ontology Sub-Concepts	Supporting Properties	Recommendations (please use item no. to comment)		
			Amendment	Addition	Removal
	XIX.Software	aaa. Reputation bbb. Culture ccc. Strategy ddd. Policy eee. Process fff. Service ggg. Application hhh. Rule	*I'm not sure whether these need to be here or not? the definition of software doesn't relate to these elements.*		
Feasibility Assessment b. What changes (i.e. amendment/addition/rem oval) to the artefacts' concepts and relationships do you suggest? Why?	XX.Humanware	iii. People jjj. Structure kkk. Industry lll. Market			
	XXI.Recruitware (quality feature)	mmm. Accessibility nnn. Usability ooo. Reliability ppp. Resilience qqq. Friendliness rrr. Alternativeness sss. Professionalism ttt. Visibility uuu. Familiarity vvv. Fairness www. Transparency xxx. Profitability			

Main Activity	Requirement	Comments On level of support (Why/Why not)
	I. *Comprehensive:*	- It is impressive, I can say that your models are quite full. - I think most of problems we have been dealing with are covered by the models
	II. *General:*	- I think that there is no concept that is specific or sector-dependent. - However some specificity) sometimes needed (eg) selection and job attributes
	III. *Consistent:*	- He require where somewhat strange. - otherwise, everything is fine.
The Overall Evaluation of Artefacts a. To what extent do you think the artefacts are:	IV. *Abstract:*	- The concept of interest has given a means for instantiating the related concepts after different levels of abstractions.
	V. *Perspicacious:*	- I can understand where the interest conflicts might happen thanks for the concept of interest and its dimensions.
	VI. *Minimal:*	- For addressing a real-world recruitment problem, someOne might not be able to reduce the concepts that it includes.

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Main Activity	Requirement	Comments On level of support (Why/Why not)
	I. **POCM Artefact**	- Why, it's only applicant interest that is addressed within the POCM. Some generalisation of the concepts are needed to address all interests of recruitment players. - You might use "interest" instead. - There are some concepts in the POCM that are not mapped to the onto-RPD, e.g. indicators, fill, latency. - some relationships between concept in POCM are not clearly defined.
Exit Question 7. Are there any suggestions you would like to add in regard to the POCM and Onto-RPD artefacts?	II. <u>**Onto-RPD Artefact**</u>	- The inner-relationships between hardware, software / humaware are not addressed. - Culture + reputation are not consistent with the definition of software concepts. - There is difference between responsiveness & timeliness in timings? - Behaviour is the ultimate output of the mental process of interest

Appendix 21 – The Different Stakeholders' Perspectives on the Enlistment *Problem using POCM:*

The enlistment problem analysis from the recruiter's perspective.

		Interaction with Job Provider (Military Units (MUs))
2.	What is the problem? (Existing or potential conflict of interests)	■ Existing/potential conflict of interests (i.e. interests differentiation or fragmentation) ■ The symptoms of the problem (signs of problem or existing conflict) are: ➤ Circulating new enlistees between different corps due to inappropriateness (rejection). ➤ Quality of vacancy filling: avg. of KSAs (72%.34) and avg. of regional diversity (53.45%). ➤ Increased cost and time.
3.	Interest (conceived identity) ■ What are the perceptions held by military unit(s) about us? ■ What are the desires of military unit(s) to be influenced? ■ Which MU groups' perceptions are most important?	■ The perceptions and desires of each MU will be related to each interest dimension. ■ Perceptions of recruitware: ➤ Less qualified recruits (reliability); cost for recovery and (profitability) ■ Perceptions of information: ➤ Less contract information provided (adequacy ■ Perceptions of timing: ➤ Delay in job filling (timeliness).

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4.	Information (communicated identity) ■ What type of information are communicated to MU(s)? (Answer: contract information; progress and filling notifications) ■ Each information communicated to MU will be assessed against information quality features from the recruiter's perspective.	Adequacy	■ Are the information provided adequate for the MU to assess and decide to accept or not? ➤ Some contract info. are missing.
		Availability	■ Are the information available for the MU to access 7/24? ➤ No, only after contacting time
		Accuracy	■ Are the information accurate so cannot be misunderstood by the MU? ➤ Yes ■ Does the information allow realistic expectations? ➤ Yes
		Realism	■ Does the information reflect the actual reality? ➤ Yes ■ Can the information be credible? ➤ Yes
		Relevance	■ Does the information relate to the matter in question? ➤ (Yes) ■ Are the information personally relevant? ➤ Yes
5/1	Recruitware (actual identity) ■ What type of Software features does the recruiter (military school(s)) have? (refer to the software features in the Onto-RPD) ■ What type of Hardware features does the recruiter (military school(s)) have? (refer to the hardware features in the Onto-RPD) ■ What type of Humanware features does the recruiter (military school(s)) have? (refer to the human features in the Onto-RPD)	Accessibility	■ How far/easy are the recruitware to access by MU? ➤ Remote job opening site. ➤ Manual handling (in-person, by mail) ■ Shall the recruitware be made accessible by the MU? ➤ Not all
		Usability	■ To what extent the recruitware are easy to use or deal with? ➤ Manual correspondences. ➤ Lack of online communication ■ To what extent the recruitware are quick to learn about/from? ➤ Info. needs careful revision and inquiries ■ To what extent the recruitware are helpful to remember what and how to do things? ➤ Only through careful reading of docs.

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Recruitware (actual identity)
■ What type of Software features does the recruiter (military school(s)) have? (refer to the software features in the Onto-RPD)
■ What type of Hardware features does the recruiter (military school(s)) have? (refer to the hardware features in the Onto-RPD)
What type of Humanware features does the recruiter (military school(s)) have? (refer to the human features in the Onto-RPD)
	Reliability	■ Are the recruitware able to function for a specified time at a specified condition?
		  ➤ Almost no, many delays in job filling.
		■ How often do the recruitware fail/go down?
		  ➤ Very often to fail in filling jobs with regional diversity

	Resilience	■ To what extent the recruitware are able to recover when something fails? ➤ Hard to recover due to the length of enlistment process
	Alternativeness	■ To what extent the recruitware are able to offer alternative filling choices? ➤ No choices

	Professionalism	■ To what extent the recruitware are communicating effectively?
		  ➤ Hard with remotely located MUs
		■ To what extent the recruitware are culture-sensitive?
		  ➤ Tailored to the local culture
		■ Do the recruitware seem responsible?
		  ➤ High responsibility

	Visibility	■ To what extent the recruitware are publicly visible? ➤ remotely and independently located for training purposes

	Familiarity	■ Are the recruitware experienced first-hand or second-hand?
		  ➤ First-hand
		■ Are the recruitware in a close relationship with the interacting MU(s)?
		  ➤ Yes

	Fairness	■ Do the recruitware treat MUs equally?
		  ➤ Yes
		■ Do the recruitware have rules against bias?
		  ➤ Some monitoring and control

	Transparency	■ To what extent the recruitware are open to the MUs? ➤ Far to be open due to control considerations
	Profitability	■ To what extent the recruitware offer a value to the MU(s)? ➤ Different recruits from different regions with different KSAs

6.	Timing (timed identity) ▪ In what events the interaction does take place? ▪ How long does the interaction take?	Availability	▪ Does the time suffice for the MU (s) to decide and act? 　➤ Very short ▪ Are there different time periods for MU(s) to engage? 　➤ No
		Timeliness	▪ Does the event of interaction happen in a fixed time? 　➤ Yes, based on the timetable ▪ Is the moment of interaction critical/sensitive? 　➤ Yes, it is very sensitive for competition purpose ▪ Can delay be tolerant? 　➤ No ▪ Can the event of interaction be changed into different times? 　➤ Yes, if possible
7/1	Problem Definition	▪ Comparison between interest dimensions ▪ Finding the key imbalance aspects between interest dimensions (problem frame)	▪ Are the interest dimensions in congruence? 　➤ No ▪ Where is the incongruence aspects? In which interest dimensions does the incongruence reside? What are the most important interest dimensions and features that can be addressed/adjusted to resolve incongruence? 　➤ Whom to recruit (remotely located MUs (location)) X recruitware (military school site: accessibility) 　➤ Recruitware (site accessibility) X timing (availability) 　➤ Recruitware (recruitment process: reliability) X timing (contract info: timeliness) X information (job location: adequacy) 　➤ Information (contract info: adequacy and accuracy)) X MU's expectations 　➤ Timing (availability/timeliness) X MU's expectations

#	Problem Definition	Frame	Questions / Description
7/2	Problem Definition	• Comparison between interest dimensions • Finding the key imbalance aspects between interest dimensions (problem frame)	• Who could prevent the current interest dimensions to be adjusted? What are the external interests (other relevant stakeholders) that impede the resolution of incongruence? ➤ Applicant (desires) ➤ Job provider (desires) ➤ Qualification provider (public school, military hospitals, CRA, and CAA): timing of activities and products, org. structure. • What are the project constraints that prevent enlarging the scope and involving other relevant stakeholders? ➤ Time and cost

Interaction with Qualification Providers (Public schools, Military hospitals, CRA, and CAA)

#	Problem Definition	Frame	Questions / Description
2.	What is the problem? (Existing or potential conflict of interests)	• Existing/potential conflict of interests (i.e. interests differentiation or fragmentation)	• The symptoms of the problem (signs of problem or existing conflict) are: ➤ Rejected/cancelled inquiry orders ➤ No response (lost order/ no reply received) ➤ Quality of filling (delay) ➤ Increased cost and time.
3.	Interest (conceived identity) • What are the perceptions held by QPs about us? • What are the desires of QP(s) to be influenced? • Which QPs' perceptions are most important?	• The perceptions and desires of each QP will be related to each interest dimension.	• Perceptions of recruitware: ➤ lack of communication (accessibility, usability); cost of large no. of orders processed (profitability); wrong orders (reliability) • Perceptions of information: ➤ Lack of order information (adequacy), inaccurate inquiry order (accuracy) • Perceptions of timing: ➤ Less time to act (availability); delay in order sending (timeliness).
4.	Information (communicated identity) • What type of information are communicated to QPs? (Answer: inquiry info. and notifications	Adequacy	• Are the information provided adequate for the QPs to act or not? ➤ Some key information of inquiry order are missing (adequacy) ➤ Specific requirements must be clarified (accuracy)

Information (communicated identity) ▪ What type of information are communicated to QPs? (Answer: inquiry info. and notifications)	Availability	▪ Are the information available for the QPs to access 7/24? ➤ No, only as is in the order ▪ Are the information sensitive so availability should be restricted? ➤ Yes, some key info. about applicants are protected.
	Accuracy	▪ Are the information accurate so cannot be misunderstood by the QPs? ➤ No, for instance (type of academic results needed, inspection levels for military fitness, etc.)
	Accessibility	▪ How far/easy are the recruitware to access by QPs? ➤ Remote job opening site ➤ Manual handling (in-person, by mail)
Recruitware (actual identity) ▪ What type of Software features does the recruiter (military school(s)) have? (refer to the software features in the Onto-RPD) ▪ What type of Hardware features does the recruiter (military school(s)) have? (refer to the hardware features in the Onto-RPD) ▪ What type of Humanware features does the recruiter (military school(s)) have? (refer to the human features in the Onto-RPD)	Usability	▪ To what extent the recruitware are easy to use or deal with? ➤ Formal military rules (on communication and escalation) ➤ Manual applications, exams, and physical exercises ➤ Lack of online communication ▪ To what extent the recruitware are making positive experience? ➤ Bad image
	Reliability	▪ Are the recruitware able to function for a specified time at a specified condition? ➤ Almost no, many delays and calls for recovery. ▪ How often do the recruitware fail/go down? ➤ Very often with remote QPs
	Resilience	▪ To what extent the recruitware are able to recover when something fails? ➤ Hard to recover, if possible then in cost of time ▪ To what extent the recruitware are able to cope and adapt in order to prevent failure? ➤ Unable in light of criticality of time and current recruitware.
	Professionalism	▪ To what extent the recruitware are communicating effectively? ➤ Mainly in-person and mail communication ▪ Do the recruitware seem team-oriented? ➤ Yes, in some work areas ▪ Do the recruitware seem responsible? ➤ High responsibility

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#	Description	Aspect	Questions
		Visibility	▪ To what extent the recruitware are publicly visible? ➢ Largely invisible; remotely and independently located for security and work issues
		Familiarity	▪ Are the recruitware experienced first-hand or second-hand? ➢ Some are first and some are second-hand ▪ Are the recruitware in a close relationship with the interacting QPs(s)? ➢ Sometimes
		Profitability	▪ To what extent the recruitware offer a value to the QP(s)? ➢ To participate in national security; to invest in new market (military)
		Availability	▪ Does the time suffice for the QP's (s) to act? ➢ Almost short because of time pressure ▪ Are there different time periods for QP(s) to act? ➢ No
6.	**Timing (timed identity)** ▪ In what events the interaction does take place? ▪ How long does the interaction take?	Timeliness	▪ Does the event of interaction happen in a fixed time? ➢ Yes, based on the timetable ▪ Is the moment of interaction critical/sensitive? ➢ Yes, it is very sensitive for competition purpose ▪ Can the event of interaction be changed into different times? ➢ Yes, if possible
7/1	▪ Comparison between interest dimensions ▪ Finding the key imbalance aspects between interest dimensions (problem frame) **Problem Definition**		▪ Are the interest dimensions in congruence? ➢ No ▪ Where is the incongruence aspects? In which interest dimensions does the incongruence reside? What are the most important interest dimensions and features that can be addressed/adjusted to resolve incongruence? ➢ Recruitware (site accessibility) X timing (availability) ➢ Recruitware (written inquiry order: usability) X information (availability/accuracy) ➢ Recruitware (recruitment process: reliability) X timing (order delivery (timeliness)) ➢ Timing (time pressure: timeliness) X information (adequacy) ➢ Information (order info: adequacy and accuracy)) X QP's expectations ➢ Timing (availability/timeliness) X QP's expectations ➢ Recruitware (accessibility/reliability/usability) X OP's expectations
7/2	▪ Comparison between interest dimensions ▪ Finding the key imbalance aspects between interest dimensions (problem frame) **Problem Definition**		▪ Who could prevent the current interest dimensions to be adjusted? What are the external interests (other relevant stakeholders) that impede the resolution of incongruence? ➢ Applicant (desires) ➢ Job provider (desires) ➢ Qualification provider (desires) ▪ What are the project constraints that prevent enlarging the scope and involving other relevant stakeholders? ➢ Time and cost

**The different stakeholders' perspectives on the enlistment problem using POCM:
The enlistment problem analysis from the job provider's perspective (MUs).**

Activity No.	Activity	Relevant Features	Guidelines and Questions
1.	Whom to recruit (with)?	• What type of individuals or groups of individuals are we recruiting with?	• Using the conversation model, the key interacting agents with the job provider (military units) are: ➤ Recruiter (military schools)
		Interaction with Military Schools (MSs)	
2.	What is the problem? (Existing or potential conflict of interests)	• Existing/potential conflict of interests (i.e. interests differentiation or fragmentation)	• The symptoms of the problem (signs of problem or existing conflict) are: ➤ 3.8 % vacancies not filled. ➤ Quality of vacancy filling: avg. of KSAs (72%.34) and avg. of regional diversity (53.45%). • The existing conflict might develop in light of seasonal market (post-school results recruitment) and results in: ➤ Loss competition for high KSAs ➤ Increased cost and time.
3.	Interest (conceived identity) • What are the perceptions held by MS(s) about us? • What are the desires of MS(s) to be influenced? • Which MS's perceptions are most important?	• The perceptions and desires of each MS will be related to each interest dimension.	• Perceptions of recruitware: ➤ No fixed time for job vacancies (timeliness); remote sites to communicate (accessibility); specific conditions of filling (less alternatives, less flexibility); cost of communications (profitability), lack of effective communication methods (usability) • Perceptions of information: ➤ Missing job info. (adequacy), lack of communication (availability) • Perceptions of timing: ➤ Less time to decide (availability); delay in response (timeliness).

#	Description	Attribute	Questions
4.	Information (communicated identity) • What type of information are communicated to MS? (Answer: job specification and description, requirements of filling, conditions, timing requirements, no. of vacancies, etc.) • Each information communicated to applicant will be assessed against information quality features from the recruiter's perspective.	Adequacy	▪ Are the information provided adequate for the MS to run a job opening or not? ➤ Job location is missing (not determined at the time of filling order). ➤ Some key info. are confidential.
		Availability	▪ Are the information available for the MS to access 7/24? ➤ Some of info. are ready at the job opening time, but some are not (e.g. job location). ▪ Are the information sensitive so availability is restricted? ➤ Yes, some key info. about the mission and activates of the SA and MUs are not available.
		Accuracy	▪ Are the information accurate so cannot be misunderstood by the MS? ➤ No, for instance the missing information items makes misinterpretation ▪ Does the information allow realistic expectations? ➤ No, due to inaccuracy of info.
		Realism	▪ Does the information reflect the actual reality? ➤ No, in terms of job location, it might be changed overtime. ▪ Can the information be credible? ➤ No.
		Relevance	▪ Does the information relate to the matter in question? ➤ (Yes) ▪ Are the information personally relevant? ➤ No, generic not tailored to applicant groups.
5/1	Recruitware (actual identity) • What type of Software features does the job provider (military units) have? (refer to the software features in the Onto-RPD) • What type of Hardware features does the job provider (military units) have? (refer to the hardware features in the Onto-RPD)	Accessibility	▪ How far/easy are the recruitware to access by MS? ➤ Remote job opening site ➤ Manual handling (in-person, by mail) ▪ Shall the recruitware be made accessible by the MS? ➤ Yes
		Usability	▪ To what extent the recruitware are easy to use or deal with? ➤ Manual job filling orders ➤ Lack of online communication
		Reliability	▪ Are the recruitware able to function for a specified time at a specified condition? ➤ Yes

No.		Quality	Assessment
	What type of Humanware features does the recruiter (military school(s)) have? (refer to the human features in the Onto-RPD)	Resilience	▪ How often do the recruitware fail/go down? ➤ Many delays and calls for recovery. ▪ To what extent the recruitware are able to recover when something fails? ➤ Hard to recover ▪ To what extent the recruitware are able to cope and adapt in order to prevent failure? ➤ Hard due to mobility, modular organising
5/2	<u>Recruitware (actual identity)</u> ▪ What type of Software features does the recruiter (military school(s)) have? (refer to the software features in the Onto-RPD) ▪ What type of Hardware features does the recruiter (military school(s)) have? (refer to the hardware features in the Onto-RPD) What type of Humanware features does the recruiter (military school(s)) have? (refer to the human features in the Onto-RPD)	Professionalism	▪ To what extent the recruitware are communicating effectively? ➤ In-person and by mail communication ▪ Do the recruitware seem team-oriented? ➤ No ▪ Do the recruitware seem responsible? ➤ High responsibility
		Profitability	▪ To what extent the recruitware offer a value to the applicant(s)? ➤ Job security; fast track to job; competitive job benefits; chance to join army; chance to travel, chance to adventure
6.	<u>Timing (timed identity)</u> ▪ In what events the interaction does take place? ▪ How long does the interaction take?	Availability	▪ Does the time suffice for the MS (s) to act? ➤ Almost short because of time pressure ▪ Are there different time periods for MS(s) to fill vacancy? ➤ No

		Timeliness	▪ Does the event of interaction happen in a fixed time? ➤ Yes, based on the timetable ▪ Is the moment of interaction critical/sensitive? ➤ Yes, it is very sensitive for competition purpose ▪ Can delay be tolerant? ➤ No ▪ Can the event of interaction be changed into different times? ➤ Yes, if possible
7/1	Problem Definition	▪ Comparison between interest dimensions ▪ Finding the key imbalance aspects between interest dimensions (problem frame)	▪ Are the interest dimensions (whom to recruit (with); recruitware (actual identity); information (communicated identity); timing (timed identity); and the perceptions and desires (conceived identity) in congruence? ➤ No ▪ Where is the incongruence aspects? In which interest dimensions does the incongruence reside? What are the most important interest dimensions and features that can be addressed/adjusted to resolve incongruence? ➤ Whom to recruit (remote MS (location)) X recruitware (military unit site: location) ➤ Recruitware (site accessibility) X timing (availability) ➤ Recruitware (vacancy preparation process reliability) X timing (timeliness) ➤ Recruitware (filling order method (manual order: usability) X information (availability) ➤ Information (job info: adequacy and accuracy)) X MS's expectations ➤ Timing (availability/timeliness) X MS's expectations ➤ Recruitware (transparency/fairness) X MS's expectations
7/2	Problem Definition	▪ Comparison between interest dimensions ▪ Finding the key imbalance aspects between interest dimensions (problem frame)	▪ Who could prevent the current interest dimensions to be adjusted? What are the external interests (other relevant stakeholders) that impede the resolution of incongruence? ➤ Applicant (desires) ➤ Job provider (military units) ➤ Qualification providers ▪ What are the project constraints that prevent enlarging the scope and involving other relevant stakeholders? ➤ Time and cost