# EXPLORING HOW BUSINESS ANALYSTS CONTRIBUTE TO THE DYNAMIC CAPABILITIES OF AGILE SOFTWARE DEVELOPMENT TEAMS

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*Masters in Information Systems*

# PLAGIARISM DECLARATION

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# ABSTRACT

Today's organisations are characterised by high competition and a volatile business environment which continues to be a predicament for agile software development managers and practitioners. Software development frameworks that are designed to help organisations respond to these environments include a group of flexible methodologies known as Agile Software Development. However, reliance on mainly software techniques and tools might not be sufficient, hence the need to consider the capabilities of individual team members, particularly those of Business Analysts.

Given that agile methodologies do not explicitly advocate the relevance of Business Analyst role, literature reveals ongoing debates regarding the role of Business Analysts in Agile Software Development teams. This can be attributed, in part, to a knowledge gap concerning the manner in which Business Analysts contribute to overall team capabilities, particularly those which are essential in enabling teams to respond to environmental changes. The purpose of this study was to address this gap by investigating how Business Analysts contribute to the Dynamic Capabilities of Agile Software Development teams. Adopting a deductive approach, this study adapted and applied a research model based on the Dynamic Capabilities theory to explore the value of business analysts in agile teams.

This study is interpretive and was executed using a qualitative, single case-study research strategy directed at an Agile Software Development team in the financial services industry**.** Data was collected through face-to-face, semi-structured interviews; a group interview; non-participant observation; documentation; and physical artefacts. The thematic analysis technique was used to analyse the data. Findings reveal that there are several factors that allow Business Analysts to contribute to the Dynamic Capabilities of Agile Software Development teams which include: sharing business operations tacit knowledge; promptly sharing insights about requirement changes and assisting team members in completing tasks; as well as actively participating in sprint planning meetings. The findings also showed that Business Analysts experience difficulty in contributing to Dynamic Capabilities when they lack system, industry, and business rules knowledge.

This study provides a useful contribution in two ways. Firstly, it proposes a model that can be applied by researchers to help explore ways in which individuals influence team dynamic

capabilities. Secondly, this contribution is important for practitioners as it highlights how the knowledge, skills, and behaviours of Business Analysts may support or hinder their ability to contribute to the Dynamic Capabilities of Agile Software Development teams. This study can be used to inform the design of capacity development programmes for individual team members and Business Analysts, and thus help managers to curate teams which will best promote Dynamic Capabilities.

Although substantial data was collected, this research was limited, to some extent, by restricted access to classified and confidential documents. It is proposed that future researchers consider applying a multiple case-study strategy to allow for comparative analysis between teams that operate in different contexts.

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# LIST OF ACRONYMS

| | |
|---|---|
| ASD | Agile Software Development |
| BA | Business Analyst |
| DC | Dynamic Capabilities |
| DSDM | Dynamic Systems Development Method |
| IIBA | International Institute of Business Analysis |
| IS | Information Systems |
| ISD | Information Systems Development |
| O1 | Organisation 1 |
| O2 | Organisation 2 |
| SD | Software Development |
| SDLC | Software Development Life Cycle |
| TSD | Traditional Software Development |
| XP | Extreme Programming |

# CHAPTER ONE: INTRODUCTION

## 1.1 BACKGROUND

Studies have revealed that today's organisations face intense competition and a volatile business environment (Chuang, Luor, & Lu, 2014; Fitriani, Rahayu, & Sensuse, 2016; Ramesh, Mohan, & Cao, 2012; Strode, Huff, Hope, & Link, 2012). Agile Software Development (ASD) was therefore, introduced as a group of flexible development methodologies designed to assist Software Development (SD) teams in responding to the changes which take place in these fast-paced environments (Fitriani et al., 2016; Ramesh et al., 2012).

## 1.2 MOTIVATION/RATIONALE

While it is suggested that the agile methodologies employed by ASD teams allow for them to operate within turbulent environments (Yu & Petter, 2014), reacting to unpredictable changes might not solely depend on the tools and techniques recommended by these methodologies. The ability to operate within an unstable business environment also depends on the presence of capable team members (Lee & Yong, 2013).

Keeping in mind the importance of capable team members, there are ongoing debates in literature regarding the necessity (Cline, 2015) of the BA role and the different ways in which they can contribute to ASD teams. These debates stem from the fact that the BA role is not explicitly recognised by ASD methodologies (IIBA, 2013).

While ASD methodologies do not overtly advocate for the role of the BA (Hoda, Noble, & Marshall, 2013; Mundra, Misra, & Dhawale, 2013; Zajac-Woodie, 2013), in practice, BAs still form part of these teams (Dorairaj, Noble, & Malik, 2012; Permana, 2015). Although there are ways in which BA can be integrated into ASD teams (Mundra et al., 2013; Zajac-Woodie, 2013), not much is known about how BAs contribute to an ASD team's ability to respond to the changes in its environment. This ability is known as a team's Dynamic Capabilities (DC) (Li, Chang, Chen, & Jiang, 2010).

It is necessary to bring attention to DC particularly, as literature has placed emphasis on the relationship between team capabilities and ASD project success, failure, and challenges (Chow & Cao, 2008; Hsu, Lin, & Wang, 2012; Taherdoost & Keshavarzsaleh, 2015). Individuals too have the ability to contribute to a team's DC (Sprafke, Externbrink, & Wilkens, 2012) but there are knowledge gaps regarding the contribution of individual BAs to ASD team DC.

## 1.3 RESEARCH PROBLEM

While some ASD methodologies do not formally recognise the role of a BA and refer to it as being unnecessary (IIBA, 2013), it cannot be ignored that in practice, BAs form part of ASD teams (Drury-Grogan & O'dwyer, 2013).The ways in which a BA can contribute to the capabilities that allow ASD teams to respond to dynamic environmental changes are not succinctly clear, hence the value of this study. In theoretical terms, scholars such as Goh, Pan, and Zuo (2013) maintain that "not enough attention has been paid to establishing theoretical underpinnings when investigating agile development and its various practices" (p. 723). It is in this context that this study sought to use a theoretical lens that would help illuminate some of the key factors that are inherent in how BAs contribute to the DC of ASD teams.

## 1.4 RESEARCH OBJECTIVES AND QUESTIONS

Based on the literature reviewed regarding the importance of team DC and arguments regarding the manner in which BAs can possibly contribute to ASD teams, the following sub-section presents this study's research objectives and corresponding questions. The questions and objectives have been divided into primary and secondary categories.

The primary objectives and questions align with the first research purpose of this study, which is to explore how BAs contribute to an ASD team's Dynamic Capabilities. The secondary objectives and questions align with this study's second research purpose, which is to describe the factors which allow BAs to contribute to the DC of ASD teams. Posing these objectives and questions allow for the research problem to be appropriately addressed.

### 1.4.1 Research Objectives

Primary Research Objective:

To explore how Business Analysts contribute to an Agile Software Development team's Dynamic Capabilities.

Secondary Research Objectives:

(i) To identify the factors which allow Business Analysts to contribute to an Agile Software Development team's Dynamic Capabilities.

(ii) To identify the factors which hinder Business Analysts from contributing to an Agile Software Development team's Dynamic Capabilities.

### 1.4.2 Research Questions

Primary Research Question:

How do Business Analysts contribute to the Dynamic Capabilities of Agile Software Development teams?

Secondary Research Questions:

(i) Which factors allow Business Analysts to contribute to the Dynamic Capabilities of Agile Software Development teams?

(ii) Which factors hinder Business Analysts from contributing to the Dynamic Capabilities of Agile Software Development teams?

## 1.5 EXPECTED RESEARCH OUTCOMES

It is expected that the exploration of BAs contribution to the DC of Agile Software ASD team will provide useful insights for both theory and practice.

## 1.6 OVERVIEW OF DISSERTATION

This dissertation comprises 8 chapters, starting with the current Chapter 1 which provides an introduction to the study. Chapter 2 provides a review of literature in relation to the research problem and debates regarding the role of the BA in an ASD

team. Chapter 3 builds on the insights from the literature review and identifies the Dynamic Capabilities theory as an appropriate lens that can be used to address the research problem. It identifies and defines key theoretical concepts that will manifest in the course of the study. On this theoretical basis, a research model is developed in order to identify factors which allow BAs to contribute to the DC of ASD teams and to ensure that the research study results can have practical application in a business context. Chapter 4 presents an overview of research methodology and explains it was deemed appropriate for this study. The study was conducted under a subjectivist ontology and an interpretivist philosophy. The research purpose was identified as being both exploratory and descriptive, while theory was approached in a deductive manner. A single-case research strategy was adopted, which was conducted within a cross-sectional time horizon. Data was collected through one-on-one and group face-to-face semi-structured interviews'; documentation; and physical artefacts. Chapter 4 also describes how data was analysed using the Thematic Analysis technique as well as how verification strategies were used to ensure validity and reliability. Chapter 5 provides the description of the case (ASD team) selected for this study. Chapter 6 presents and describes the analysed findings. This is followed by Chapter 7 which discusses the implications of the results and how they respond to the research questions. Chapter 8 concludes with highlights of the research results, limitations and recommendations for future research.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 INTRODUCTION

The purpose of this chapter is to explore the literature on Business Analysts (BA) and Software Development (SD) teams. In order to discuss and establish ways in which BAs contribute to Agile Software Development (ASD) teams, it is necessary to first define the role of the BA as well as distinguish between the traditional and agile SD methodologies employed by SD teams. Sections 2.2 – 2.5 are therefore descriptive in nature, as they aim to explain the characteristics of Traditional Software Development (TSD) and ASD methodologies, and briefly explain how BAs contribute to TSD teams. Section 2.6 presents a critical discussion on the necessity of BAs in ASD teams and ways in which BAs can contribute to these teams. Section 2.7 summarises the chapter and addresses the need to identify ways in which BAs contribute to ASD team Dynamic Capabilities (DC)

## 2.2 THE BUSINESS ANALYST ROLE

Several studies suggest that the role of the BA is unclear (Richards & Marrone, 2014; Sonteya & Seymour, 2012) and remains the most vaguely defined IT role (Richards & Marrone, 2014). While scholars struggle to agree on a single definition of the BA role, the widely accepted definition of the BA is someone who is responsible for bridging the communication gap between the business, which specifies user requirements, and the IT team which implements the solution (Sonteya & Seymour, 2012; Zajac-Woodie, 2013). The communication gap has been highlighted as a contributing factor to the failure of Information Systems Development (ISD) projects and affects how well user requirements are understood (Park & Jeong, 2016). As the communication gap grows, so does the uncertainty of user requirements. The BA is therefore tasked to reduce this gap by facilitating communication between the business and IT (Sonteya & Seymour, 2012).

## 2.3 TRADITIONAL SOFTWARE DEVELOPMENT

Traditional Software Development (TSD) methods represent a “mechanistic” and “phase-based” approach to software development (Brhel, Meth, Maedche, & Werder, 2015, p. 164). The most commonly applied traditional method is known as ‘Waterfall’, which is considered appropriate for projects which take place in stable environments that are predictable and conveniently arranged (Kisielnicki & Misiak, 2017). The Waterfall methodology, therefore, proposes techniques and practices which are suitable for projects with fixed (Kisielnicki & Misiak, 2017) or predictable requirements (Chuang et al., 2014). The development activities in Waterfall take place according to the Software Development Life Cycle (SDLC) which consists of five sequential phases that are expected to have set timelines: analysis, design, implementation, testing, and maintenance (Bassil, 2012). Figure 2-1 illustrates the various phases of the Waterfall SDLC model. The analysis phase is reserved specifying how the software being developed should behave. It involves identifying the functional and non-functional requirements of the system (Bassil, 2012). The design phase is aimed at formulating a plan for the software solution which includes addressing issues such as software architecture. During implementation, the identified requirements and design specifications are used to write the code for the software being developed. Testing refers to the process of verifying whether the software solution meets the requirements and design specifications. Maintenance takes place once the software solution has been deployed and is aimed at ensuring that the software is performing as it should (Bassil, 2012) TSD methodologies such as Waterfall are employed by TSD teams (Dorairaj, Noble, & Malik, 2012), which will be described in the next section.

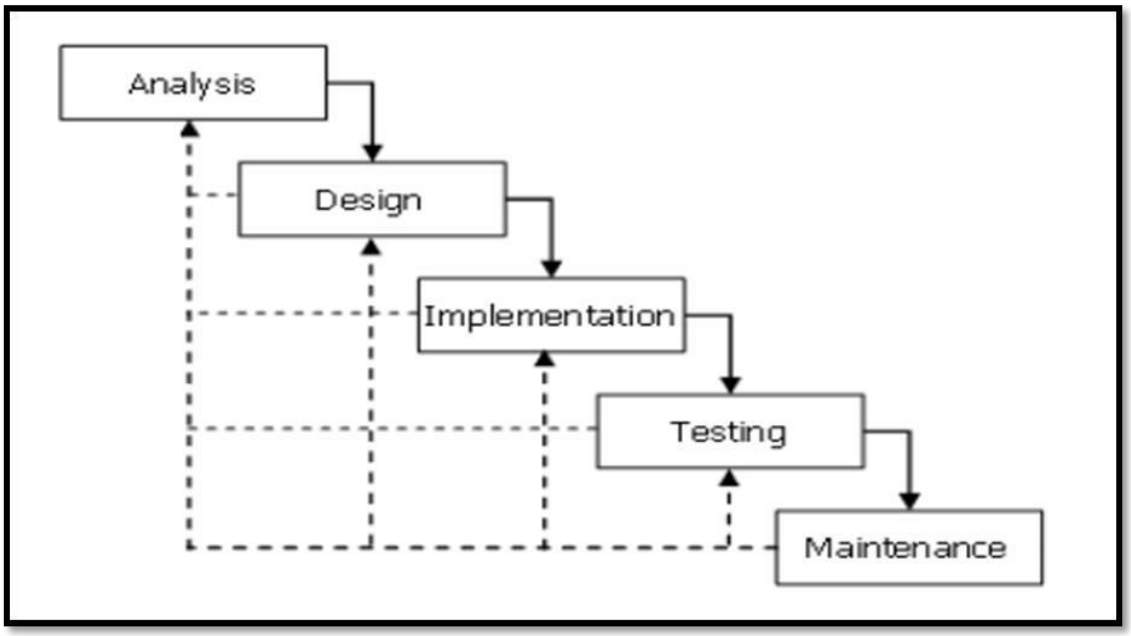


Figure 2 - 1: Waterfall SDLC model (Bassil, 2012, p. 2)

## 2.4 BAs CONTRIBUTION TO TRADITIONAL SOFTWARE DEVELOPMENT TEAMS

The roles in Traditional Software Development (TSD) teams are determined by the functional tasks performed by each team member (Hoda, Noble, & Marshall, 2013). These roles are referred to as organisational roles (Hoda et al., 2013). Some examples of organisational roles are business analyst, systems analyst, developer, and tester (Dorairaj et al., 2012; Hoda et al., 2013). Each role is expected to contribute to the team by carrying out activities that are associated with a certain phase in the previously mentioned SDLC (Dorairaj et al., 2012). The business and systems analysts mainly participate in the analysis phase of the SDLC during which the functional and non-functional requirements of a system are identified (Bassil, 2012). During this stage, it is important for BAs to engage with the relevant business stakeholders and system users to determine and understand the requirements that the software solution must address (IIBA, 2015). The BAs are responsible for communicating the requirements to the rest of the development team so that they can complete the remainder of the SDLC phases (Park & Jeong, 2016). Once the analysis phase is complete, the developers take part in the design and implementation stages where they devise plans for the software solution and write the necessary code. The testers are responsible for completing the verification tasks in the testing phase (Bassil, 2012).

## 2.5 AGILE SOFTWARE DEVELOPMENT

ASD methods were introduced as a more flexible alternative to TSD methods (Fitriani et al., 2016). They were designed in an attempt to help teams respond to the changes which take place in volatile business environments (Ramesh et al.,2012). While TSD methods are linear and sequential, the software development in ASD methods is performed in iterative cycles which aim to include the customer in the development process (Brhel et al., 2015). ASD methods are based on a set of values and principles expressed in the Agile Manifesto (Rodríguez, et al., 2019), and are an umbrella term used to describe a range of flexible software development methods (Lindsjørn, Sjøberg, Dingsøyr, Bergersen, & Dybå, 2016). The different methods include: Scrum, Extreme Programming (XP), Dynamic Systems Development Method (DSDM), Crystal methods, Feature Driven Development, Adaptive System Development, Lean Software Development (Wang, Conboy, & Cawley, 2012), Evo (Strode et al., 2012), and Kanban (Joaquin, Alexander, Matthias, Jens, & Kristin, 2019). Scrum has been recognised as the most commonly used framework, while Kanban has been cited as the most recent addition to the family of methodologies (Wang et al., 2012).

The following subsections will describe the Agile Manifesto and provide detail about Scrum in particular, as it was the methodology employed by the team in this study. The description of the Scrum methodology will provide readers with a holistic understanding of the team's practices.

### 2.5.1 The Agile Manifesto

The Agile Manifesto was introduced in 2001 describes the philosophy which forms the foundation of all development methods which are categorised as being 'agile' (Cram, 2019). The following sub-sections describe the values and principles included in the Agile Manifesto.

#### *Agile Values*

The agile values are as follows: individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to change over following a plan (Beck, et al., 2001, para. 2). The four values are illustrated in Figure 2-2 (Denys, 2018). The authors of the manifesto argue that the values on the right should not be interpreted as being obsolete in the software industry, as the values on the left do not seek to completely

replace those on the right. The point of the manifesto is to highlight that while the values on the right are valid, agile practitioners should embrace and emphasise those on the left (Beck, et al., 2001).

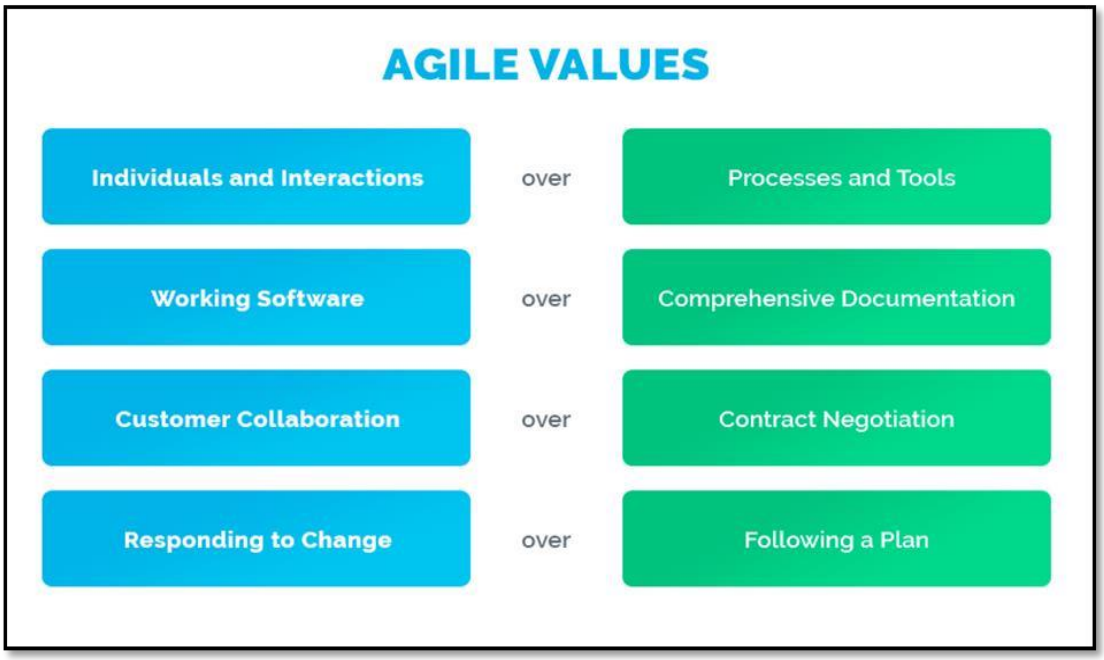


Figure 2-2: Agile Values (Denys, 2018)

### *Agile Principles*

As depicted in Table 2-1, there are also 12 principles which support the values expressed in the Agile Manifesto (Yusoff, Alias, Abdullah, & Mansor, 2019). The principles can be used as guidelines for ASD teams during development (Yusoff et al., 2019). The authors of the manifesto highlight customer satisfaction as their highest priority. It is recommended that teams seek to satisfy the needs of their customers by quickly and regularly presenting them with quality software (Beck, et al., 2001). Another principle includes the development team's need to become comfortable with changing requirements throughout the development process (Beck, et al., 2001). While each of these 12 principles serve as useful guidelines to ASD teams, specific attention is drawn to the principle of welcoming change, as it aligns with the main aim of this study: to understand how BAs contribute to an ASD team's ability to respond to the changes in its environment.

Table 2-1: Agile Principles (Fowler & Highsmith, 2001, p. 35)

| | | | |
|---|---|---|---|
| **1** | Our highest priority is to satisfy the customer through early and continuous delivery of valuable Software. | **7** | Working software is the primary measure of progress. |
| **2** | Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage. | **8** | Agile processes promote sustainable development. The sponsors, developers and users should be able to maintain a constant pace indefinitely. |
| **3** | Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale. | **9** | Continuous attention to technical excellence and good design enhances agility. |
| **4** | Business people and developers work together daily throughout the project. | **10** | Simplicity - the art of maximizing the amount of work not done.is essential. |
| **5** | Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done. | **11** | The best architectures, requirements and designs emerge from self-organizing teams. |
| **6** | The most efficient and effective method of conveying information to and within a development team is face-to-face conversation. | **12** | At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly. |

### 2.5.2 Scrum Methodology

This subsection will discuss the Scrum methodology. A background of the methodology will be presented, followed by its roles, phases, ceremonies, and artefacts.

#### *Background*

Scrum is an ASD framework that was developed by Jeff Sutherland and Ken Schwaber (Hoda, Noble, & Marshall, 2013). It is important to mention that unlike other agile methods such as XP which specify a set of rules and practices that must be applied when developing software, Scrum focuses on the general project management component of software development (Barksdale & McCrickard, 2012; Hoda et al., 2013).

### *Roles*

Scrum teams consist of three roles: product owner, scrum master, and the development team (Lei, Ganjeizadeh, Jayachandran, & Ozcan, 2017). This subsection will describe each of the three roles.

#### Product Owner

In Scrum, the product owner describes the customer representative who is appointed to act on the behalf of the project stakeholders (Greg et al., 2019). The stakeholders of a project empower the product owner to make decisions related to product features and priorities (IIBA, 2013). The product owner is responsible for making sure that the development team understands the goal of the project, managing the list of prioritised functional and non-functional requirements (product backlog), and ensuring that the development team understands the contents of the backlog (Lei et al., 2017). This role contains elements of the traditional BA role and will be further discussed in section 2.5.2.

#### Scrum Master

A scrum master is "the team's expert, coach, and facilitator" (Stoddard, Gillis, & Cohn, 2019, p. 497). Scrum masters are required to guide and oversee Scrum meetings, as well as keep track of the team's progress throughout the project period (Tanner & Pan, 2015). They are also responsible for eliminating any impediments that may prevent the development team from completing their work and protecting the team from external distractions (IIBA, 2013). The scrum master role resembles the role of the traditional BA and will be further elaborated on in section 2.5.3.

#### The Development Team

Some authors refer to the final Scrum role as the 'Scrum team' (Santos, Goldman, & De Souza, 2015; Tanner & Pan, 2015), while others refer to it as the 'development team' (Lei et al., 2017; Lous, Kuhrmann, & Tell, 2017). Regardless of which terms authors choose to employ, this role refers to a group of three to nine (Diebold et al., 2013) cross-functional individuals who are responsible for delivering the product requested by the product owner and presenting working software at the end of each sprint (Lei et al., 2017; Tanner & Pan, 2015). While

each team member may possess a certain skill set that may, for instance, be related to business analysis or testing, Scrum does not prescribe any titles to its development team members (Schwaber & Sutherland, 2017). The development team is self-organising, implying that each member is encouraged to manage their own work and choose tasks that they are willing to commit to (Tanner & Pan, 2015).

It must be noted that the focal point of this study is not the larger Scrum project team which includes the product owner and the scrum master. The focus of this study is the development team that operates within the Scrum project team. This is critical to note, as this study is concerned with how BAs contribute to development teams in particular.

### *Phases*

The Scrum methodology consists of three phases: pre-game, main game, and postgame (Anwer, Aftab, Shah, & Waheed, 2017; Ayed, Vanderose, & Habra, 2012; Schwaber, 1997). This subsection will briefly describe the activities performed in each phase.

#### Pre-game

The pre-game stage is reserved for planning and architecture considerations (Ayed et al., 2012). The planning is led by the previously mentioned product owner who outlines the initial vision of the project and puts together a product backlog (Anwer et al., 2017).

#### Main game

The main game is centred around sprints (Ayed et al., 2012). Sprints are the iterations during which the development team carries out their work (Anwer et al., 2017). A sprint can be two to four weeks long, depending on the level of intricacy and risks attached to the tasks (Anwer et al., 2017).

#### Post-game

The post-game represents the project's closure phase (Ayed et al., 2012). Once all the features have been implemented, a final release of the product can

commence. The release can come to an end the goals that were outlined in the pre-game phase of the project have been satisfied (Anwer et al., 2017).

### *Ceremonies*

Ceremonies are meetings or gatherings which are used to monitor the progress made by Scrum teams (Vogelzang, Admiraal, & van Driel, 2019). The following section will describe five Scrum ceremonies: product backlog grooming (refinement) (Agarwal & Majumdar, 2012), sprint planning, daily scrum or stand up, sprint review, and sprint retrospective (Lous et al., 2017).

#### Product Backlog Refinement

The goal of a product backlog refinement meeting is to review the product backlog before an upcoming sprint planning meeting (Van Den Broek, Bonsangue, Chaudron, & Van Merode, 2014). The session is attended by the Scrum team and is used to assess the size, detail, and dependencies of the user stories in the backlog. The large user stories (epics) are refined and the unclear, as well as incomplete user stories, are addressed by the product owner (Van Den Broek et al., 2014).

#### Sprint Planning Meeting

Sprint planning meetings take place at the start of each sprint (Tanner & Pan, 2015), after the product refinement meeting (Van Den Broek et al., 2014). The meeting is attended by the scrum master, product owner, and development team (Tanner & Pan, 2015). The purpose of the planning session is to review the prioritised backlog and select user stories that will be completed during the sprint (IIBA, 2013). This session also gives the attendees an opportunity to further deliberate on how specific tasks will be executed (Tanner & Pan, 2015).

#### Daily Scrum

Daily Scrums are meetings that are held specifically for the development team (Schwaber & Sutherland, 2017) and take place for approximately fifteen minutes every day (Çetin & Onay Durdu, 2019; Schwaber & Sutherland, 2017). The purpose of these meetings is to monitor the team's progress on the tasks that must be completed during a sprint (Bannink, 2014). The meetings are facilitated by the scrum master and are conducted in front of a Scrum board. During the meeting,

there are three questions that must be answered by each development team member, “what did I do yesterday? what shall I do today? and what are the problems and innovations encountered?” (Çetin & Onay Durdu, 2019, p. 2).

**Sprint Review and Retrospective**

Sprint reviews take place at the end of a sprint. During the review, the product owner provides the development team with feedback about the quality of the product. The product owner’s feedback and change requests are then used to update the items in the product backlog (Vogelzang et al., 2019). The retrospective takes place immediately after the review, where the team is given the opportunity to discuss issues related to collaboration and decide on the commitments they will make in the following sprint (Vogelzang et al., 2019).

**Artefacts**

Scrum highlights the use of three artefacts: the product backlog, sprint backlog, and the burndown chart (Tanner & Pan, 2015). These artefacts allow the development team to visually present and monitor their progress (Vogelzang et al., 2019). The following subsection will briefly describe each of these artefacts. As previously mentioned, the product backlog is managed by the product owner (Çetin & Onay Durdu, 2019). The sprint backlog is created during the sprint planning meeting and is made up of items from the product backlog (Çetin & Onay Durdu, 2019). The burndown chart is a graph that illustrates the progression of the project and informs the team on how much work still needs to be completed (Vogelzang et al., 2019).

ASD methodologies, such as Scrum, are employed by ASD teams (Rola, Kuchta, & Kopczyk, 2016). The following section will describe the nature of a typical ASD team and discuss how BAs contribute to these teams.

## 2.6 BAs CONTRIBUTION TO AGILE SOFTWARE DEVELOPMENT TEAMS

ASD teams are comprised of cross-functional and self-organising individuals who have the skills required to deliver a requested software solution (Hoda et al., 2013). As previously mentioned, when applying the Scrum methodology, this group of cross-functional individuals is referred to as the ‘development team’. Unlike TSD teams, ASD teams are not restricted by their organisational roles or experience. While ASD

team members can still contribute to their teams under their organisational roles, they may also choose to contribute to the team according to their strengths and weaknesses (Hoda et al., 2013).

While literature clearly defines how BAs contribute to TSD teams, there are continuing debates regarding the role and value of the BA in ASD teams. The contradictions presented in literature stem from the fact that in most cases, the BA role is not explicitly recognised and discussed in agile methodologies (Tan, Nakata, & Paul, 2016). This lack of clarity has raised concern and fuelled discussions amongst practicing BAs. At a 2013 Agile Conference held in Nashville (United States), a BA discussed how the dearth of information in agile methodologies regarding her role made her develop a sense of apprehension about becoming "obsolete" in her environment (Zajac-Woodie, 2013, p. 89). This led her to question and find ways in which she could add value to ASD teams (Zajac-Woodie, 2013). The following section will, therefore, present the debate about the necessity of the BA role in ASD teams and discuss the different ways in which BAs can contribute to these teams.

### 2.6.1 The Necessity of the Business Analyst

Literature states that there are some agile methodologies that do not explicitly acknowledge the role of the BA and view it as being "unnecessary" (IIBA, 2013, p. 6). It must be noted that although the BA role may not be overtly recognised in agile methodologies and ASD teams, it does not mean that business analysis activities are not conducted throughout the project. It is to rather highlight that business analysis may be performed by any members of the ASD team (IIBA, 2013).

Cline (2015) argues that Scrum is an example of an agile methodology that does not recognise the role of the BA. It is put forward that the tasks which would typically be assigned to the BA in a TSD team, are taken over by a product owner (Cline, 2015). This view is, however, opposed by Takpuie and Tanner (2016) who draw from the writings of Schwaber (1997) to demonstrate that the role of the BA in the Scrum methodology and the ASD team, in particular, is implied. Takpuie and Tanner (2016) suggest that BAs can be integrated into ASD team under their organisational roles and contribute to the team as 'documenters'. Other scholars recommend that BAs should rather contribute to ASD teams by taking on new roles such as customer

representatives (Matturro et al., 2018) or agile coaches (Babar et al., 2018). The following subsections will discuss the BA in each of these roles.

### 2.6.2 The BA as a Customer Representative

ASD methodologies state that every ASD team should have a customer representative (Gregg, Scharadin, & Clements, 2019). It is argued that the responsibilities that are assigned to the customer representative incorporate parts of the traditional BA role representatives (Matturro et al., 2018). In addition to identifying and communicating business requirements to the ASD team, other BA related responsibilities that must be taken on by the customer representative may include frequently communicating with the customer and clarifying their needs (Matturro et al., 2018). Ashraf and Aftab (2017) expand on this idea by stating that the customer representative does not simply incorporate parts of the BA role into their own role, but that they perform the role of a BA.

Given the similarity between the BA role and the role of a customer representative, some authors argue that BAs can perform the role of a customer representative (Diebold, Ostberg, & Wagner, 2015; IIBA, 2013; Tan et al., 2016). Literature states that this typically happens in cases where an organisation is unable to appoint a customer representative (Mundra et al., 2013). It has, however, been warned that should a BA take on this new role, they must ensure that they act in the best interest of the customer. They must give precedence to the requirements and be able to take on the perspective of the customer, as opposed to that of an ASD team member (Mundra et al., 2013).

### 2.6.3 The BA as an Agile Coach

In Scrum teams, the scrum master (agile coach) is expected to act as the main liaison between the product owner (customer representative) and the development team (Bass, 2014). Due to this resemblance in the role of the traditional BA and the agile coach, it has been suggested that BAs can assist teams by acting as their agile coach (Babar et al., 2018). The ability for a BA to play this role is illustrated in a study by Takpuie and Tanner (2016), which identified a participant as both a BA and a scrum master. It must, however, be noted that while this role may be taken on by a BA, Babar et al. (2018) warn that not every BA has the skill set necessary to assume the role of an agile coach. A BA who decides to contribute to the team as an agile coach must ensure that they possess the expertise that will enable them to guide and assist

the ASD team in understanding and applying an agile methodology (Hoda et al., 2013).

### 2.6.4 The BA in an Organisational Role

As previously mentioned, BAs can be integrated into ASD teams under their organisational BA roles (Mundra, Misra, & Dhawale, 2013; Takpuie & Tanner, 2016). Under these roles, BAs can contribute to the ASD team by performing the following activities: requirements elicitation and analysis, assisting the team in understanding business requirements, creating and maintaining an agile document repository, and acting as a proxy customer representative. The following subsections will discuss these activities in further detail.

#### *Requirements elicitation and analysis*

Mundra, Misra, and Dhawale (2013) acknowledge that although the BA role is not a clearly defined role in Scrum, it cannot be discarded, as it brings significant value to the Scrum development team. The value of the BA can be compared to that of an architect (Mundra et al., 2013). While the Scrum methodology does not recognise the role of the architect who is responsible for technical contributions, their inputs are still vital for building the required software (Mundra et al., 2013). The same can be said for ASD teams who need a BA for requirements elicitation and analysis (Mundra et al., 2013).

#### *Assisting the team in understanding business requirements*

A study by Mundra et al. (2013) found BAs play a significant role in ensuring that a Scrum development team is able to make sense of the business requirements (Mundra et al., 2013). BAs can do so by documenting the requirements as clear user stories that the developers and testers will understand (Gregorio, 2012). This is not very different from the role of a BA in a TSD team, where they are expected to act as a liaison between IT and business stakeholders (Shah, 2017), which requires them to communicate with the business using business language that they will understand and use more technical terms when conveying ideas to the development team (Park & Jeong, 2016).

#### *Performing verification testing*

It is suggested that BAs can contribute to the ASD team by executing verification tests throughout the sprints (Gregorio, 2012). The verification tests are performed

to ensure that the user stories satisfy the acceptance criteria (Gregorio, 2012). This responsibility is appropriate for the BA, as they have been identified as members of the team who have the most thorough understanding of the user stories (Gregorio, 2012).

### *Creating and maintaining an agile documentation repository*

According to Gregorio (2012, p. 3), "The Business Analyst should establish and maintain a repository for agile sample documentation". Uploading essential documentation onto a shared site allows other ASD team members to gain access to templates that may assist them in completing their own work. BAs can, therefore, use the repository to share examples of documents that relate to user stories, backlogs, and estimates (Gregorio, 2012).

### *Acting as a proxy customer representative*

In service to the ASD team, the IIBA also suggests that the BA can act as a substitute for the customer representative, should he or she be unavailable (IIBA, 2013). While the concept of the BA as a proxy customer representative may appear to be helpful, it has some risks attached to it (Buchan, Bano, Zowghi, MacDonell, & Shinde, 2017). Customer representatives who think that the BA is seeing to their assigned responsibilities may reduce their level of engagement with the ASD team and over rely on the BA as their proxy. This could result in an inability to identify the necessary requirements or reduce the level of understanding the ASD team has about the requirements (Buchan et al., 2017).

## 2.7 SUMMARY

This literature review described TSD methodologies, TSD teams and the manner in which BAs contribute to these teams. It then described ASD methodologies and specifically outlined the Scrum methodology that was used by the team in this study. The literature review then presented a debate about the necessity of BAs in ASD teams and discussed different ways in ways in which BAs can contribute to ASD teams. While some argue that the role of BAs in ASD teams that apply agile methodologies such as Scrum are unnecessary (Cline, 2015; IIBA, 2013), others have suggested ways in which BAs can add value to ASD teams. The literature review revealed that BAs can contribute to ASD team by; taking on new roles such as

customer representative and agile coach, or by performing a range of activities under their organisational BA role.

Although this literature review has established that BAs can assist ASD teams in a number of ways, it has not identified specific ways in which BAs can contribute to an ASD team's ability to respond to the changes in its environment. This ability to respond to environmental changes is known as an ASD team's DC (Li, Chang, Chen, & Jiang, 2010). While it is suggested that the agile methodologies employed by ASD teams allow for them to operate within volatile environments (Yu & Petter, 2014), reacting to unpredictable changes might not solely depend on the practices recommended by these methodologies. The ability to operate within an unstable business environment also depends on the presence of capable team members (Lee & Yong, 2013). Due to literature's emphasis on the importance of having the right people involved in ASD teams (Lalsing, Kishnah, & Pudaruth, 2012) and highlighting the significance of an individual's skills and talents (Bossini, 2013; Shah, 2016), it is necessary to clearly identify ways in which individual BAs contribute to the DC of ASD teams.

It must, however, be noted that some authors (Sprafke, Externbrink, & Wilkens, 2012), have highlighted how literature says very little about specific factors that contribute to DC. There is also a lack of studies that discuss ways in which an individual, in particular, may contribute to the DC of a team. Most studies that consider the contributions made to DC by an individual, do so at an organisational level. The few studies which attempt to address factors contribute to team DC, consider components that apply to the team as a whole and do not give attention to individual team members.

The following Theoretical Framework Chapter will, therefore, address ways in which individual BAs on ASD teams can contribute to ASD team DC.

# CHAPTER THREE: THEORETICAL FRAMEWORK

## 3.1 INTRODUCTION

Informed by the previous review of literature, this chapter presents Dynamic Capabilities (DC) as the theoretical lens that was applied to explore how Business Analysts (BAs) contribute to Agile Software Development (ASD) teams. To facilitate this exploration, a research model was developed and its components are discussed in order to help address the research problem and questions of this study.

## 3.2 APPLICATION OF THE DYNAMIC CAPABILITIES THEORY

By way of background, the DC theory can be traced back to the 1990s (Ambrosini & Bowman, 2009). It differentiates between 'ordinary' capabilities (doing correct things) from 'dynamic' capabilities, which are "doing the right things, at approximately the right time, based on new product (and process) development…" (Teece, 2017, p. 698). The DC theory is appropriate for this study as it is applied when studying environments which are subject to rapid changes and turbulent environments (Teece, 1997).

Several Information Systems (IS) studies have also used the DC theory to explore software process improvement (Lee & Chen, 2017), flexible development teams (Li et al., 2010) as well as investigating ISD teams' effect on project performance (Hsu et al., 2012).

It must also be noted that ASD teams are subject to volatile business environments and are encouraged to embrace the changes which take place during software development (Aramand & Valliere, 2012; Yu & Petter, 2014). The DC of a team therefore have been defined as, the actions which allow teams to "continuously integrate, reconfigure, and renew resources and competencies in response to the changing socio-technical environments" (Li et al., 2010 p. 1727).

## 3.3 AGILE SOFTWARE DEVELOPMENT TEAM DYNAMIC CAPABILITIES

The application of the DC theory in this study is apt, as it builds on the relatively few studies (Li et al., 2010 and Hsu et al., 2012) which focus on DC within Software Development (SD) teams and ISD project teams. In these studies, at least six

categories of team DC are identified and are defined in the section that follows: reaction capabilities, anticipatory capabilities – SD teams (Li et al., 2010), absorptive capacity, collective mind, market/environment orientation and coordination capability which takes a whole project team focus (Hsu et al., 2012).

### 3.3.1 Reaction Capabilities

Reaction capabilities refer to the abilities which allow a team to respond to unanticipated changes that occur in the later stages of the development cycle in an inexpensive and timely manner. They allow a SD team to perform managerial actions such as recruiting additional experienced members who can contribute to the team's ability to anticipate changes (Li. et al, 2010).

### 3.3.2 Anticipatory Capabilities

Anticipatory capabilities focus on a team's ability to predict any possible changes in the requirements of an SD project. The anticipatory nature of this capability means that potential changes must be managed at the beginning of an SD project. Anticipatory capabilities are embedded in planning practices (Li et al., 2010). A team with anticipatory capabilities will use the experience it has gained from past projects, ensure that stakeholders participate in the early stages of the SD process, focus on client needs, and manage possible risks by making use of user experience and the domain knowledge of team members (Li. et al, 2010).

### 3.3.3 Absorptive Capacity

Absorptive capacity is an ISD team's ability to identify important external information so that it can be obtained, fully understood and applied as new knowledge (Hsu et al., 2012). Teams with high levels of absorptive capacity are able to gain and understand new knowledge with the intention of using it to quickly react to changes (Hsu et al., 2012). A lack of absorptive capacity hinders knowledge transformation and the ability of team members to take in, internalise and apply knowledge (Hsu et al., 2012).

### 3.3.4 Collective Mind

In an ISD team, a collective mind refers to the shared understanding formed between its members (Hsu et. 2012). It requires team members to recognise how their actions affect the outcome of a project and to ensure that they dedicate themselves to the

goals of their team (Hsu et al., 2012). A collective mind allows the team to take ownership of their project (El-Khawaga, Galal-Edeen, & Riad).

### 3.3.5 Market/Environment Orientation

An ISD project team's market/environment orientation is "the ability to effectively sense environmental changes occurring outside of the workspace that may influence teamwork" (Hsu et al., 2012, p.81). The 'environment' portion of this capability's name is to emphasise that while a team should understand their clients and system users, it should also be critically aware of the changes in their environment which are usually caused by a variety of other stakeholders (Hsu et al., 2012). Teams that are unable to identify and understand the changes in their environment experience difficulty in appropriately managing and responding to those changes (Hsu et al., 2012).

### 3.3.6 Coordination Capability

The coordination capability describes a team's capacity to handle interdependencies (Hsu et al., 2012). Dependencies may relate to "shared resources, task assignments, and task or subtask relationships" (Lindsjørn et al., 2016, p. 275). Coordination capabilities are needed when changes to requirements or technologies are made, as there will subsequently be a change in the task structure (Hsu et al., 2012).

## 3.4 SELECTED AGILE SOFTWARE DEVELOPMENT TEAM DYNAMIC CAPABILITIES

For the purposes of this study, the market/environment orientation and coordination capability DC have been chosen for particular reasons. Firstly, the strong impact, amongst other DC, of market/environment orientation on the performance of ISD projects is canvassed in literature (Hsu et al., 2012). Furthermore, market/environment orientation does not restrict itself to certain changes that take place during certain project phases, as in the case of reaction and anticipatory capabilities. By taking on the market/environment orientation capability, this study is able to take into account the changes which may take place at any stage of an ISD project (Hsu et al., 2012).

Secondly, the coordination capability is also highlighted by some scholars as a key enabler of an ISD team's success (Lindsjørn et al., 2016; Mishra, Mishra, & Ostrovska, 2012). Mishra et al. (2012) argue that coordination gives team members awareness

about the tasks they must carry out, as well as the timeframe attached to completing those tasks. Lindsjørn et al. (2016) adds that coordination allows team members to then manage the dependencies between their interrelated tasks. However, the suggestion that the coordination capability is critical to an ISD team's success is debatable, as some (Hsu et al., 2012) view coordination as having weak impact on an ISD's project performance. This controversy is worth pursuing as will be done in the course of utilising the DC theoretical lens and including coordination capability in this study. Lastly, the choice of only these two categories was necessary in view of the time and space limits of a research study of this nature. This matter is also be reflected upon later in the recommendations section of the Conclusions chapter.

The following subsections discuss the use of these two categories (market/environment orientation and coordination capability) of DC by ASD teams.

### 3.4.1 Market/Environment Orientation of ASD Teams

In broad terms, an ASD team with good market/environment-orientation takes part in a number of activities to ensure that it understands external changes. First, the team ensures that it has a holistic understanding of the organisation it is servicing by seeking and acquiring information about how it functions (Hsu et al., 2012). This information may include details about an organisation's competition, regulations, technical changes and market needs (Hsu et al., 2012). Thereafter, the team regularly engages with data or information about environmental changes. Other activities include discussing these changes with other team members, quickly responding to the changes, and allocating enough time to execute ideas related to the changes (Hsu et al., 2012).

Regarding ASD teams in particular, literature highlights the importance of involving clients (Alzoubi, Gill, & Al-Ani, 2016) and understanding the changing needs of users throughout the development of software products (Ozkan, 2015). Hsu et al. (2012) stress that while the team must ensure that it understands these needs, in the context of DC, attention must also be given to other stakeholders and the changes they make, as they may also affect the development of the system. Stakeholders refer to the parties who can directly or indirectly impact or be impacted by the system being developed (Khan, Ahmad, & Abdollahian, 2013).

According to Hsu et al. (2012), a diverse set of expertise within an ISD team enhances its ability to sense external changes and take in external knowledge. Individuals with specific expertise are therefore expected to recognise the changes which relate to their domain (Hsu et al., 2012). Generally speaking, expertise refers to one's competencies, skills, and knowledge (Coyle, 2015). Expertise in an ISD team include technical skills, domain knowledge and product specific knowledge (Moe, Šmite, Šāblis, Börjesson, & Andréasson, 2014).

### 3.4.2 Coordination Capability of ASD Teams

Given that literature categorises coordination as being explicit or implicit (Bick, Spohrer, Hoda, Scheerer, & Heinzl, 2017), it is necessary to provide clarity on the type of coordination that was analysed in this study. Explicit coordination suggests that in order to commence work on shared tasks, teams must rely on each other's verbal communication to express plans, assign responsibilities, and obtain information (Aggarwal, Woolley, Chabris, & Malone, 2019). Implicit coordination, on the other hand, calls for team members to anticipate each other's activities and needs, and be able to, "dynamically adjust their own behaviour, without explicit communication" (Aggarwal et al., 2019, p. 3). It is fitting that this study focuses on the implicit nature of coordination, as literature posits that in fast-paced and volatile settings, a team's success is often determined by its ability to coordinate implicitly (Aggarwal et al., 2019). Implicit coordination is made up of five components: know why, know what is going on and when, know what to do and when, know who is doing what, and know who knows what (Strode et al., 2012).

Members of well-coordinated agile teams understand what is expected of them and how their tasks are connected to the tasks of others (Mishra et al., 2012). ASD methodologies prescribe several mechanisms to ensure that teams are able to coordinate their activities (Lindsjørn et al., 2016). Synchronisation activities (such as sprit planning meetings) and synchronisation artefacts (such as task boards) are two types of coordination mechanisms used by agile teams (Stray, Moe, & Aasheim, 2019). Synchronisation activities are events that involve all team members in order to create a shared understanding of a task, process, and expertise available in a team (Strode et al., 2012). The other type of coordination mechanisms are synchronisation artefacts which are produced when synchronisation activities take place and are made available to the team. The artefacts may be accessed physically or virtually, and

can exist temporarily or permanently (Strode et al., 2012). Both synchronisation activities and artefacts allow agile teams to achieve higher levels of implicit coordination (Strode et al., 2012).

## 3.5 BUSINESS ANALYST CONTRIBUTION TO SELECTED DYNAMIC CAPABILITIES

Having considered the two categories of market/environment orientation and coordination capability at the level of the team as a whole, this section focusses on the individual contribution of BAs. The DC lens was utilised in this study to develop a research model that was informed by literature (Hsu et al., 2012) and used to illuminate key factors that allow BAs to contribute to ASD team DC. The model that was used to address the research problem and establish the substance of the BA's contribution is depicted in Figure 3-1.

Firstly, BAs can contribute to team market/environment orientation through their individual market/environment orientation (Hsu et al., 2012), relationship management and tacit knowledge sharing factors (Schlosser & McNaughton, 2007). Secondly, BAs can contribute to team coordination capability through their individual task mental model (Balijepally, Nerur, & Mahapatra, 2015; Hsu et al., 2012) and transactive memory (Hsu et al., 2012). These factors are discussed in greater detail in the next sub-sections, according to the (a) Definition of each factor (b) Individual's contribution to the relevant DC and the (c) Business Analyst's specific contribution to an ASD team's DC.

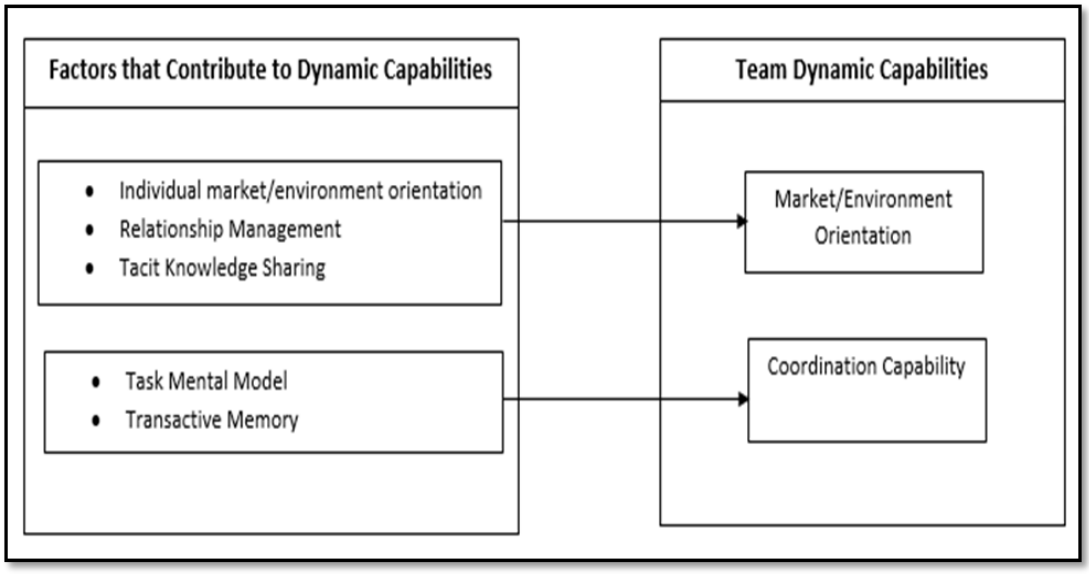


Figure 3-1: Research Model – Exploring Business Analyst's contribution to Agile Software Team Dynamic Capabilities (A*dapted from Hsu et al., 2012*)

### 3.5.1 Business Analyst's Contribution to Market/Environment Orientation

Individual actors in organisations are able to contribute to collective market/environment orientation (Hsu et al., 2012), hence the inclusion of this factor in investigating the BA's contributions to ASD team DC.

#### Individual Market/Environment Orientation

(a) Definition

A study conducted by Schlosser and McNaughton (2007) set out to investigate an individual's influence on an organisation's market orientation. Due to the lack of market orientation definitions available at the individual level, the researchers decided to adapt an organisational level definition to that of an individual. A similar approach has been taken in this study, as the team's market/environment orientation definition provided by Hsu et al. (2012) has been adapted to fit that of an individual team member. The market/environment orientation of a BA is therefore defined as their ability to identify, understand and communicate environmental changes that may affect their team.

(b) Individual contribution to market/environment orientation

Market-oriented organisations depend on individuals who take it upon themselves to collect, analyse and share market information with others (Schlosser & McNaughton, 2007). The choice to evaluate the capability on an individual level is supported by Hsu et al. (2012), who claim that a team member on an ISD team is expected to contribute to market/environment orientation by sensing and communicating changes which relate to their area of expertise and sharing information about those changes with their team.

(c) BA's individual market/environment orientation in ASD

The importance of a BAs market/environment orientation is echoed by the International Institute of Business Analysis (IIBA), which states that "it is incumbent on the analyst to constantly review requirements with the business stakeholders and ensure that any shifts in business needs are accurately reflected in future releases of the product" (IIBA, 2013, p. 2013). Literature states that employees whose roles

require customer interaction should be given exposure to customers and access to market information (Baber, Upadhyay, & Kaurav, 2014). Individuals in these roles are seen as being front-line employees who are able to acquire and share new market related information with others in their organisation (Baber et al., 2014).

BAs can also be viewed as front-line team members who contribute their expertise by engaging with clients and project stakeholders (Hoda et al., 2013; IIBA, 2013). This study investigated how a BA's individual market/environment orientation contributes to a team's market/environment orientation capability. The BAs in this study were evaluated according to the activities that are expected of a market/environment-oriented team member. These activities include: the BA's ability to familiarise themselves with how an organisation functions, their level of engagement with information about changing customer and stakeholder demands, their discussion about these changes with other team members, their ability to respond promptly to change, and their time spent on implementing ideas related to changes (Hsu et al., 2019).

## Relationship Management

### (a) Definition

Relationship management abilities or inter-personal skills (Takpuie & Tanner, 2016) describe a person's capacity to take part in social communication and to interact with others (Florea & Stray, 2018).

### (b) Individual contribution to market/environment orientation

According to Schlosser and McNaughton (2007), individuals contribute to an organisation's market orientation by building relationships with others (Schlosser & McNaughton, 2007). It has been stressed that organisations that want to be market-oriented must urge their employees to develop an understanding of their customers through regular interaction with them (Schlosser & McNaughton, 2007).

### (c) BA's relationship management in ASD

Frequent social interaction has also been encouraged in ASD literature (Tripp, Riemenschneider, & Thatcher, 2016). ASD emphasises the need to create and

maintain relationships with customers as well as users, as they are the main provider of requirements (Nørbjerg, Nielsen, & Stouby Persson, 2017). In addition to acquiring a better understanding of stakeholders and their requirements, the ability to manage relationships can also give ASD teams access to external sources that are able to share knowledge and resources related to business and technical changes (Li et al., 2010). The IIBA emphasises that the agile BA must be able to maintain relationships with multiple stakeholders (IIBA, 2013). Forming the necessary relationships requires a BA to first conduct customer research and a stakeholder analysis, so that they can better understand the needs and preferences of each party (IIBA, 2013). The BA must then approach requirements from a holistic perspective, taking into consideration all involved stakeholders (IIBA, 2013). This study will evaluate how a BA's relationship management contributes to a team's market/environment orientation.

### Tacit knowledge sharing

#### (a) Definition

Cummings (as cited in Santos, Goldman, & De Souza, 2015, p. 1007) defines knowledge sharing as, "the provision of task information and know-how to a person, so that (s)he can collaborate with others to solve problems, develop new ideas, or implement policies or procedures". To better understand the BA's knowledge sharing, it is also necessary to further discuss the types of knowledge that can be shared. The writings of prominent knowledge management authors (Nonaka & Takeuchi, 1995; Polanyi, 1958) have contributed to creating this understanding by conceptualising knowledge as being tacit and explicit. Tacit knowledge is highly personal, contextual, and gained through experience (Duryan & Smyth, 2019; Hernaus, Cerne, Connelly, Poloski Vokic, & Škerlavaj, 2019). These characteristics make tacit knowledge difficult to formally document and share with others (Polanyi , 1958). Explicit knowledge, on the other hand, is formal knowledge that can be easily expressed or codified through written communication and shared with those who need it (Hu, Williams, Mason, & Found, 2019).

#### (b) Contribution to market/environment orientation

Dynamic capability literature has linked knowledge sharing to market orientation by discussing organisational learning, the ability to respond to customer requirements, and adaptability. It is argued that the knowledge sharing which takes place amongst

employees is necessary for organisational learning, which in turn improves an organisation's market sensitivity and its ability to innovate (Wang & Wang, 2012). Organisational learning enables individuals to understand their environment and find the most appropriate ways to respond to it (Zamir & Park, 2017). Knowledge sharing also allows organisations to quickly respond to customer requirements while achieving lower operational costs (Wang & Wang, 2012). It must be noted that tacit knowledge sharing in particular, has more of a significant effect on employee adaptability (Zamir & Park, 2017). Adaptability in this sense refers to the ability to effectively adjust to change, complete new tasks, and consider new ways of approaching work (Zamir & Park, 2017).

*Tacit knowledge in Software Development*

Agile Software Development encourages the use of minimal documentation in an attempt to create an environment which allows the team to be more adaptable, and to ensure that changes in the development process can be responded to (Patanakul & Rufo-McCarron, 2018). The minimal presence of documentation in ASD requires that team members to make use of each other's tacit knowledge (Fowler & Highsmith, 2001; Takpuie & Tanner, 2016).

Tacit knowledge in SD is seen in an individual's managerial knowledge (Takpuie & Tanner, 2016). Managerial knowledge is about planning, managing deadlines, leading projects, and interpersonal skills. These knowledge examples are considered to be tacit as they are acquired through experience (Takpuie & Tanner, 2016). Some other examples of tacit SD knowledge refer to systems knowledge, coding conventions, design practices, and creative ways to use tools (Chau, Maurer, & Melnik, 2003).

(c) BA's tacit knowledge sharing in ASD

So far, this subsection has identified tacit (interpersonal skills) knowledge types that specifically align with the BA's role. Another type of knowledge that tacit elements (Andreescu & Mircea, 2009) and which must be understood by the BA relates to business rules.

The issue of business rules is especially significant in this study as business rules are subject to change in response to the fast-paced changes which may occur in a SD environment (Andreescu & Mircea, 2009). Business rules can be challenging to

identify especially in cases where the explicit expression of these rules would not necessarily make them easier to understand. Business rules have the ability to be both explicit and tacit (Andreescu & Mircea, 2009). The tacit component of business rules is particularly critical as they contain knoweldge which clarifies the context in which the rules should be applied, espeically when there are no clear guidelines about the application of those rules (Andreescu & Mircea, 2009).

Knowledge sharing can take place through codification and personalisation strategies (Cohen and Olsen, 2015). According to Santos et al. (2015), the codification strategy can be used to make tacit knowledge explicit so that it can be shared through tools and repositories, while personalisation focuses on facilitating informal communication between people so that they can share their tacit knowledge while they interact (Santos et al., 2015). This is also known as socialisation (Nonaka & Takeuchi, 1995). ASD teams share their tacit knowledge through face-to-face interactions (Patanakul & Rufo-McCarron, 2018) and take a personalisation approach to knowledge sharing (Santos et al., 2015). In this context, tacit knowledge can be shared through; customer collaboration, release planning, iteration planning, sprint planning, daily stand ups, retrospectives, and pair programming (Razzak & Ahmed, 2014; Singh, Singh, &

The reviewed market/environment orientation literature stresses the importance of an individual's tacit knowledge sharing, and that ASD also relies on teams to share their tacit knowledge with one another. Given the emphasis placed on tacit knowledge sharing, this study focused on ways in which BAs share their tacit knowledge, and how their knowledge sharing contributes to an ASD team's market/environment orientation.

### 3.5.2 Business Analyst's Contribution to Coordination Capability

According to Hsu et al. (2012) individual team members can contribute to a team's coordination capability by building a task mental model and transactive memory (Hsu et al., 2012). Task mental model speaks to the 'know what to do and when' and the 'know who is doing what' components of implicit coordination. Transactive memory is related to the 'know who knows what' component. This study investigated how a BA's task mental model and transactive memory contribute to an ASD team's implicit coordination capability.

## Task Mental Model

### (a) Definition

A task mental model generally refers to a team's "shared representation" or understanding of a task (Kotha, George, & Srikanth, 2013, p. 17). From the literature reviewed, there are no studies that have described and discussed the nature of a BA's task mental model. In an effort to better understand how a BA's task mental model contributes to a team's coordination capability, this study takes into consideration the definition of an individual's task mental model from two ISD related studies.

The first study describes a developer's task mental model as how well he or she understands the components of a specific SD task and the relationships that exist between those components (Balijepally, Nerur, & Mahapatra, 2015). The second study insists that while it is important for one to understand the tasks which have been assigned to them, one's task mental model also includes awareness about which tasks are being completed by other team members (Hsu et al., 2012). For this study, a BA's tasks mental model describes how well they understand their tasks, how aware they are of tasks being performed by other team members, and how well they understand the relationship between their BA tasks and the tasks of others.

### (b) Individual contribution to coordination capability

Task mental models are critical to an ISD team's coordination capability because they allow team members to complete the tasks they have been assigned, while being aware and considerate of the tasks being performed by others (Hsu et al., 2012). The same can be said for ASD teams, as it is suggested that individuals in well-coordinated teams are conscious about the tasks they must complete, and they understand how their work affects the work of others (Lindsjørn et al., 2016).

### (c) The BA's task mental model in ASD

This study proposes that by taking part in synchronisation activities and making use of synchronisation artefacts, individual BAs are able to develop their task mental models. Sprint planning sessions and daily stand-up meetings are examples of synchronisation activities (Strode et al., 2012). A study by Stray et al. (2019) found that sprint planning meetings were critical for managing dependencies in

requirements. By attending these sessions, team members became mindful of the priorities and particulars related to each user story and task (Stray et al., 2019). Daily stand-ups have also been identified as a type of agile meeting that gives a team member an opportunity to become aware of 'who is doing what' (Strode et al., 2012), and sort out task allocation dependencies (Stray, 2019). Agile task boards are examples of synchronisation artefacts (Stray et al., 2019). The boards are visible to each team member and keep them informed about the tasks being completed by the rest of the team. Making use of the board allows an agile team to manage the dependencies between different tasks (Stray et al., 2019).

## Transactive Memory

### (a) Definition

In a teamwork context, a transactive memory can be described as how well a team member is aware of "who knows what" (Argote & Ren, 2012, p. 1376). An ISD team member's transactive memory is defined as the ability to identify and locate team members who possess particular knowledge (Hsu et al., 2012).

According to Kwahk and Park (2018), the idea of a transactive memory was introduced by a study (Wegner, 1987) which investigated the relationships formed between couples. The study conceptualised transactive memory as the memory systems that develop when couples or group members spend a considerable length of time interacting with one another. During this time, individuals become aware of each other's knowledge and make use of it (Kwahk and Park, 2018). This study, therefore, investigated how a BA's ability to identify and find the expertise they require promotes their team's coordination capability.

### (b) Individual contribution to coordination capability

Transactive memory is essential in teams, as the extent to which team expertise can be used and coordinated depends on whether individual members are aware of where to locate the required expertise (Hsu et al., 2012). Although the majority of the current literature focuses on transactive memory at an organisational level (Kwahk and Park, 2018), it is possible for individual team members to develop their own transactive memories (Hsu et al., 2012).

(c) BA's transactive memory in ASD

According to Kwahk and Park (2018), social interactions increase an individual's chance of being exposed to the expertise of others. Current transactive memory studies have also found that participating in frequent interactions regarding one's work has a significant impact on building one's transactive memory (Kwahk & Park, 2018). In ASD, social interaction can take place in meetings (Drury-Grogan, 2018). These meetings are also examples of synchronisation activities. Activities such as sprint planning meetings, team leader meetings, daily stand-ups, and retrospectives are used to manage expertise dependencies (Stray et al., 2019). Managing these dependencies requires teams to identify the roles and expertise possessed by others (Stray et al., 2019). This study proposes that exposure to synchronisation activities can help develop a BA's transactive memory.

## 3.6 SUMMARY

This chapter presented the DC theoretical lens and discussed its appropriateness in exploring how Business Analysts contribution to an ASD team's DC. While SD studies have identified six DC categories, this study chose to evaluate two of those categories: market/environment orientation and coordination. The research model illustrates these DC along with factors that may contribute to them. The following chapter will detail this study's research methodology.

# CHAPTER FOUR: RESEARCH METHODOLOGY

## 4.1 INTRODUCTION

The following chapter describes the research methodology which was followed for this study. The methodology identifies the research ontology, philosophy, purpose, philosophy, approach to theory, research strategy, and time horizon. Data collection and analysis is then discussed, followed by a description of the pilot study, validity and reliability, research instrument, and ethical considerations.

## 4.2 RESEARCH ONTOLOGY

The two main ontological stances are objectivism and subjectivism (Ragab & Arisha, 2018). Objectivists maintain that all social actors are exposed to one single reality and that one can gain objective knowledge without interacting with social actors (Lackéus, Lundqvist, & Middleton, 2016; Saunders, Lewis, & Adrian, 2012).

This study was conducted under the subjectivist stance which states that there are multiple realities which are created by social actors and that all knowledge is personal and depends on an individual's viewpoint (Lackéus, Lundqvist, & Middleton, 2016). A subjectivist viewpoint is necessary as the aim of this study is to understand each participant's point of view regarding their experiences with BAs.

## 4.3 RESEARCH PHILOSOPHY

There are five major research philosophies: positivism, critical realism, interpretivism, postmodernism and pragmatism (Saunders et al., 2012). While all of these philosophies are useful in carrying out research, Goldkuhl (2012, p. 6) states that, "the main character of IS research knowledge is an understanding through processes of interpretation". This study was therefore conducted using the interpretivism philosophy.

Interpretivism stresses the need to understand the lived experiences of individuals (Zeki & Güneyli, 2014) and requires research participants to voice their ideas and opinions about a given topic (Lee, 2012). Each participant will have a different belief system and worldview (Lee, 2012). Interpretivism acknowledges the subjective

meanings held by participants and aims to avoid their misrepresentation, so that they may be used to make sense of a research problem (Goldkuhl, 2012).

Interpretivism has also been identified as a suitable philosophy for studying Dynamic Capabilities (DC). This is supported by Nørbjerg, Nielsen, and Persson (2017) who, explain that, "an interpretive approach is particularly useful when addressing problems with a dominant social or cultural dimension, such as dynamic capabilities". An interpretivism philosophy will be followed, as this study aims to understand the topic from the subjective perspective of members in ASD teams, and answer the primary research question: how do Business Analysts contribute to the Dynamic Capabilities of Agile Software Development teams?

## 4.4 RESEARCH PURPOSE

A research purpose may be classified as being exploratory, descriptive, or explanatory (Snead & Wright, 2014). The purpose of this study is both exploratory and descriptive.

Exploratory research seeks to investigate an issue that has not been sufficiently addressed by existing literature (Saunders, Lewis, & Adrian, 2012). According to Potokri (2014), exploratory studies are used to gain insights and uncover details about a phenomenon.

The exploratory nature of this study will provide more insight into exactly how BAs contribute to an ASD team's ability to respond to changes in its environment. It is also important to note that research questions for exploratory studies usually begin by asking 'how' (Saunders et al., 2012). This is in line with this study's primary research question: how do Business Analysts contribute to the Dynamic Capabilities of Agile Software Development teams?

One of the most important characteristics of exploratory research is its ability to investigate a problem as well as determine the feasibility of conducting further studies about specific issues (Barth & Rieckmann, 2016). Conducting this research in an exploratory manner will, therefore, provide an opportunity for the wider research community to carry out further investigations.

The aim of descriptive research is to provide its readers with a detailed account of a phenomenon (Nassaji, 2015). Nassaji (2015, p. 129) explains that descriptive research, "…is more concerned with what rather than how or why something has

happened." This is in line with the secondary research questions of this study that aim to describe: (i) which factors allow Business Analysts to contribute to the Dynamic Capabilities of Agile Software Development teams (ii) which factors hinder Business Analysts from contributing to the Dynamic Capabilities of Agile Software Development teams. The descriptive nature of this study is evident in the manner in which the findings are presented in Chapter 6.

## 4.5 APPROACH TO THEORY

There are two contrasting approaches to theory: deductive and inductive (Saunders et al., 2012). For this study, theory will be approached in a deductive manner, as the DC theory will be used as a lens to explore how BAs affect the dynamic capabilities of agile teams. The research model that was illustrated in Chapter 3 will also be used to guide the data collection and analysis process. Cho (2014) explains that a deductive approach is appropriate when a study is being guided by existing theory and uses predefined codes during data analysis.

## 4.6 RESEARCH STRATEGY

The predominantly used research strategies in qualitative research include case study research, ethnography, action research, grounded theory and narrative research (Saunders et al., 2012). For the purposes of this study, a qualitative, single case study research strategy was used. Saunders et al. (2012) suggest that cases studies serve as a useful strategy when attempting to answer the 'how' questions, which are included in this study. Case studies also allow a researcher to gain a deeper understanding of the research problem in its real-life context (Yin, 2013).

The issue of BAs and their contributions to ASD teams' DC will, therefore, be able to be studied in that team's natural environment. As previously stated, the purpose of this study is exploratory. A case study strategy is therefore appropriate, as it is mainly used to explore a phenomenon of interest (Mills, Harrison, Franklin, & Birks, 2017). The following subsection will present the case study design. It will discuss the type of case study being conducted, the unit of analysis, and the sampling strategy.

### 4.6.1 Case study design

There are four types of case study designs: single-case (holistic), single-case (embedded), multiple-case (holistic) and multiple-case (embedded) (Yi, 2013). This

research applied a single case study design. According to Ishak and Baker (2014, p. 31), research which is conducted using a single case adopts a “holistic single-case design”.

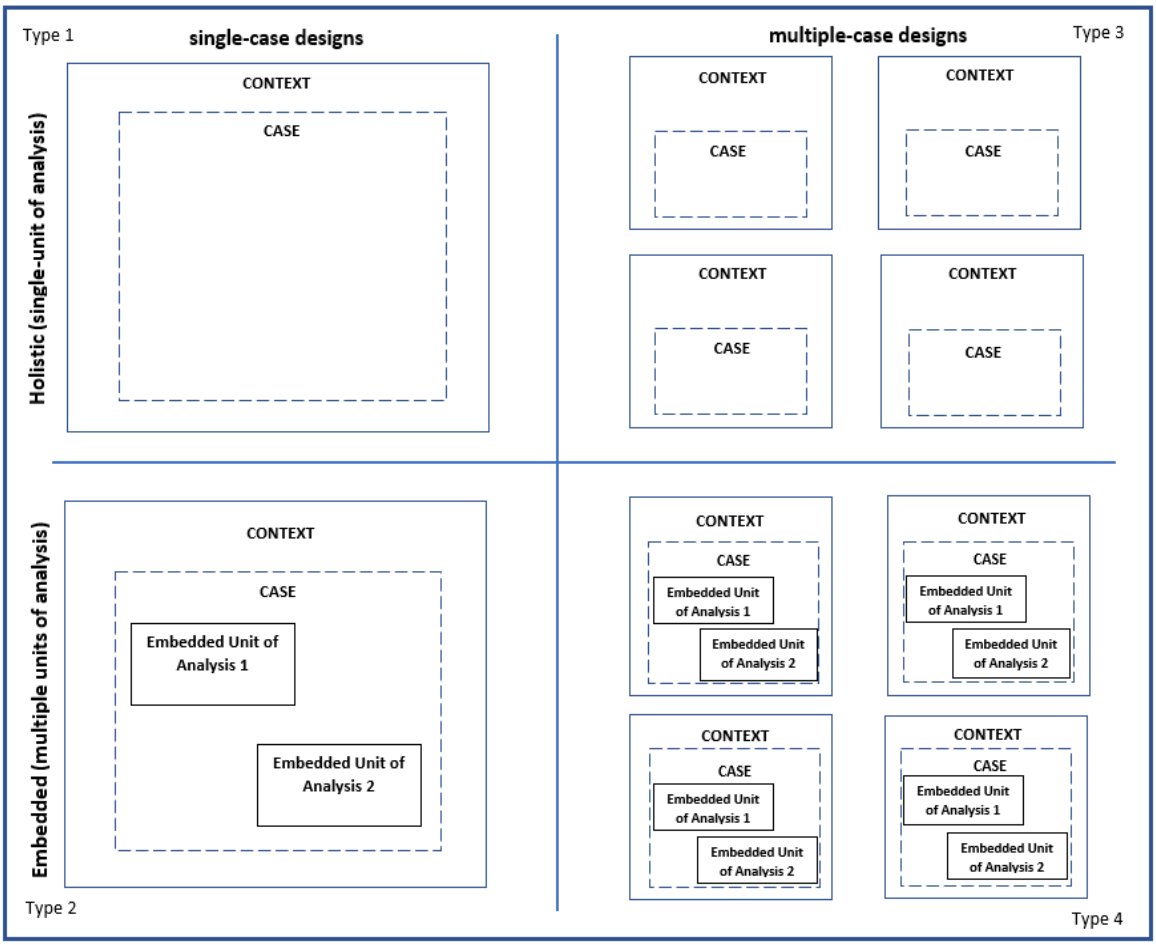


Figure 4-1: Basic Types of Designs for Case Studies (Yin, 2013, p. 91)

Figure 4-1 illustrates that no matter which design type is chosen, the researcher must give context to each studied case (Yin, 2013). The matrix also indicates that selecting a single or multiple case will result in different designs which include single or multiple units of analysis (Yin, 2013). This study will follow the single-case (holistic) design in which the case is the ASD team and the context will be the financial services industry.

### 4.6.2 Single Case Study Rationale

According to Yin (2013), single case study designs are usually appropriate under five single case rationales. The case must be critical, unusual, common, revelatory, or longitudinal. While Yin (2013) gives more focus to the five listed reasons, he also

argues that there may be others. For example, the time and resources available to a researcher have been highlighted as a significant reason to conduct a single rather than a multiple case study (Yin, 2013). Two of the six identified rationales apply to this study: a critical case and limited time and resources. The critical case rationale demands that the case be vital to the selected theory (Yin, 2013). The ASD team that was selected in this case operates in a rapidly changing environment, which is necessary for studying DC. This will be further discussed in the following 'target population and sampling strategy' section.

In discussing the second rationale, it must first be stressed that although the evidence of multiple cases is considered to be more convincing and that the study as a whole is viewed as being more robust (Yin, 2013), realistic expectations must be set before data are collected and analysed. Given the time constraints and resources available to a student researcher, it would have been overly ambitious to conduct this study as a multiple case. While this study is aware of and appreciates the advantages of conducting a multiple case study, it also takes heed of Yin's (2013, p.99) warning that, "the conduct of a multiple-case study can require extensive resources and time beyond the means of a single student or independent research investigator. Therefore, the decision to undertake multiple-case studies cannot be taken lightly".

It must be noted that single case studies have still proven to be useful in past research. Hanssen (2012) maintains that, given the limited time and resources available to a researcher, single cases provide an opportunity to investigate a topic in a more thorough manner than a multiple case study. A single case strategy is appropriate for this research in particular, as literature reveals that past studies have used single cases to investigate DC. These studies explain that a single case design will give the researcher an opportunity to gain a deeper understanding of DC and their complexities in a specific context (Caniato, Moretto, & Caridi, 2013; Sune & Gibb, 2015).

It must also be noted that one of the most common misunderstandings about single case study research is the inability to generalise its findings (Flyvbjerg, 2006). It has been argued that it is possible to generalise on the basis of a single case study that is considered to be 'critical' (Flyvbjerg, 2006). This is supported by Yin (2013, p.93), who suggests that critical single case studies can make a "significant contribution to

knowledge and theory building by confirming, challenging, or extending the theory. Such a study even can help to refocus future investigations in an entire field". This single case study is, therefore, able to be generalised to other ASD teams that operate in volatile business environments.

### 4.6.3 Unit of analysis

In case study research, the unit of analysis is the case itself (De Massis & Kotlar, 2014). The unit of analysis can also be defined as the 'what' which is being investigated (Ye & Rey, 2013), or the subject the researcher will report on at the end of the study (Osman & Tanner, 2017). This means that the unit of analysis was the ASD team, as the study will report on how the team's DC is contributed to by BAs.

### 4.6.4 Target population and Sampling strategy

The target population consists of ASD teams. In case study research, sampling refers to selecting the appropriate cases and data sources. Sampling, therefore, takes place at the case level and the data source level, where data sources must be selected from the case (Gentles, Charles, Ploeg, & McKibbon, 2015). In terms of sampling techniques, quantitative research employs probability sampling while qualitative studies select cases and data sources by using non-probability sampling (Ishak & Bakar, 2014). The most commonly used non-probability sampling methods include convenience, purposive, quota and snowball sampling (Acharya, Prakash, Saxena, & Nigam, 2013). According to Ishak and Bakar (2014), while techniques such as convenience sampling are easier to use, they may result in ineffective samples. Ishak and Bakar (2014 recommend that qualitative researchers should employ purposive sampling and add that a purposive strategy is appropriate for case study research where specific types of cases are necessary for the investigation.

While this study also made use of convenience sampling, the primary sampling strategy was purposive. The case was conveniently selected as it was easily accessible and located in the researcher's city. The purposive sampling strategy ensured that ASD team was chosen based on its ability to answer the research questions (Saunders et al., 2012). The case had to satisfy the following criteria: (i) be an ASD team that operates in a volatile business environment; (ii) be an ASD team that has dedicated BA roles. In line with the theory of DC (Chapter 3), the first criterion was to ensure that DC were studied in the appropriate environment. The case that was selected for

this study operates in the financial services industry, which has been described as being subject to rapid changes (Zhao, Tsai, & Wang, 2019). The second criterion addresses the fact that there are some ASD methodologies which do not explicitly advocate for the role of the BA in an ASD team (Chapter 2). This study was only interested ASD teams that have dedicated BA roles.

## 4.7 TIME HORIZON

Research can be classified as being cross-sectional or longitudinal (Groth & Nielsen, 2015). Cross-sectional studies are used to investigate an issue which takes place at a specific time (Saunders et al., 2012), while longitudinal studies are interested in how an issue develops over time (Groth & Nielsen, 2015). This study was crosssectional as the data collection process took place in March of 2019 and lasted four months. The choice to conduct a cross-sectional study was informed by the limited time available to the researcher.

## 4.8 DATA COLLECTION

Qualitative data was collected through; face-to-face, semi-structured interviews; a focus group; non-participant observation; documentation; and physical artefacts. The individual and group interviews served as the primary sources of data and were supplemented by the four other data sources. Snowball sampling was used during the interviews where the researcher would conclude the interview by asking: are there any other people you think I should speak to? This encouraged the participants to identify members of the development or project team that could provide more insight to the research problem. The Case Description Chapter describes the profile of the participants and lists their involvement in the study.

**One-on-one, face-to-face, semi-structured interviews**

Ten audio-recorded interviews were held with ASD project team members and lasted for approximately 45 minutes. The audio recordings were then transcribed into a word-processing file (Microsoft Word) by a professional transcription company. The individual interviews allowed each team member to anonymously voice their opinions on certain topics of discussion which may be sensitive (Shelton,
Smith, & Mort, 2014). The semi-structured interview approach allowed for predefined as well as follow up questions to be asked by the researcher (Saunders et

al., 2012). Along with the notes that were made while during the interview, a research diary (Appendix A) was used after the interview to reflect upon the answers provided by the participants.

**Semi-structured group interview**

According to Hatani (2015), it is important to note the difference between focus groups and group interviews. In focus groups, the researcher takes on the role of a moderator who facilitates the interaction between participants. Group Interviews, on the other hand, require the interviewer to allow the participants to answer questions one after another (Hatani, 2015). The session that took place with the six developers resembled more of a group interview than it did a focus group. The researcher posed a question and invited each participant to share their opinion. While some answers given by team members led to discussions amongst the whole group, attention was later brought back to the individual respondent. This enabled each developer to share their views while allowing for some interaction between the participants. Notes were made during the interview, and the session was later reflected upon using a research diary. The interview was then audio-recorded and transcribed. Before the group interview, two developers took part in one-on-one interviews which allowed the researcher to highlight issues that had to be further discussed in the group interview. After the group interview, one of the developers was interviewed individually in order to clarify concepts that were discussed in the group interview, and corroborate findings that were revealed during the ongoing analysis period.

**Non-participant observations**

Non-participant observations were mainly used to gain insight into how the ASD team coordinates their tasks and how BAs contribute to the ASD team's coordination capability. According to Shelton et al. (p. 274), "observation aims to mitigate one of the primary limitations of interview data; that what people say and what people do may be different". In line with literature which states that ASD teams are able to coordinate their work by taking part in synchronisation activities (agile ceremonies) (Stray et al., 2019), the researcher asked to attend the team's agile ceremonies and was given permission to observe two types of these activities: product backlog refinement and sprint planning.

The team held these two meetings in one combined session. The researcher attended the session through a Skype call. The chat function in Skype was used to ask the scrum master any additional questions related to the ongoing meeting. Notes were made throughout the session, and the audio of the recorded meeting was revisited during analysis. The observations were, therefore, helpful in comparing the views expressed in the interviews to what was observed in the meeting.

**Physical artefacts**

Literature reveals that ASD teams coordinate their work by making use of synchronisation artefacts such as task boards (Stray et al., 2019). A photo of the ASD team's synchronisation artefact (scrum board) was taken and is included in the Findings and Analysis Chapter. This was the only artefact that could be made available to the researcher. The contents of the scrum board were explained by the scrum master. The scrum board allowed the researcher to understand how the BA's use of synchronisation artefacts contributes to the ASD team's coordination capability.

**Confidential project team documentation**

The researcher asked the participants if there were any documents that she could review and was given access to two confidential documents: Fit-Gap Analysis and a PowerPoint presentation. The Fit-Gap analysis assisted in making sense of the 'gaps' that are referred to by the participants throughout the study. The PowerPoint presentation allowed the researcher to form a better understanding of each project team members' roles and responsibilities.

## 4.9 DATA ANALYSIS

Qualitative analysis can be difficult for researchers, as it requires them to develop a rich understanding of a vast amount of data (Osman & Tanner, 2017). To alleviate the challenges associated with qualitative data analysis, Osman and Tanner (2017) suggest the use of Braun and Clarke's (2006) thematic analysis approach. Figure 4-2 illustrates a thematic analysis model (Osman & Tanner, 2017) which is based on the Braun and Clarke (2006) thematic analysis technique. In addition to using the thematic analysis model, the data was also analysed in a deductive manner. The

research model was used to address the research questions related to the BAs' contribution to ASD team DC.

While Figure 4-2 presents the six phases of thematic analysis, it must be noted that the analysis process was iterative.

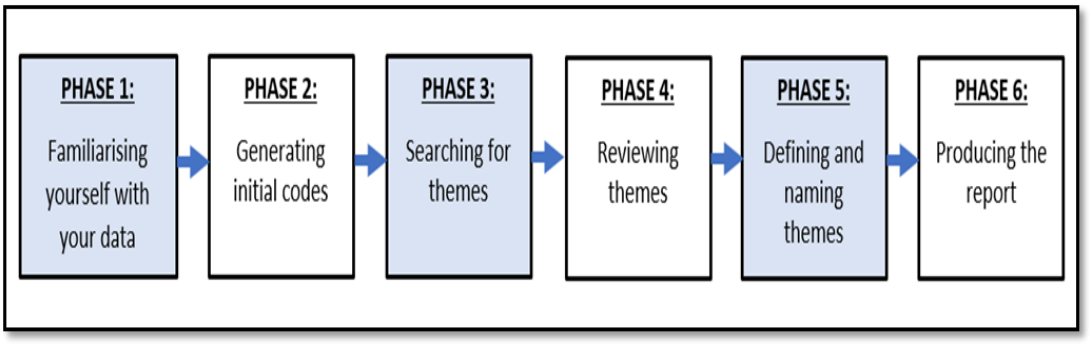


Figure 4-2: Phases of Thematic Analysis, adapted from Osman and Tanner (2017)

**Familiarising yourself with your data**

Due to the limited time available to conduct the study, the interview data was transcribed by a professional transcription services company. The researcher then read through each transcribed interview whilst listening to the interview audio. This allowed for corrections to be made and for aliases to be added to the responses. The comment feature in Microsoft Word was used to make notes about the respondents' answers. The researcher's notes and research diary were also reviewed while listening to the audio and reading through the transcripts.

**Generating Initial codes**

The initial codes were generated as guided by the research model. Examples of these codes were individual market/environment orientation, tacit knowledge sharing, and relationship management.

**Searching for themes**

The codes were used to produce themes that described how BAs contributed to a particular DC, as well as identify factors that make it difficult for BAs to contribute to that DC.

**Reviewing, defining, and naming themes**

The themes were assessed to ensure that they represented the coded quotes. Once the themes were defined and named, they were presented to the researcher's supervisor who provided feedback about the clarity and accuracy of the themes.

**Producing the report**

The findings were further analysed and compiled into a report (Chapter 6) which included the most relevant extracts that would assist in answering the research questions. In addition to including the quotes from the interview participants, the report also incorporates the secondary data sources which corroborate the views expressed by the participants.

In addition, theoretical saturation was achieved by adequately detailing each of the factors that affect the DC constructs. Data saturation was achieved after conducting 10 interviews and obtaining additional data sources.

## 4.10 PILOT STUDY

A pilot study was conducted before the main study took place. A group interview was conducted with two senior BAS who respectively have 24 and 17 years of experience. The pilot study proved to be quite useful, as the participants were employees of the financial services organisation that is described in the case description chapter.

This allowed the researcher to build an initial understanding of the environment of the ASD teams that work within that organisation, and gain insight into the experiences of BAs in financial service organisations. It also allowed for the interview questions to be revised and if necessary, new questions to be added in an effort to collect high-quality data (Takpuie & Tanner, 2016). The pilot study was cross-sectional as it took place in November of 2018. The analysed data from the pilot was not used in the final case study, as the participants were members of different teams.

## 4.11 VALIDITY AND RELIABILITY

Concerns of and reliability are crucial to all qualitative studies (Noble & Smith, 2015). Validity is defined as the extent to which a study accurately expresses the opinions of its participants (Yilmaz & O'Connor, 2012), while reliability refers to the consistency of the study (Leung, 2015). While there is no unanimously agreed upon criteria for evaluating the validity and reliability of qualitative studies (Noble & Smith,

2015), there are several strategies that have been suggested to ensure the credibility of a study's findings.

This study made use of the following verification strategies: selecting the appropriate sample (Morse, Barrett, Mayan, Olson, & Spiers, 2002), using 'rich' and 'thick' verbatim quotes from participants (Noble & Smith, 2015), consulting multiple data sources (Buchan et al., 2017), reflexivity (Noble & Smith, 2015), developing a case study protocol (Yin, 2013). Table 4-1 details how each of the verification strategies were applied to this study.

Table 4-1: Verification Strategies Used to Ensure Validity and Reliability

| Verification Strategy | Application |
|---|---|
| **Appropriate sample** | Purposive sampling ensured that the case chose for this study would be able to answer the research questions. |
| **Using 'rich' and 'thick' verbatim quotes** | The use of rich and thick verbatim quotes allowed for study to maintain the integrity of each participant's experience. |
| **Multiple data sources (Triangulation)** | This study made use of five data sources to corroborate findings: one-on-one, semi-structured interviews; semi-structured group interviews; non-participant observations; physical artefacts, and project team documents. |
| **Reflexivity** | A research diary was used to keep note of interesting points made throughout the study. Appendix A illustrates the template that was used to guide the researcher's reflection process. The reflection diary also assisted in noting the interview questions that should be amended and topics that should be focused on in future interviews. |

| | |
|---|---|
| **Case study protocol** | Yin (2013) recommends that case study protocols should not only be developed for multiple-case studies, as researchers conducting single cases can also benefit from the protocol. Appendix B increases the reliability of the case study by guiding the researcher on how to collect the required data. |

## 4.12 RESEARCH INSTRUMENTS

Some of the interview questions were specific to the roles being interviewed. While all the participants were required to answer questions related to the BAs' contribution to the ASD team's DC, the opening questions asked to each participant may have differed according to their role. For example, the first interview conducted with the scrum master was mainly aimed at understanding: the ASD team's operating environment, the methodologies used by the team, the project the team was currently working on, and the role of the BA within the team. Thereafter, the scrum master was asked questions about the BAs' contribution to the team's DC.

This study, therefore, made use of five different interview schedules which were compiled for conducting: a one-on-one interview with the scrum master, a one-onone interview with each BA, a one-on-one interview with each of the three developers, a group interview with the developers, and a one-on-one interview with general project team members (business specialist and external tester).

Appendices C-F present the interview questions that were presented to each project team role. Each interview schedule is generally divided into the following sections: opening questions where the participants introduce themselves; questions related to BAs' contributions and difficulties in contributing to each DC; and closings questions where participants were asked about documentation and participant recommendations.

## 4.13 ETHICS AND CONFIDENTIALITY

The issue of research ethics and confidentiality was of utmost importance to this study. To ensure that all possible ethical matters were identified and properly

addressed, the researcher applied for ethics approval from the Information Systems department as well as the Commerce Faculty. The data collection process only commenced once ethics approval was granted. Consent to perform the study was granted by each of the participants and their manager. A template of the forms is included (Appendix G and I). The consent form provided information about the purpose of the study.

The organisation's management and the study's participants must understand and agree to take part by signing the consent form. The researcher considered that the participants of this study would be answering questions that relate to their team members. The study, therefore, ensured that the details discussed in the interviews were not shared with any other participants. The data collected from this study was not misused by the researcher in any way and was reserved for the purpose of this study. To protect the anonymity of all involved, throughout the study, alias' were used to conceal the identity of the selected organisations and its employees (Saunders et al., 2012; Takpuie & Tanner, 2016).To further protect the anonymity of the organisations involved in this study, the confidential documents provided by the project team are not included in the list of appendices.

## 4.14 SUMMARY

In summary, Table 4-2 provides a synopsis of this study's research methodology.

Table 4-2: Research Methodology Summary

| | |
|---|---|
| **Research Ontology** | Subjectivism |
| **Research Philosophy** | Interpretivism |
| **Research Purpose** | Exploratory |
| **Approach to Theory** | Deductive |
| **Research Strategy** | Qualitative, single case study |
| **Time Horizon** | Cross-sectional |
| **Data Collection** | One-on-one and group semi-structured interviews, nonparticipant observations, physical artefacts, documents |
| **Data Analysis** | Thematic |
| **Validity and Reliability** | Verification strategies |

The next chapter provides the Case Description of this single case study.

# CHAPTER FIVE: CASE STUDY DESCRIPTION

## 5.1 INTRODUCTION

The following chapter provides a description of the case (ASD team) selected for this study. The case is made up of members from two organisations: a financial services group (pseudonym: O1) and a software engineering company (pseudonym: O2). O1 is the client/customer and O2 is the software engineering service provider.

While O1 has a dedicated IT department, it outsources the development aspects of its Group Risk (GR) system to O2. System development projects related to GR are therefore made up of O2 and O1 employees who come together to form one Scrum project team. This study was conducted after the completion of O1's GR system migration project and during the period in which new functionality was being added to the migrated system. The participants in this study worked on both of these projects.

It must be noted that the focal point of this study is the *development* team, who are a part of the larger Scrum project team. The development team consists of two BAs from O1 as well as one BA and six developers from O2.

To ensure that the research findings are understood in a holistic manner, contextual information about each organisation is provided, along with details about the GR system projects, the development team, roles of various team members, and the role of the BA in particular.

## 5.2 BACKGROUND OF ORGANISATIONS

The following section describes the two organisations that make up this case. Each organisation is described in terms of its operating period, global presence, branch locations, services provided, and role in the GR system project team. The roles which each organisation has assigned to the Scrum project team are also indicated.

### 5.2.1 Organisation 1 (O1): The Customer

O1 is one of South Arica's largest financial services groups and is listed on the Johannesburg Stock Exchange (JSE) as well as the Namibian Stock Exchange (NSX). The group was founded over a century ago and operates on both a local and global scale. O1's head office is located in the Western Cape, South Africa and has several branches in each South African province and around the world. O1 offers financial services to individuals, businesses, and organisations which include but are not limited to insurance, investments, and financial planning. This case study focused on the head office branch as it has employees who are responsible for providing technological solutions to the O1 group.

More specifically, this study's O1 participants are members of the Employee Benefits (EB) insurance division and are responsible for providing a range of riskrelated products and services (benefits) to their corporate clients. Some of the products and services offered by the EB insurance division deal with retirement savings, life insurance, disability income protection, and accident insurance.

O1 assigned 13 of its employees to the Scrum project team, which included a product owner, technical architect, five business specialists, two BAs, two testers, and two customer service managers. Four O1 team members were able to participate in this study: two BAs, one business specialist, and one tester. Table 5-1 lists each participant's project team role, assigned participant pseudonym, and their time on the project team.

Table 5-1: Scrum Project Team Role of O1 Participants

| Project Team Role | Pseudonym | Time on Project Team | Study Participation |
|---|---|---|---|
| **Business Analyst (Development Team)** | BA1 | 3 years | Individual Interview |
| | BA2 | 3 years | Individual Interview |
| **Business Specialist** | BS1 | 5 years | Individual Interview |
| **Tester** | TES1 | 3 years | Individual Interview |

### 5.2.3 Organisation 2 (O2): The Service Provider

O2 is a leading South African software engineering company which specialises in delivering administration systems to financial service organisations. O2's administration systems allow customers such as O1 to efficiently collect contributions and make benefit payments to their clients. O2 offers its products as well as its development services to help customers develop bespoke administration software. The company has been in operation for over 29 years and has approximately 20 local as well as international clients. O2 is currently headquartered in Gauteng (South African province) and has branches in the Western Cape (South African province).

The Western Cape branch assists O1 in developing and maintaining their GR system. The branch is home to employees who are members of the combined O1 and O2 project team. The employees from O2 work from their customer's (O1) offices from Monday to Thursday, and work from their own offices on Fridays. Some of these employees may also be asked to do overtime work for some of O2's other clients. The project team members from O2 include a BA, development manager, scrum master, and six developers. Of the nine O2 project team members, eight were available to be interviewed. Table 5-2 lists the roles taken on by each O2 participant, their assigned pseudonym, time on the team, and their involvement in this study.

Table 5-2: Scrum Project Team Role of O2 Participants

| Project Team Role | Pseudonym | Time on Project Team | Study Participation |
|---|---|---|---|
| **Technical Business Analyst (Development Team)** | BA3 | 2 years 9 months | Individual Interview |
| **Scrum Master** | SM1 | 1 year 6 months | Individual Interview |
| **Software Developer (Development Team)** | DEV1 | 1 year 3 months | Individual & Group Interview |
| | DEV2 | 6 years | Individual & Group Interview |
| | DEV3 | 8 months | Individual & Group Interview |
| | DEV4 | 7 years | Group Interview |
| | DEV5 | 4 years | Group Interview |

| | | | |
|---|---|---|---|
| | DEV6 | 2 years | Group Interview |
| | | | |

## 5.3 PROJECT DETAILS

As previously stated, the data for this study was collected after the completion of O1's GR system migration project, and during the period in which new functionality was being added onto the migrated system. In terms of the system migration project, O1 had expressed that their previous system was slow in speed and did not allow their insurance agents to capture business tasks quickly enough. The development team, therefore, created a new and faster GR system and migrated the existing insurance schemes from the old GR system onto the new one. The system migration project was initiated in 2011 and was estimated to take 8 months to build.

The project's complexity was, however, underestimated, as it was only completed at the end of 2018. The most recent project, which is made up of the same members of the system migration project, was initiated in 2019 and is estimated to 3 months. The goal of the project is to introduce new functionality for managing O 1's insurance schemes. Table 5-3 describes the roles of the Scrum project team members responsible for working on the GR system. Table 5-3 only includes the roles of project team members who participated in this study. The following section provides further detail about the roles within the development team.

Table 5-3: Description of Project Team Roles

| Project Team Role | Description |
|---|---|
| **Development Team** | This team collaborates with the rest of the project team and is responsible for completing tasks that are related to developing and delivering O1's GR system. |
| **Scrum Master** | The scrum master ensures that the Agile principles are to by the project team. He is also responsible for removing any impediments that prevent the development team from completing their work. |

| | |
|---|---|
| **Business Specialist** | The business specialists are highly experienced GR system users. They are knowledgeable about O1's business operations and have each been assigned a particular O1 process area to take ownership of. A business specialist may, for example, be referred to as a 'member management business specialist'. They assist the product owner by advising them on business requirements which involve their assigned process. They also typically assist in carrying out testing tasks. |
| **Tester** | The tester is not a formal member of the project team, but it was expressed that they have assisted in the testing of the GR system. |

## 5.4 DEVELOPMENT TEAM

This section provides more detail about the development team. First, the team's composition and development methodology are described, which is followed by an explanation of the role of the BA during each scrum project phase.

### 5.4.1 Team Composition and Development Methodology

The development team is made up of three BAs and six developers. Table 5-4 lists each development team role and describes what is expected of them.

Table 5-4: Description of Development Team Roles

| Development Team Role | Description |
|---|---|
| **Business Analyst** | The business analysts gather and document business requirements that are supplied by the product owner and other stakeholders in O1. The requirements are then relayed to the development team. The business analysts assist the developers in understanding the business requirements throughout the duration of the project. The absence of a dedicated tester in the development team requires the business analysts to perform testing tasks. |
| **Technical Business Analyst** | In addition to the activities that must be carried out by the standard business analyst role, the technical business analyst must also collaborate with the developers and use the supplied requirements to prepare a technical specification document and a solution design. |

| | |
|---|---|
| **Software developer** | The developers write code according to the business requirements. The developers interact with the business analyst to seek clarity about the requirements. Some developers are also 'functional owners' who are specialists within their functional areas and assist in putting together technical specification documents and solution designs. Functional owners also perform code reviews and provide insight about new functionality that will impact their area of specialisation. |

Figure 5-1 summarises how the BAs, including the technical BAs, act as liaisons between the customer organisation and the developers during GR system projects.

The process shown in Figure 5-1 highlights that requirement clarification and refinement is an iterative process that takes place not only at the beginning of a project, but throughout the project period.

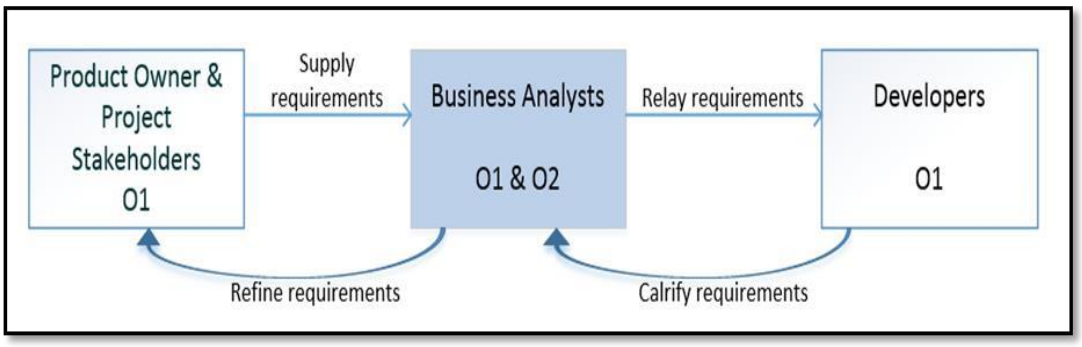


Figure 5-2: The BA as a liaison between the customer and the developers

The development team follows the Scrum methodology and has two-week sprint cycles. The team organises its work by taking part in the following scrum ceremonies: product backlog refinement, spring planning meetings, daily stand-ups, sprint reviews, and sprint retrospectives.

### 5.4.2 Business Analyst Role during Scrum Phases

While Table 5-4 and Figure 5-1 provide a brief overview of how the BAs communicate and clarify the business requirements to the development team, the following section provides more detail about the role of BAs in each of the three scrum phases: pre-game, main-game, and post-game.

**Pregame**

During the pregame phase, the project team takes places in preliminary product backlog refinement (refinement) and sprint planning meetings. The project team holds these synchronisation activities in one combined session, every two weeks. The session ensures that the epics (large user stories or work items) which are defined by the product owner are decomposed into smaller-sized, estimated, and prioritised user stories that will be implemented in the upcoming sprint. Before the session commences, BAs must gather requirements from the product owner and other project stakeholders and put together a Fit-Gap document. The document explains what is required for the upcoming epic by presenting and outlining several gaps (high-level user stories) that should be implemented in the GR system. The FitGap documents are distributed to each project team member before the session.

The project team is expected to read through and become familiar with the document before attending the meeting. The refinement portion of the meeting is dedicated to unpacking each of the high-level user stories in the Fit-Gap document. During the session, a BA will read out the gap, explain it to the project team, and answer any questions they may have. The BA may also make use of a refinement board (synchronisation artefact) to explain the gaps. The technical BA is also expected work with the developers and put together the technical specification document and solution design before the meeting. The following sprint planning session gives the development team an opportunity to discuss how they will coordinate and deliver their tasks in the upcoming sprint.

**Main game**

During the sprints, the BAs are expected to carry out testing tasks, and assist the development team in understanding the business requirements. This requires the BAs to liaise with a range of stakeholders who are able to provide the development team with clarity about the requirements.

**Post-game**

Once the project is complete, the BAs put together training manuals that are handed over to the training department at O1. The department uses the manuals to teach the system users about the new or updated functionality in the GR system.

## 5.5 SUMMARY

This chapter described the case that was chosen for this study. It detailed the two organisations that make up both the development and the project team and described each team member's role. The role of the BAs throughout Scrum projects was explained, which will ensure that the findings are fully understood in the next chapter.

# CHAPTER SIX: FINDINGS AND ANALYSIS

## 6.1 INTRODUCTION

This chapter provides a detailed account of the factors which allow as well as hinder Business Analysts' ability to contribute to the Dynamic Capabilities (DC) of Agile Software Development (ASD) teams. Section 6.2 presents and describes the factors related to the market/environment DC, while Section 6.3 presents and describes the factors related to the coordination DC. Finally, the chapter is summarised in Section 6.4.

## 6.2 MARKET/ENVIRONMENT ORIENTATION DYNAMIC CAPABILITY

The following section presents and describes the factors which allow BAs to contribute to a development team's market/environment orientation DC, as well as the factors which hinder the BA from contributing. As previously mentioned, market/environment orientation refers to a development team's ability to recognise and understand environmental changes which may affect teamwork (Hsu et al., 2012). The factors are described in terms of the BA's individual market/environment orientation, tacit knowledge sharing, and relationship management.

### 6.2.1 Individual market/environment orientation

Findings indicate that there are individual market/environment orientation factors which both allow and hinder a BA's ability to contribute to a development team's market/environment orientation DC. The BAs contribute to team market/environment orientation by performing a range of activities which can be classified as three factors: seeking, acquiring, and sharing information related to the business operations; discussing changes in stakeholder needs with stakeholders and the development team; and promptly sharing insights about requirement changes and assisting team members. Results also reveal that the following factors hinder a BA's ability to promote team market/environment orientation: their lack of product knowledge; lack of system knowledge, industry knowledge, business rules knowledge; and miscommunication with project stakeholders. These factors are described in the following subsections.

### *Contributing factors*

The following subsection describes the individual market/environment orientation factors which allow BAs to contribute to a development team's market/environment orientation.

Seeking, acquiring, and sharing information related to the business operations

> *BAs promote a development team's market/environment orientation DC by acting as sources of information related to business operations. Sharing this type of information with the team allows the development team to become familiar with their environment, which is necessary for identifying, understanding, and responding to the changes which may take place in it. For information seeking and acquisition purposes, findings also reveal that close collaboration between BAs, product owners, and business specialists is essential. This collaboration provides BAs with easy access to information about how the business functions, its product offerings, and changes in the business. The BA is then able to share this information with the development team, as it may affect the team's development efforts. Operational related information also includes details about business needs which BAs share with the team through documentation.*

Close collaboration between BAs and business specialists is necessary to promote team's dynamic capabilities. BS1 highlighted how important it is for BAs to approach and engage business specialists about business operations, so that the BAs can communicate that information to the development team. Due to the development team's system focus, they tend to forget about their operating environment. The BAs contribute to the development team's market/environment orientation by sharing the information that they acquire from collaborating with business specialists.

> *"After speaking to us and knowing how the business operates, they know how to explain it to the developers especially, so that the developers can have an understanding because the developers are very system orientated but, and they sometimes tend to forget that there's actually a production team out there who sits with the actual job to be done." (BS1*)

This was supported by the external tester. She shared that BAs' close collaboration with business specialists allows them to collect and share information about business operations which may affect the team's development efforts.

In order to understand how the business operates, the development team must also understand the insurance products which are offered by the business. BAs acquire product information by reading product documentation and share that information with the development team. BA1 expressed that reading documentation is particularly necessary when the business introduces a new product to the market. Engaging with the product documentation helps a BA to develop their understanding of the products offered by O1 and confidently answer product related questions posed by other team members. Sharing product related information with the development team allows the BAs to guide and support the team in building the GR system.

In terms of information related to business needs, BA1 and BA2 explained that it is acquired when they ask the product owner questions which require her to identify and justify the business' needs. The business needs are then shared with the rest of the team through a Fit-Gap document which is discussed during refinement sessions.

Discussing changes in stakeholder needs with stakeholders and the development team

> *BAs add to a development team's market/environment orientation* DC *by acting as proactive liaisons that engage with product owners and other stakeholders about their changing needs and communicate them to the development team. A BA's ability to interpret and communicate these changes assists the development team in understanding the nature of the changes and allows them to design and implement solutions that will appropriately respond to those changes. While agile methodologies offer ceremonies that can be used to transfer knowledge between different parties, the BA's ability to immerse themselves in the business' needs and proactively engage with the project stakeholders plays a significant role in ensuring that the development team is able to understand and respond to changes in their environment.*

Similar to the approach taken when identifying initial needs, both BA1 and BA2 emphasised the importance of having discussions with the product owner about the purpose of a requirement change. An inability to understand the purpose of a change affects how well the BA can assist the development team in interpreting and implementing the change. This was confirmed by DEV3 who expressed that the BA's discussions with the product owner is necessary when the requested changes do not conform with the business standards, or when the developers are not confident about how they will implement the changes given the current state of the system. Under those circumstances, the developers ask the BAs to probe the product owner about certain components of the change and provide them with more clarity.

> *"I'll speak to business that's the first thing and as I said, you always ask, 'what do you want? Why do you want it?' Because if you don't find why they want it, if they don't have a reason put it that way, why you need it, it's a problem kind of." (BA1)*

Although the agile space encourages developers and customers to interact directly, the BAs still play a major role in clarifying requirement changes for the development team. Due to the frequent miscommunication that takes place, the development team expects the BAs to act as liaisons between the product owner and the developers. BAs contribute to the development team's ability to respond to the requirement changes by ensuring that the team has a rich understanding of the changes.

> *"Yes, when there are changes in the plans, I guess the BA's help us understand like what the business is wanting exactly because there is often a breakdown in communication between developers and the business when they interact directly and also the BA's, like if we are changing something, the BA's will help us and keep us in line with what the business rules want." (DEV1)*

Participants revealed that BAs discuss changes in business needs and requirements both formally and informally. The BAs and developers discuss changes during sprint planning sessions and together, the team determines how the changes will be implemented.

> *"…we would have planning sessions and discuss how we need to tackle the changes ahead of us." (DEV6)*

*"Once I have a good understanding of what is required and the information that I get from them then need to go back to my team… and relay to them what the requirements are and together we will try to come up with a solution design, basically; how we are actually going to meet the requirements, what changes need to happen in the system, what changes need to happen in the database…" (BA3)*

In terms of engagement with other project stakeholders, BA2 shared that while O1 sends out general communications about changes made in the organisation, his primary sources of information regarding stakeholder changes are the stakeholder themselves. BA2 demonstrates that it is critical for BAs to understand the importance of preparing for upcoming sprints and proactively identify and interact with the appropriate stakeholders ahead of time. For example, BA2 made sure to get clarification from representatives about a change made by the legal department which must be reflected in the system. It is important that this kind of clarity is provided before a BA enters a sprint and is presented with questions from the team. Directly discussing changes with project stakeholders enhances a BA's understanding of the change and allows them to provide understanding to other team members.

*"So it's a matter of getting their understanding of it, which at times is difficult, so you need to, you know, cast your net wide and try and find that. If not, going back to them, I don't have problems going back to people, so until I understand I have to, otherwise it's pointless going into the agile, into a sprint and there are questions and I can't answer. So I have to be on it." (BA2)*

<u>Promptly sharing insights about requirement changes and assisting team members</u>

*BAs can contribute to a development team's market/environment orientation DC by quickly sharing insights* about requirement changes and *assisting the team by performing tasks extend beyond their defined roles. By quickly communicating changes made to requirements, identifying members who lack understanding of the changes, and assisting members* in *completing testing tasks related to those changes, BAs contribute to a development team's ability to interpret and respond to the changes.*

BA2 shared that he promptly responds to changes by sending out clear communications to the team. This includes writing up a one-page document detailing

the change, updating system tasks on Jira, and providing further clarity via email. BS1 noted how quick the BAs are to identify a team member who does not fully understand a change that must be implemented. The BAs for instance, detail to the assisting testers how a change should be carried out.

> *"Well, the BAs will see pretty quickly if someone is not, maybe not understanding everything one hundred percent or they don't know how to test something, then they will come and say, 'look, can I just please explain to you again?' and 'this is how you must test.'" (BS1)*

TES1 agreed with the sentiments shared by BA2 and BS1. She also expressed that in addition to explaining the changes, BAs assist the testers by taking on testing tasks, such as running tests and writing up test cases, which are outside of their role. This not only enhances the development team's ability to implement the change faster, but to do so without much difficulty.

> *"Sometimes they say 'look, let us first see if this is okay before we … we actually give it to you'. There were incidents like that and that actually helped you know when they … they said 'okay so this is exactly in terms of the change. Okay, now testers you see if you can break it further or you know tell us what's wrong with it'. So that actually helped smooth this whole change process." (TES1)*

### *Hindering factors*

Findings reveal that there are six factors which obstruct a BA's ability to contribute to development team's market/environment orientation DC. These factors include: a lack of product knowledge, technical knowledge, industry knowledge, business rules knowledge; and miscommunication with project stakeholders. The following subsection describes these factors in more detail.

Lack of product knowledge

> *BAs who have insufficient product related knowledge experience difficulty in contributing to a development team's market/environment orientation DC. BAs' gaps in product knowledge make it challenging for the team development team to understand the product they have to complete tasks for. This lack of knowledge also reduces the team's sense of efficiency and morale.*

One participant expressed their frustration with some of the BAs' lack of knowledge regarding a particular insurance product, which will hereafter be referred to as 'P1'. The frustration developed due to the absence of a BA who was considered to be the most knowledgeable about P1. The developer was left to rely on the other two BAs who had less experience working with P1 and who therefore had difficulty in sharing P1 related information. During the group interview, the developer revealed that having to constantly find out how the product works created a sense of annoyance around completing his tasks.

> *"And then I do find the BAs tend to struggle when they are helping me with the place that they are not entirely knowledgeable with, so like it's a major problem with P1, because it seems like nobody knows what's happening with P1 [deep sigh from another team member]. So every time I ask the BAs what is meant to happen with P1 they can't always tell me exactly and there is only like one P1 lady [BA3] so she's on leave whatever. So yes, sometimes when they don't have all the knowledge about that area, there can be a bit of a gap or a problem. And then it can make working on whatever that area is quite frustrating because then there is a whole bunch of back and forth." (DEV1)*

<u>*Lack of system knowledge, industry knowledge, and business rules knowledge*</u>

> *Findings reveal that a BA with insufficient technical and industry knowledge has difficulty in contributing to a development team's market/environment orientation DC. A lack of knowledge regarding system functionality limits a BA's ability to advise a product owner about the impact of their changing needs or requirements. This shortage of system functionality knowledge, along with an insufficient understanding of business rules and an organisation's industry, hinders how well the BA can explain and discuss requirement changes with the development team. An inability to promote understanding amongst development team makes it challenging for them to appropriately respond the changes in its environment.*

An important part of identifying and understanding changes in customer needs is being able to guide the client in defining their requirements. A reoccurring theme throughout the dataset is the BA's inability to point out and explain the functional

limits of a system to the customers, so that requirement changes stay within the boundary of the system's capabilities. This lack of system knowledge frustrates the developers, as they are presented with tasks that they cannot complete. These findings suggest that an agile BA cannot solely be knowledgeable in the area of business requirements. Developers expect BAs to also have an understanding of the functionalities attached to a system.

Developers also feel strongly about the need for BAs to reject business requests that do not align with the system's capabilities. This was opposed by the scrum master who feels that disputes regarding new or different functionality should be resolved by the product owners and the developers. SM1 explained, *"the BA shouldn't actually have to have that fight. They should be willing to understand that [the change] and go forward with it, and at the end of the day, it is not their fight. It will be more of an argument between the team and product owner."* It is evident that there is a lack of consensus in the team regarding the level of responsibility and authority that should be extended to the BA.

> *"It's all about knowledge. If they don't understand, we've seen it so many times, especially with a new BA…sometimes the BA needs to grow a pair and actually say to business, 'do, you know what? No. This is not what we are going to do.' And that's where the knowledge of our system comes in to say, 'but if you are going to do that, you are going to break the whole system'." (DEV5)*

> *"It's not an easy job, I think it's very difficult because there are scenarios which aren't considered. There's also, sometimes a BA doesn't know a system very well. For example, a developer can tell you the ins and outs of a program, but a BA might not know that. So to understand that someone can say 'can we do this? Can we build this functionality?' And, the BA will go, 'technically we should be able to', but a developer will be able to explain 'yes' or 'no, we cannot'." (SM1)*

Findings also suggest that there is disagreement between BAs and the development team regarding the importance of systems knowledge negatively impacts the development of DC. For example while the team insists that a BA must be knowledgeable about the functionalities of the system, BA2 seemed to be conflicted. BA2 went from stating the importance of understanding the system, to then expressing, *"but the golden rule of a BA is: you don't need to know the system, you*

*need to understand your business".* It is clear that BA2 holds contradicting views and is trying to resolve the extent to which he should be familiar with the GR system. BA3 on the other hand, views having system knowledge as being critical, as it influences the quality of her technical specification document and solution design. It must be noted that BA2 and BA3's differences in opinion regarding system knowledge may stem from the fact that BA2 is referred to as being a 'business BA', while BA3 is considered to be a 'technical BA'. This may have an effect on how much significance they assign to system knowledge and its role in helping them carry out their work.

> *"I would say extensive, above average. You need to understand in order to come up with a good technical spec and with a good design, you need to understand what our capabilities are and if you don't understand at the outset again you can go and investigate and ask around and test it yourself and see what is on the front end." (BA3)*

When discussing lack of knowledge, the team's scrum master also made reference to the BAs' understanding of business rules and the financial services industry. A BA that has insufficient knowledge of O1's complicated business rules and the industry that O1 operates in, experiences difficulty when explaining and discussing the changes in requirements with the development team.

> *"…you need to understand the business rules…there is actually a huge amount of business rules which is very difficult, which I think a lot of BAs do struggle with and not having any context of how a financial services company like O1 works. It can be very daunting for them I mean, they are not technical, so sure, it can even be that the complexity is twofold. If you think about it, if you have no idea what the business model is like, and their business rules, and to add to that, you have to go to development team and explain to them what the business rules or what the requirements. It can be very, very difficult for them. (SM1)*

<u>*Breakdown in communication between BAs and project stakeholders*</u>

> *A breakdown in communication between BAs and project stakeholders hinder a BA's ability to contribute to a development team's market/environment orientation dynamic capability. The breakdown in communication may lead to the BA's misinterpretation of requirements which are passed onto the development team, resulting in poor solution*

*designs, and delays in development. In addition, a BA's inability to identify and engage with the appropriate stakeholders affects the completeness and correctness of information which is used for drawing up solution designs.*

BA2 and group interview participants made reference to a situation where the product owner rejected a solution to a requirement change during a refinement session. BA2 explained that the solution to the business' need and requirements had been approved by the business specialists who assists the product owner in defining business requirements that relate to their specific functional area. The product owner however, disagreed with the BAs and business specialists on the proposed solution. BA2 shared that he had a meeting scheduled with the business specialists and the product owner the following day to establish whether he misunderstood the requirement and understand how misaligned the proposed solution was to the business requirement.

The developers in the group interview felt that the BA's inability to fully understand the requirement change was due to the BA not identifying and consulting with the appropriate stakeholders. These findings reveal that when there is a breakdown in communication between the stakeholders, some developers place the blame on the BAs. The developers did, however, also share that there are instances when the BA should not be blamed for the breakdown in communication and delays in the development process, as project stakeholders and the product owner in particular, often change their minds and do not consult with the BAs before a refinement session.

*"Yes, I also think it is when a BA does not really understand a requirement. So they think they have got an idea of what business wants, but it just plugs into not consulting the right people, or actually consulting the right people and they just change their mind at a later stage as well. (DEV5)*

BA2 admitted that this misunderstanding had a severe negative impact on the team as it delayed the upcoming sprint. DEV1 however, disagreed with BA2 about the impact of the misunderstanding on the development schedule and explained that, *"sometimes it can be a bit of a problem of communication, but we normally sort it out pretty quickly*."

### 6.2.2 Tacit knowledge sharing

Findings reveal that there are tacit knowledge sharing factors which both allow and hinder a BA's ability to contribute to a development team's market/environment orientation capability. BAs contribute to team market/environment by sharing tacit knowledge which is related to business operations and business rules. Participating in ineffective communication with offsite team members hinders how well a BA can promote a development team's market/environment orientation. Findings also show that BAs experience difficulty in transferring their tacit knowledge to team members who have knowledge gaps. These contributing and hindering factors are described in the following subsections.

#### *Contributing factors*

BAs add to a development team's market/environment orientation by providing them with their tacit business operations and business rules knowledge. This subsection describes these contributions in detail.

Sharing business operations tacit knowledge

> *BAs contribute to the development team's market/environment orientation DC by sharing their business operations tacit knowledge. Instead of having to constantly rely on business specialists to provide knowledge about business operations, a BA who has spent a significant amount of time in an organisation can take on the role of a trusted knowledge source. Sharing this tacit knowledge is not only important for the development team, but for the project team as a whole. It allows for team members to learn about their environment and prepares them for the process of understanding and responding to changes in business needs.*

When asked about a BA's tacit knowledge, participants identified it as knowledge related to O1's business operations. BS1's description of BA1's business operations knowledge indicates that it has a tacit component, as it is complex knowledge that was developed through BA1's experience of working at O1 over a number of years. BA1's experience in the organisation allows him to take on the role of a trusted O1 knowledge source. BS1 stressed that without BA1 sharing the business knowledge he

has built over many years, the project team as a whole would not perform as well as they do. This knowledge sharing allows the larger project team to develop an understanding of their environment, which is necessary for responding to the changes that occur in it. DEV1 added that instead of approaching the business specialists for information about the business, he often directly speaks to BA1. It is evident that although information related to business operations is usually shared by business specialists, a BA that has spent a significant time in the organisation can develop operational knowledge through years of experience.

> "*… because I know a bit about the business it makes my job different to other BA's stuff maybe because sometimes, they will ask me for some information, because I know the business and I know the processes and I know, everything, not everything but I know of some of the processes." (BA1)*

> *"BA1 has been in the business forever… because he's been here forever, he knows everything inside out. So ja, he is, without him we'd be in a bit of trouble." (BS1)*

<u>Sharing business rules tacit knowledge</u>

> *By sharing their tacit knowledge in relation to business rules, BAs promote team learning which in turn contributes to the development team's market/environment orientation DC. By clarifying the context in which business rules should be applied, BAs provide more understanding to the team, which allows them to respond to changes in requirements, while keeping in line with business needs and business rules. Dynamic capabilities are further nurtured when BAs share their tacit knowledge, as it stimulates developers to share their system related knowledge.*

The development team described the BAs' business rules tacit knowledge as knowledge which clarifies how complicated business rules should be implemented. DEV1, DEV2, and TES1 explained that this understanding provided by BAs, contributes to the development team's ability to respond to changes in requirements in a manner which aligns with business needs and the business rules.

> *"I mean, it also depends on what we were working on but when we're working on something that's quite complicated and the rules are sometimes unclear to us, it helps us yeah. It helps a lot because like if some changes come in and then we have*

*to sort of understand what the… say like, they'll change one thing but we still have to stick to the business rules that they'd given us, then sometimes we can speak to BA1 or the other one about that and it … yeah it helps us to respond to the change pretty well" (DEV1)*

Given that DEV1 makes reference to BA1 when discussing tacit knowledge sharing, it must once again be noted that this knowledge possessed by BA1 is partly due to his experience in the organisation. BA1 expressed that he often shares his business rule tacit knowledge with the development team. While all project team members have access to BA1's knowledge, he mostly shares it with groups of developers, as they are the ones who require it the most. This tacit knowledge is shared during informal white board sessions with the developers. BA1 highlighted that sharing his tacit business-related knowledge also encourages developers to share their system tacit knowledge. The socialisation which takes place during these white board sessions allows for mutual knowledge sharing to occur. Learning is therefore not restricted to one group of the development team but takes place for both the BAs and the developers.

*"Okay, there are lots of times that that's happened and it's mostly between myself and the developers and some of the developers are keener on working like that…but we often sit in front of the board…mostly three of us. And, I'll say, 'if we do that this is not going to work' and they'll say, 'if we do that, that's not going to work'. So we speak to each other and discuss it and I like that because then you sort out a lot of stuff and they understand the bigger picture and sometimes I understand the bigger picture from the system side." (BA1)*

### *Hindering factors*

Ineffective communication with offsite team members obstructs the BAs' ability to add to the development team's market/environment orientation DC. Findings also reveal that sharing tacit knowledge is challenging when BAs interact with team members who have knowledge gaps.

Ineffective communication with offsite team members

*Distance between BAs and other project team members results in ineffective communication, which hinders the BA's ability to share their*

*tacit knowledge and contribute to the development team's market/environment orientation dynamic capabilities. The influence of ineffective communication extends beyond the development team. It is also important for sharing tacit knowledge with project stakeholders who have an effect on the development team's work.*

BAs have difficulty sharing their tacit knowledge through non face-to-face communications. This inability to communicate effectively hinders the extent to which a BA can make tacit knowledge, which may relate to requirement changes, understandable to the rest of the team. BA1 expressed that he has trouble sharing his tacit knowledge with team members who are offsite. He feels that explaining a concept to someone in person on a whiteboard is more effective that doing so over the phone. He insisted that when working in an ASD environment, all team members should be on site to ensure that meaningful communication and discussions take place. BA1's inability to share his tacit knowledge face to face frustrates him and causes him to say things to his team members that he later regrets.

*"Especially when they are not here. If you have the whiteboard, I told you it's easy to explain and I don't like the telephone. And this other guy, the architect, he was on the telephone so I couldn't really show him what I mean, and he made comments from that side and I don't like that. I might have said something that I shouldn't have but it doesn't matter. I mean, that's what frustrates me- if you cannot explain." (BA1)*

<u>Team members' knowledge gaps</u>

*It is more challenging for BAs to transfer their tacit knowledge to junior developers that lack industry experience. In this case, a recipient's prior knowledge determines how well a BA can successfully share additional tacit knowledge with them. The inability to contribute to the market/environment orientation dynamic capability is therefore not necessarily due to the BA's capacity to share knowledge but is affected by another team member's knowledge background. Team members who have a sufficient understanding of the subject being discussed are in a better position to comprehend the tacit knowledge being shared by the BA.*

DEV2, a senior developer, interestingly noted that a BA's ability to effectively share their tacit knowledge has more to do with the receiver of that knowledge. He shared that it is more challenging for a BA to share their knowledge with a newer developer who does not possess prior knowledge of the subject at hand.

> *"[laughing] I think, discussing with you being in the industry for a while, it's a lot easier but I think perhaps if it's a newer developer who doesn't have that knowledge, is sometimes, there's a lot of backtracking to try and get the understanding. "(DEV2)*

### 6.2.3 Relationship management

Findings indicate that there are relationship management factors which promote as well as hinder a BA's ability to contribute to a development team's market/environment orientation capability. BAs contribute to market/environment orientation by proactively involving project stakeholders, establishing rapport with project stakeholders and establishing rapport with the development team. Asking irrelevant questions to project stakeholders hinders the BA's ability to contribute to the development team's market/environment. The contributing and hindering factors are described in the following subsections.

#### *Contributing factors*

The following section will discuss the factors which allow BAs to contribute to the development team's market/environment orientation dynamic capability.

Proactively involving project stakeholders

> *BAs contribute to a development team's market/environment orientation DC by proactively interacting with a range of project stakeholders. BAs must take the initiative to involve the product owner, business specialists, system users, and various other stakeholders to ensure that all their needs and concerns are understood and accounted for throughout out the development process.*

BA3 makes an effort to proactively speak to business specialists and different user groups to ensure she stays up to date with business needs and gather user feedback. BA1 and BA2 similarly expressed that they visit the user's work areas and discuss features of the system that will affect the way they conduct their work. These types of behaviour from the BAs ensure that business and user needs are accounted for

throughout the development process. BA1's regular involvement of users is supported by DEV1 who added that BA1 often consults the doctors and lawyers to ensure that the system's features are aligned to their changing needs.

*"In between I'll also go to the doctor's department or anywhere that we need to, just to show them, 'listen are you comfortable with this because in future you're going to do this now'. So, that's the type of stuff that I'm doing, running around to make sure. I really like to get everybody involved and informed" (BA1)*

*"I think he's a lawyer or something and BA1 sort of was interacting with him to make sure that what we're doing like suited what they wanted as well. And he went to the doctors as well to be like, 'if we do it like this would that…work for you?' So yeah, he sort of went to them and got their feedback while we're busy with severe illness." (DEV1)*

<u>Establishing rapport with project stakeholders</u>

*BAs contribute to the development team's market/environment orientation DC by establishing rapport with project stakeholders. Building a rapport allows the BA to maintain cordial relationships with stakeholders, which gives the development team quick and easy access to the pool of knowledge and resources necessary to deliver business value and satisfy user requirements.*

Developing rapport with project stakeholders creates a comfortable environment for both the BA and the stakeholders to discuss project-related issues. While some stakeholders prefer to only discuss project-related issues, BA1 explained that there are others who appreciate the interest he shows in their personal lives. BA1 shared that as he became more familiar with one of the risk consultants, he would ease into asking a project related question by first asking inquiring about her hobbies. According to BS1 and the group interview members, this ability to form relationships with the stakeholders gives the development team access to the knowledge and resources necessary to build the system.

*"Like the other risk consultant, she likes nature photos and stuff. You just say, 'oh, another of your photos, didn't you…?' Listen, just to start off and then you ask the question quickly after that." (BA1)*

In addition to having access to the required knowledge, a BA's ability to establish rapport ensures that this knowledge is delivered to the team as quickly as possible, so that they can rapidly deliver new features and resolve issues. BA1 shared that maintaining good relationships with stakeholders enhances the project's speed of delivery. Due to BA1's strong relationships, he is able to bypass the long process of booking a meeting with a stakeholder in order to discuss a project issue.

Along with having friendly conversations with stakeholders, BA3 also emphasised the need to have a good understanding of nonverbal communication. BAs must be able to pick up on the nonverbal communication expressed by stakeholders, while being mindful and able to adjust their own nonverbal communication. The ability to read a stakeholder's body language and tone of voice allows a BA to interpret the true meaning or implications behind the interactions they have with them. By developing an understanding of the stakeholder, BAs are able to decipher their needs and instil a sense of confidence in their ability to convey those needs to the development team.

> *"I think as a BA it is very important to be able to build relationships. That is a key in actually BA work. You must be able to read quickly from someone's body language or their tone or their speech; what they are trying to say so you need to be able to read between the lines and having to communicate in all sorts of ways; body language, tone, voice, volume maybe and that is all very important because once a business user for example, gains your trust that is what you must try and aim for; that they are confident in what you are doing… and they have faith in your capabilities and they trust that what you are doing is right." (BA3)*

<u>Establishing rapport with the development team</u>

> *BAs nurture the development team's market/environment orientation DC by establishing rapport with the team. Building a relationship with team members creates a sense of comfortability and encourages the developers to interact with the BA about business requirements, and changes to those requirements that must be responded to. BAs who are easily accessible, approachable, and engage in informal, face-to-face interactions are able to develop cordial relationships with team members.*

To build these relationships with team members, BAs must be easily accessible and approachable. Findings indicate that when BAs are open to having informal, face-to-face interactions with the development team, they are able to effectively collaborate and develop cordial relationships with one another. The developers in the group interview expressed that because BA1 sits next to them, they are able to regularly consult with him. A developer also added that because BA1 is approachable, he is easy to talk to. The developers feel that working in an ASD environment enables BAs and developers to build friendships with one another and communicate openly.

> *"Yes, it is also nice that you don't have to skype him, you make an appointment and whatever. He sits right next to us. He is also quite approachable you can literally stand up and say hey, I need to talk to you, or can I show you something." (FG)*

> *"Even if they have discussions, we would also chip in. And that makes it quite nice, but I think that's why the whole agile thing, because, you are becoming sort of friends, you know." (FG)*

### *Hindering factors*

A BA's poor relationship management skills hinders their ability to contribute to the development team's market/environment orientation capability. This section will describe the 'asking irrelevant questions to project stakeholders' factor.

Asking irrelevant questions to project stakeholders

> *Asking irrelevant questions to project stakeholders hinders a BAs ability to contribute to a development team's market/environment orientation. This inability to ask appropriate questions limits the ability for BAs to build close relationships and quickly collect information that must be relayed to the development team.*

BA1 explained that high-profile stakeholders value their time and are less inclined to allow BAs to work with them on an open-door policy if they ask questions which they feel are a waste of their time. According to BA1, when BAs asks irrelevant questions to stakeholders, the stakeholder will not immediately engage with the BA. They will encourage the BA to make an appointment at a later stage to discuss the question.

This delays how quickly BAs can extract information from the stakeholders and share it with development team.

> *"If you ask decent questions because they are high-profile persons and so they don't want to be bothered with, 'what's the colour of your eyes'? type of questions. I'll try to sort that out. Don't go to them with that kind of stupid question. If you go every day there with a stupid question, he will later on say no, make an appointment or something like that." (BA1)*

## 6.3 COORDINATION DYNAMIC CAPABILITY

The following section presents and describes factors which allow BAs contribute to a development team's coordination DC. Participants did not make reference to any factors which hinder the BAs ability to contribute to the development team's coordination capability. As previously mentioned, the coordination DC describes the development team's ability to manage a range of interdependencies (Hsu et al., 2012). The BAs promotion of this DC will be detailed in terms of task mental model and transactive memory.

### 6.3.1 Task mental model

For this study, a BA's tasks mental model describes how well they understand their tasks, how aware they are of tasks being performed by other team members, and how well they understand the relationship between their BA tasks and the tasks of others. Findings indicate that BAs contribute to a development team's coordination capability by not only developing their own task mental model, but by also assisting the team in building theirs. This can be achieved by performing the following activities: engaging with project stakeholders, distributing documentation, taking part in product backlog refinement sessions; participating in sprint planning meetings, and monitoring task boards.

<u>Engaging with project stakeholders, distributing documentation, taking part in product backlog refinement sessions</u>

> *BAs promote the coordination DC by assisting the development team in developing their task mental model, which in turn improves the 'know why' component of their implicit coordination, and supports their ability to appropriately reprioritise their tasks in response to changing*

*environments. BAs must, however, first mature their own task mental models before they can play a role in contributing to the team's task mental model. BAs, therefore, improve their understanding of the team's tasks by engaging with various project stakeholders before attending product backlog refinement sessions.*

When discussing task mental model, this study considered the 'task' during the refinement portion of the meeting to be the identified gap (high level user story), in the Fit-Gap document (refer to chapter 5). The explanation of tasks that is provided through documentation, synchronisation activities, and synchronisation artefacts is critical in ensuring that team members are familiar with the project goal and the specific tasks they may choose to commit to in the upcoming sprints.

Findings indicate that refinement sessions allow BAs to give the project team, including the development team, a richer understanding of each task from a business point of view.

*"And in the refinement, they will obviously read out the gaps and what is required, and they need to be available to answer any questions the team has." (SM1)*

BA3 expressed that she feels that she plays a prominent role during the refinement session of the meeting. This was supported by DEV3 who added that during the refinement session, BAs play a significant role in providing their development team members with a better understanding of the entire project by discussing each task that needs to be completed. Explanations given by the BA therefore add to the development team's shared understanding about the project's tasks, which leads to the improvement of the team's 'know why' component of implicit coordination. This allows the development team to remain aware of the project goal while completing their tasks and to find appropriate ways to coordinate their tasks when confronted with change requests.

*"Because in Agile they actually have sessions for sprint planning, so they have refinements in which I play more of a key role and then they have the planning, which is purely for the devs, basically." (BA3)*

*"I'd say definitely for the first portion because that is literally, this is the direction we go, we go through the whole project. We go from gap one to gap eight, we*

*only going to do gap one now, but everyone should have an understanding of what's to come so when we build, we build appropriately." (DEV3)*

It must, however, be noted that in order for a BA to improve the development team's task mental model and in turn contribute to the team's coordination dynamic capability, they must first develop their own task mental model. Findings indicate that engaging in preliminary discussions and ad-hoc meetings with a range of stakeholders ensures that BAs are able to understand tasks from different business and technical perspectives. BA3 expressed that as a technical BA, her role before refinement sessions differs from the other two business BAs. In addition to putting together a Fit-Gap document, BA3 is also expected to liaise with senior developers, technical architects, and business architects before attending a refinement session. Interacting with these parties allows the BA to develop a more technical and system specific understanding of the tasks that will later be discussed in the refinement and planning session, as well as prepare a Solution Design that will be referred to during that meeting.

The researcher was given permission to listen in and record a product backlog refinement and sprint planning session through a Skype call. It must be noted that BA1 and BA3 were on sick leave when this meeting was held. To provide assistance to the project team, a project champion with extensive knowledge of O1's GR system and business' needs took on the role of a BA. He will be referred to as BA4. It is also worth mentioning that due to not being able to physically observe the participants in the meeting, the researcher used the chat function in Skype to ask the Scrum Master questions related to the BAs' actions. For example, in the beginning of the refinement session, it was unclear which BA was leading the discussion about the tasks that needed to be completed. This interaction is illustrated in Figure 6-1.

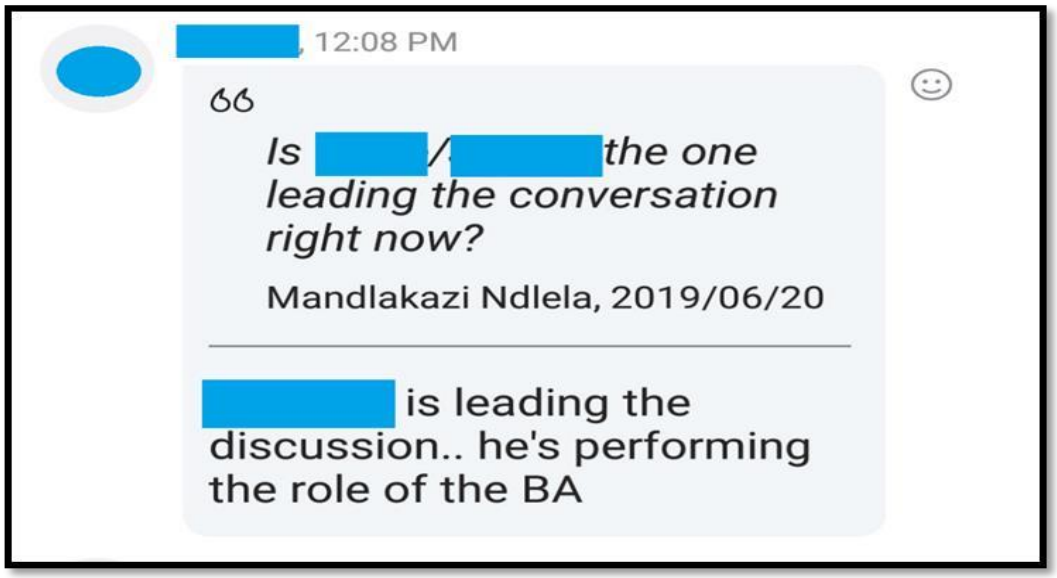


Figure 6-1: Skype chat with Scrum Master

The audio from the meeting corroborates the views expressed by the participants. As revealed by SM1, BA4 presented each task to the team during the refinement session, asked them if they had any questions about the task, and answered questions posed by team members. For example, DEV2 asked BA4 to clarify the task and asked questions such as, *"what fields do you want to see?".* BA4 also confirmed DEV3's statement about sharing the project's goal by explaining all the gaps (tasks) that need to be completed. BA2 also provided more detail to the development team by explaining the user's perspective regarding one of the tasks.

Participating in sprint planning meetings

> *Findings reveal that BAs promote a development team's coordination DC by actively engaging in sprint planning meetings which give them the opportunity to enrich their task mental models. These meetings give BAs, as well as other team members, an opportunity to become familiar with the tasks being completed by themselves, other development team members; and understand the relationships between their tasks and the tasks of others. As members of the development team, BAs' nurturing of their task mental models contributes to the whole team's 'know what to do and when' as well as the 'know who is doing what' components of implicit coordination. Establishing this understanding within the development team supports the organisation and management of tasks*

*which is necessary for reacting to future changes in the team's environment.*

During the sprint planning portion of the meeting, each prioritised user story is divided into several tasks that must be completed by the development team. Figure 6-2 illustrates the user stories along with the tasks that were identified during the meeting. The team uses the Scrum board in Figure 6-2 to monitor the status of these tasks. The tasks are written on 'sticky notes' which represent a piece of work must be seen to. In this study, tasks may refer to activities (blue sticky note), preparing test cases (green sticky note), running tests (green sticky note), and putting together 'dev packs' (green sticky notes) which are signed off documents that illustrate the test results. The yellow stick notes refer to a user story and the red sticky notes represent impediments that are being faced by the development team.

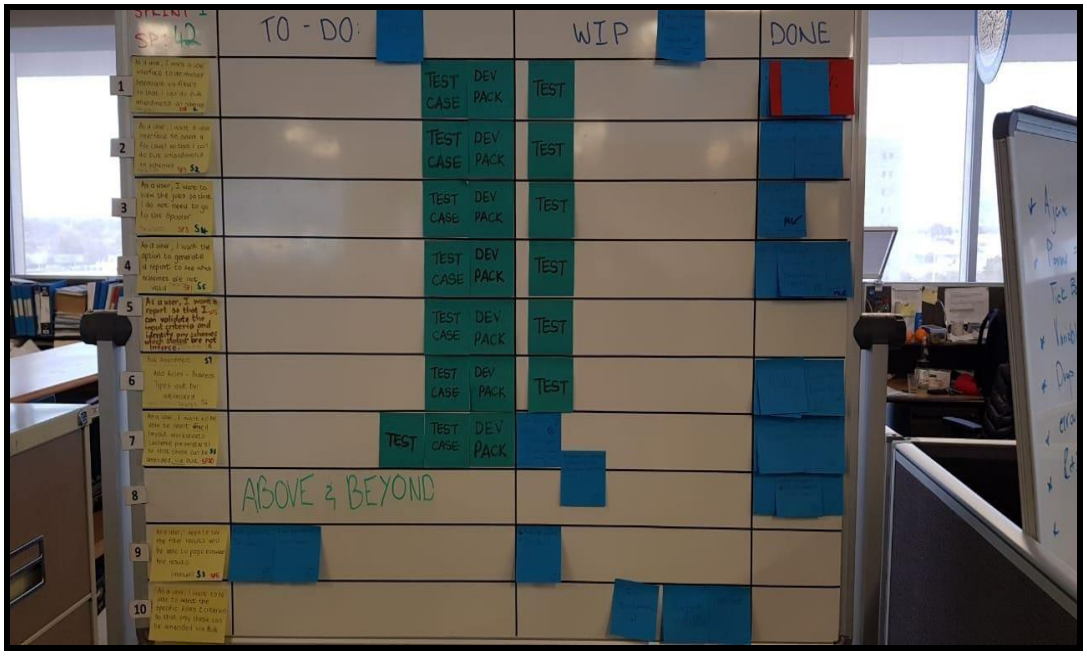


Figure 6-2: Scrum board

BA3 shared that she is not as active in the sprint planning sessions when compared to the refinement sessions, but BA1 and BA2's participation in sprint planning meetings is essential for developing their own tasks mental models and contributing to the development team's coordination capability.

BA1 shared that the development team does not have a dedicated tester role. This has led to BA1 and BA2 also playing the role of the testers in the development team. They are responsible for writing test cases, running tests, and preparing the dev packs

related to user stories. BA1's experience in sprint planning meetings reveals two ways in which BAs can develop their task mental model. Firstly, each developer's commitment to a task ensures that the BAs are able to identify team members who are working on specific tasks as well as share information about those tasks. Secondly, by asking questions about the nature of developers' tasks, BAs are able to identify the functionalities that they need to test. This behaviour from BA1 improves his task mental model by developing his understanding of other team members tasks, and by helping him establish the relationships that exists between his testing tasks and the tasks of developers. This was supported by BA2 who added that participating in sprint planning meetings allows him to discuss his testing tasks with developers, who are able to explain and help him become familiar with the dependencies that exist between his testing tasks and their programming tasks. As members of the development team, BA1 and BA2's task mental models contribute to the 'know what to do and when' as well as the 'know who is doing what' components of the team's implicit coordination.

*"We'll speak about every detail of the task, what we going to do so that everybody knows. From the developer's side, they will say what they are going to do." (BA1)*

*"So, in this meeting… one of the developers will say, 'okay, I'll take this story of this sticky, this activity kind of. I'll take this one. And then we'll say, 'okay what does that involve?'" because then we make notes to say okay, 'yes, we must test it, we must set it up a test'." (BA1)*

*"…we do our testing, we say we are going to test this, this and this and sometimes in we do it in the same planning and they'll [developers] say, 'hey but whoa, you want test that now, but we didn't put that into the development." (BA2)*

<u>Monitoring task boards</u>

*BAs promote a development team's coordination DC by monitoring Scrum boards which allow them to develop a visual understanding of the relationships between their tasks and the tasks of others. This task mental model that is created through visualisation promotes the 'know what to do and when' component of a development team's implicit coordination capability. BAs who are able to identify when to work on tasks relative to*

*other tasks of others, as well as address impediments faced by the team ensure that the team makes progress on their prioritised tasks.*

It is interesting to note the differences in opinions among the participants regarding the BA's use of the Scrum board. When asked about how much attention the BAs should pay to the team's Scrum board, DEV 3 expressed, *"not that much. It really doesn't seem like that much."* This was contradicted by BA1 and BA2 who shared that as members of the development team, it is critical for them to keep track of the tasks on the board which relate to setting up test cases, executing tests, and addressing impediments.

BA1's use of the Scrum board also helps him improve his task mental model by visually representing the relationships between his testing tasks and the tasks of the developers. These relationships can be seen on the Scrum board in Figure 6-2. For example, the board illustrates that user story 7 cannot yet be tested by the BA1, as it still has an activity that must be completed by one of the developers.

BA2 expressed that he uses the Scrum board to identify 'impediments' that the development team is facing. An example of an impediment that is relevant to the BA role may be related to a lack of information from project stakeholders. Both BA1 and BA2 shared that they discuss the nature of the impediments with the development team, and then seek the necessary information from the stakeholders in order to give clarity to the team and assist in removing the obstruction.

*"I think it's the one thing that I've learned from agile is, that it is all hands on deck. You get involved were you can and especially if…it's a developer and he is struggling with something…if it's an impediment that's put in place by someone, then I'll speak to them to sort it out, otherwise we don't deliver." (BA2)*

It must however be acknowledged that the extent to which the BAs proactively monitor the boards for impediments is unclear, as DEV3 shared that SM1 takes on the responsibility of relaying the impediment to the BAs.

*"It's the responsibility of the Scrum Master to let the BA know that there's an issue that they have to attend to. So often the BA will just be told, look there's something here and we need someone to have a look at it." (DEV3)*

### 6.3.2 Transactive memory

A team member's transactive memory is defined as the ability to identify and locate team members who possess particular knowledge (Hsu et al., 2012). Findings show that BAs contribute to their development team's coordination capability by nurturing their own transactive memory. This can be done by attending synchronisation meetings and gaining experience in the project team.

Attending synchronisation meetings & Gaining experience

> *By taking part in synchronisation meetings and gaining experience as members of the project team, BAs are able to mature their transactive memory which in turns supports their ability to contribute to the development team's coordination DC. By being able to identify and locate the knowledge required by the development team, BAs add to the team's 'know who knows what' component of implicit coordination. This coordination of expertise allows for the development team to gain quick access to the knowledge it requires for developing the system and satisfying business requirements.*

BA1 shared that he identifies and locates the sources of knowledge he needs by establishing which development team members are responsible for completing certain tasks. As previously mentioned, BA1 becomes aware of team members who are taking on particular tasks by attending sprint planning meetings (synchronisation meeting). This may be one of the reasons as to why SM1 stressed the need for BAs to attend all of development team's ceremonies. Attending agile ceremonies allows BAs to develop their transactive memory and approach the individuals who can supply them with the knowledge they require.

> *"It's normally the person that works on that task or that bit of the task."(BA1)*

> *"…they obviously need to attend all those meetings [refinement and planning sessions, daily stand up, review, retrospective]." (SM1)*

Participants also shared that the BAs and the rest of the development team have access to project team members who are experts in their fields. SM1 revealed that the BAs and the rest of the development team are made aware of which project team members who are functional or process owners. This is information that can be made

available to the BAs during team meetings. Findings also reveal that transactive memory is manifested through experience that is gained over time. BA2 and a focus group member both agreed that being able to locate the expertise in a team is a skill which develops with experience

> *"So, it's just experience now, because we know who's the experts in each field." (BA2)*

> *"Yes, often that comes with time, you know who to go to for certain aspects to get the correct answers and the correct information." (FG)*

## 6.4 SUMMARY

This chapter presented and described the analysed findings. While there are factors which both allow and hinder a BAs ability to contribute to the market/environment orientation DC of ASD teams, the findings only identified factors which contribute to the coordination dynamic capability. Chapter 7 will discuss these findings by comparing them with literature.

# CHAPTER SEVEN: DISCUSSIONS

## 7.1 INTRODUCTION

The purpose of this chapter is to compare the research findings to literature and answer this study's primary and secondary research questions. The primary research question for this study was:

> How do Business Analysts contribute to the Dynamic Capabilities of Agile Software Development teams?

The two secondary research questions asked:

(i) Which factors allow Business Analysts to contribute to the Dynamic Capabilities of Agile Software Development teams

(ii) Which factors hinder Business Analysts from contributing to the Dynamic Capabilities of Agile Software Development teams?

Section 7.2 will answer the posed research questions by discussing factors that allow Business Analysts (BA) to contribute to Agile Software Development (ASD) team Dynamic Capabilities (DC). In addition to the findings on the specifics of the BA role and building on previous studies about this role, the discussion proceeds to briefly locate these outcomes within literature on roles of individual members, in general, and within ASD teams.

As mentioned in Chapter 6, the findings did not reveal any factors which obstruct BAs from contributing to ASD team coordination DC. Section 7.3 will, therefore, only discuss the factors which hinder the BA's ability to promote an ASD team's market/environment DC.

## 7.2 FACTORS WHICH CONTRIBUTE TO ASD TEAM DC

The following section addresses the first secondary research question:

> Which factors allow Business Analysts to contribute to the Dynamic Capabilities of Agile Software Development teams?

This research question will be addressed according to the two investigated DC: market/environment orientation and coordination capability.

### 7.2.1 Market/environment orientation

This subsection will discuss factors that allow BAs to contribute to the market/environment orientation DC of an ASD team. These factors include the following and discussed in the subsections below:

(i) Promptly sharing insights about requirement changes and assisting team members,

(ii) Sharing business rules tacit knowledge, and

(iii) Establishing rapport with the development team.

**Promptly sharing insights about requirement changes and assisting team members**

The study found that BAs contribute to an ASD team's DC by quickly sharing their insights about requirement changes and assisting the team by taking on tasks that are outside of their defined roles. This aligns with DC literature on how, in general terms, individuals add to their SD team's market/environment DC by promptly discussing changes that relate to their area of expertise with other team members (Hsu et al., 2012). Individuals also contribute to a group's market/environment orientation by ensuring that the shared information is accurate (Schlosser & McNaughton, 2007). The ability to promptly share insights about requirement changes also aligns with the key ASD principle of welcoming changing requirements (Fowler & Highsmith, 2001).

Findings also revealed that by taking on testing tasks, BAs are able to assist the development team in responding to requirement changes that will subsequently affect the functionalities that must be tested. With BAs in ASD teams being the most familiar with the business requirements, they able to assist an ASD team by performing verification or acceptance tests (Gregorio, 2012; Mundra et al., 2013).

**Sharing business rules tacit knowledge**

Findings confirm that BAs contribute to an ASD team's DC by sharing tacit knowledge about an organisations' business rules. BAs play a critical role in clarifying the context in which the business rules should be applied.

This study also established that BAs share their tacit knowledge with ASD teams through socialisation. This socialisation takes place when BAs and ASD team gather around a whiteboard to share their knowledge with one another. This finding builds on past ASD studies which indicated that team members find it easier to share their tacit knowledge by informally interacting with one another (Santos et al., 2015) and taking part in agile ceremonies such as daily stand-ups (Razzak & Ahmed, 2014; Singh et al., 2014).

**Establishing rapport with the development team**

While DC literature emphasises the relationship management that must take place with customers and other project stakeholders, findings show that BAs must also nurture their relationship within the ASD team. This study found that establishing rapport with the ASD team creates a conducing working environment in which developers interact freely with BAs and seek to understand business requirements. In order to create these sound relationships, BAs must be easily accessible to the development team; be approachable and willing to partake in informal, face-to-face interactions. This behaviour allows for relationship building and collaboration between the BAs and the rest of the ASD team.

These findings build on a study which reported on how members of two agile subteams that were unfamiliar with one another experienced difficulty in communicating, collaborating, and developing the correct functionalities for their customer (Lalsing et al., 2012). Related studies indicated that members of ASD teams who nurtured their relationships were able to easily share project related information with each other (Takpuie & Tanner, 2016) and individuals who value collaborating are able to assist team members in managing the changes in their environment (Li et al., 2010).

### 7.2.2 Coordination capability

The following subsection will discuss factors that allow BA to contribute to the coordination DC of an ASD team. These factors include the following and are discussed in the subsections below:

(i) Participating in sprint planning meetings, and

(ii) Participating in synchronisation meetings and gaining experience.

**Participating in sprint planning meetings**

This study found that BAs contribute to an ASD team's coordination DC by actively engaging in sprint planning meetings, which assist BAs in strengthening their task mental models. This is consistent with literature on how individuals who take part in this type of agile ceremony or synchronisation activity are able to develop an understanding of the ASD team's prioritised user stories and tasks (Stray et al., 2019; Strode et al., 2012).

Furthermore, this study's findings indicate that by participating in sprint planning meetings, BAs are not only able to understand their tasks and the tasks being performed by other team members, but can understand how their tasks are related to the tasks of others. These meetings are able to extend the understanding of the BA as an individual in a team, where the task mental model of individual ASD team members is essential in ensuring that they are all able to contribute to a team's coordination (Lindsjørn et al., 2016). Such coordination is critical in enabling the SD team to rearrange their tasks in response to the changes in their environment (Hsu et al.,2012). The BAs' nurturing of their task mental models contributes to the whole team's 'know what to do and when' as well as the 'know who is doing what' components of implicit coordination (Stray et al., 2019). This study, therefore, provided additional clarity regarding the ability for a BA to contribute to an ASD team's market/environment orientation by developing their task mental model.

**Participating in synchronisation meetings and gaining experience**

This study established that by attending synchronisation meetings, the BAs in particular are able to develop their transactive memory and contribute to a team's DC coordination capability. The BA's knowledge of where to locate certain expertise

assists the rest of the team in quickly coordinating and making use of skills that are needed to build the required system and satisfy and changes in business requirements.

This builds on previous studies which have reported that that, generally transactive memory develops as groups of people spend more time interacting with each other and become aware of one another's expertise (Kwahk & Park, 2018; Wegner, 1987).

## 7.3 FACTORS WHICH HINDER THE CONTRIBUTION TO ASD TEAM DC

The following section answers the subsequent secondary research question:

> Which factors hinder Business Analysts from contributing to the Dynamic Capabilities of Agile Software Development teams?

As previously stated, from a task mental model and transactive memory perspective, this study did not reveal any factors which make it challenging for BAs to contribute to an ASD team's DC. The following discussion will therefore address the factors related to the market/environment orientation DC which include:

(i) Lack of system knowledge, industry knowledge, and business rules knowledge,

(ii) Ineffective communication with offsite team members, and

(iii) Asking irrelevant questions to project stakeholders.

### Lack of system knowledge, industry knowledge, and business rules knowledge

A critical theme that emerged from the findings was the BAs' lack of system knowledge. This shortage of knowledge does not only restrict the extent to which BAs can advise product owners about the feasibility of a requested functionality, it also negatively affects the quality of the discussions about requirement changes that can be had between the BAs and the rest of the ASD team.

This study also established that ASD teams feel that it is not sufficient for BAs to only have an extensive understanding of business requirements. In order to contribute to an ASD team's market/environment orientation DC, an agile BA must have a substantial understanding of a system's functionalities. It must be noted that there

was also a difference in the weight that different types of BAs assigned to the importance of system knowledge. 'Technical BAs' feel that BAs should have an extensive level of system knowledge, while 'Business BAs' acknowledge the importance of system knowledge but find business-related knowledge to be more necessary. This is not particularly surprising given the differences in the activities that each type of BA performs.

This finding partially aligns with literature which states that BAs must be able to discuss requirements with developers and other technical team members in a manner that they will understand (Hoda et al., 2013; Park & Jeong, 2016). Similar sentiments were shared in a study by Chauhan (2015) who argued that agile BAs who lack system knowledge experience difficulty in clearly capturing requirements from customers that must be interpreted and implemented by developers.

Moreover, this study found that the lack of industry and business rules knowledge were factors that hinder a BA from contributing to an ASD team's market/environment orientation DC. Also, BAs who have an insufficient understanding of an organisation's business rules and the industry that the organisation operates within, experience difficulty when trying to contextualise requirement changes to the development team. This confirms the view that BAs who lack industry knowledge are unable to engage with customers and gather accurate requirements that provide the development team with a holistic understanding of what the business requires (Chauhan, 2015).

**Ineffective communication with offsite team members**

Findings show that a BA's non-face to face communication with the development as well as the project team hinders their ability to share their tacit knowledge and assist ASD teams in understanding requirement changes. This is supported by a study on distributed ASD projects which confirmed that development teams experience difficulty in sharing tacit knowledge with dispersed team members (Razzak & Ahmed, 2014). This study, therefore, confirmed that the inability for BAs to share tacit knowledge with offsite team members hinders their ability to contribute to an ASD team's market/environment orientation DC.

### Asking irrelevant questions to project stakeholders

Lastly, findings reveal that asking irrelevant questions to project stakeholders hinders a BA's ability to form relationships with project stakeholder which in turn allow them to contribute to an ASD team's market/environment orientation DC. The inability to approach busy, high profile stakeholders with critical questions weakens the BA's ability to cultivate relationships that will give them quick and easy access to vital information that must be relayed to the development team. This delays how quickly BAs can acquire and share information with the development team, which in turn obstructs how quickly the team can respond to requirement changes. This finding builds on previous studies which point to the 'coordinator' role of the BA who is expected to collect and clarify customer requirements and priorities that must be relayed to the ASD team (Hoda et al., 2013).

## 7.4 SUMMARY

In summary, there are several factors which allow BAs to contribute to the Dynamic Capabilities of ASD teams. The identification of these factors from this study helps to clarify the role of BAs and build on previous studies which focussed on how individuals, in general can support an ASD team.

In particular, this study established that factors associated with individual market/environment orientation, relationship management, and tacit knowledge are all essential in facilitating a BAs capacity to contribute to an ASD team's market/environment dynamic capability. In terms of coordination, this study confirmed that BAs who wish to contribute to an ASD team's coordination DC must ensure that they first develop their own task mental model and transactive memory by participating in synchronisation meetings that are prescribed by ASD methodologies. The next chapter will present the conclusions of this study.

# CHAPTER EIGHT: CONCLUSIONS

## 8.1 INTRODUCTION

This concluding chapter outlines how the research problem identified in Chapter 1 was addressed. It will identify the highlights of each chapter, present this study's contributions to theory and implications for practice, discuss the study's limitations and make proposals for future research.

## 8.2 CHAPTER HIGHLIGHTS

The problem statement in Chapter 1 was progressively responded to in the chapters that followed. Chapter 2 revealed that Business Analysts (BA) can contribute to Agile Software Development (ASD) teams by; taking on new roles such as customer representative and agile coach, or by performing a range of activities under their organisational BA role. Chapter 3 illustrated how this study adapted and applied a research model based on the Dynamic Capabilities (DC) theory to explore how BAs contribute to an ASD team's ability to respond to changes in their environment. Chapter 4 presented this study's research methodology and explained the interpretive nature of this research, which was executed using a qualitative, single case-study strategy.

Chapter 5 presented a description of the ASD team that participated in this study. In Chapter 6, it was found that there are a number of factors which can both support and hinder a BAs ability to contribute to the market/environment and coordination DC. Chapter 6 also found that BAs did not face any difficulty in contributing to the coordination DC. Chapter 7 compared the findings with literature and found that factors such as promptly sharing insights about requirement changes and assisting team members contribute to ASD team DC, while a lack of system knowledge, industry knowledge, and business rules knowledge hinder the BAs' ability to contribute to DC. Table 8-1 and Table 8-2 illustrate the findings from Chapter 6 which were compared with literature from Chapter 7.

Table 8-1: Factors which contribute to ASD Team DC

| Dynamic Capability | Finding | Supporting Literature |
|---|---|---|
| **Market/Environment Orientation** | Promptly sharing insights about requirement changes and assisting team members | • Fowler and Highsmith (2001)<br>• Gregorio (2012)<br>• Hsu et al. (2012)<br>• Mundra et al. (2013)<br>• Schlosser and McNaughton (2007) |
| | Sharing business rules tacit knowledge | • Razzak and Ahmed (2014)<br>• Santos et al. (2015)<br>• Singh et al. (2014) |
| | Establishing rapport with the development team | • Lalsing et al. (2012)<br>• Li et al. (2010)<br>• Takpuie and Tanner (2016) |
| **Coordination Capability** | Participating in sprint planning meetings | • Hsu et al. (2012)<br>• Lindsjørn et al. (2016)<br>• Stray et al. (2019)<br>• Strode et al. (2012) |
| | Participating in synchronisation meetings and gaining experience | • Kwahk and Park (2018)<br>• Wegner (1987) |

Table 8-2: Factors which hinder the contribution to ASD Team DC

| Dynamic Capability | Finding | Supporting Literature |
|---|---|---|
| **Market/Environment Orientation** | Lack of system knowledge, industry knowledge, and business rules knowledge | • Hoda et al. (2013)<br>• Park and Jeong (2016)<br>• Chauhan (2015) |
| | Ineffective communication with offsite team members | • Razzak and Ahmed (2014) |
| | Asking irrelevant questions to project stakeholders | • Hoda et al. (2013) |

## 8.3 CONTRIBUTION TO THEORY AND IMPLICATIONS FOR PRACTICE

The basis for the contributions is based on the empirical research results of this study. It provides a useful contribution in two ways. Firstly, it demonstrated how the Dynamic Capabilities theory can be used as a lens to help researchers explore ways in which individual Business Analysts can contribute to ASD team DC. Associated to this, the study provided a research model that identified market/environment orientation and coordination as some of the crucial categories of team DC. It also identified individual market/environment orientation, relationship management,

tacit knowledge sharing, task mental model, and transactive memory as components which contribute to those DC.

Secondly, this study is important for practitioners as it highlights how particular factors may contribute or hinder the ability of BAs to contribute to ASD teams DC. In this regard, this study can also help inform the design of capacity development programmes for BAs and individual team members, and thus help managers to curate ASD teams which will best promote Dynamic Capabilities.

## 8.4 LIMITATIONS AND PROPOSALS FOR FUTURE RESEARCH

Regarding the research process limitations, substantial data was collected and analysed. However, the study was limited, to some extent, by the restricted nature of access to classified and confidential documents of the organisations that were the subject of the study. A related limitation was the sometimes closed nature of some meetings for purposes of non-participant observations. Where permissible, the researcher was allowed access to segments of these meetings via Skype. However, this limitation did not adversely impact the outcomes of the study as it was mitigated by the optimal use of complementary data collection methods.

Although the appropriateness and significance of outcomes from single-case studies (Chapter 4) such as this one remains crucial and significant, it is proposed that future researchers should consider applying a multiple case-study strategy to allow for comparative analysis between teams which operate in different contexts.

Lastly, two (market/environment orientation and coordination capability) out of the four identified categories of team DCs were investigated due to the time and space limits of a research study of this nature (Chapter 3). There is, scope for future researchers to investigate the remaining two categories: absorptive capacity and collective mind. The Dynamic Capabilities theoretical lens could be used for such a purpose.

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# APPENDICES

## Appendix A: Research Diary Template

**DATE:**

**NATURE OF SESSION:**

**PARTICIPANTS:**

1. What struck me the most?

2. Why did it strike me?

3. What was a surprise?

4. Why was this information/view/approach a surprise?

5. What could have affected the atmosphere within the session/during the observation (mood, pace, method, recent events)?

## Appendix B: Case Study Protocol

*Guideline*

## A. Overview of the Case Study

### 1. Purpose

The purpose of this study is to explore how Business Analysts contribute to the Dynamic Capabilities of Agile Software Development teams.

### 2. Study objectives

Primary objectives

- To explore how Business Analysts contribute to an Agile Software Development Team's Dynamic Capabilities.

Secondary objectives

- To identify the factors which facilitate Business Analysts' ability to contribute to an Agile Software Development Team's Dynamic Capabilities.
- To identify the factors which hinder Business Analysts' ability to contribute to an Agile Software Development Team's Dynamic Capabilities.

### 3. Theoretical framework: Dynamic Capabilities

Dynamic capabilities are actions which allow a software development team to "continuously integrate, reconfigure, and renew resources and competencies in response to the changing socio-technical environments" (Li et al., 2010 p. 1727). The two team dynamic capabilities that will be used investigated, as suggested by Hsu et al. (2010) include:

- market/environment orientation
- coordination

### 4. **Unit of analysis:** Agile Software Development Team

5. **Sampling:**

i. Purposive

- Teams that follow agile practices
- Teams with dedicated Business Analyst roles
- Teams that operate in a rapidly changing/dynamic market environment

ii. Convenience

iii. Snowball

## B. Data Collection Procedures

1. **Names of contact persons for doing fieldwork**

- Manager: [redacted]

**2. Data collection plan**

Types of evidence expected

- Semi-structured, one-on-one Interviews (Scrum master, business analysts, developers, other project team members)
- Semi-structured group Interviews (Developers)
- Non-participant observations (Agile ceremonies)
- Physical artefacts (Task boards)
- Documents (Ask participants for any available documentation)

**3. Expected preparation prior to fieldwork**

- Get a signed letter of consent from manager
- Print out consent forms for participants
- Send a reminder email to contact person
- Review company websites

**4. To-do on site**

- Get participants to sign consent forms

- Inform participants about the aim of research, ethics, confidentiality

**C. Data Collection Questions**

**Appendix C:** Scrum master interview questions
**Appendix D:** One-on-one BA interview questions
**Appendix E:** General project team member interview questions (developers, tester, business specialist)
**Appendix F:** Group interview questions

## Appendix C: Scrum Master Interview Questions

*Guideline*

**1. General Opening Questions**

**Just tell me a little bit about yourself:**

1.1 How long have you been a Scrum Master?
1.2 How long have you worked as a Scrum Master on this team?
1.3 What does your role on this team entail?

**2. Business Environment**

2.1 How would you describe the type of business environment your team operates within?

- Rapid changes or stable?

**3. Project Background**

3.1 Can you please describe the project you're currently working on?

- Purpose
- Who is it for?

3.2 At what stage of the project are you on?

**4. General BA Question**

4.1 What is the role of a BA on an agile team?

**Market/Environment Orientation**

| Market/environment orientation component | Interview Questions |
|---|---|
| **5. Individual market/environment orientation** | 5.1 How well do you think BAs help the rest of the team identify and respond to changes in customer and stakeholder needs? |
| | 5.2 Can you recall a time when BAs had some difficulty in helping the team recognise and respond to changes in customer and stakeholder needs? |

**Coordination Capability**

| Coordination capability components | Interview Questions |
|---|---|
| **6. Task mental model** | 6.1 How well do you think your BA understands the relationship between their tasks and the tasks of others? Why do you say so? |
| | 6.2 Can you recall a time when a BAs lacked an understanding of the relationship between their tasks and the tasks of others? |
| | 6.3 How did that between affect the team's coordination? |
| **7. Transactive memory** | 7.1 How well can BAs identify team members who have expertise related to their work? |
| | 7.2 How do you think that that knowledge affects the team's coordination? |

| | |
|---|---|
| | 7.3 Can you recall a time where BAs had difficulty in locating the expertise they needed in the team? |
| | 7.4 How did that affect the team's coordination? |

**Closing Questions**

8. Before we end the interview, is there anything you'd like to add?
9. Are there any documents you would like me to read? (Unit/team report)?
10. Are there any other people you think I should speak to?

*Guideline*

**1. General Opening Questions**

**Just tell me a little bit about yourself:**

1.1 How long have you been a BA?
1.2 How long have you worked as a BA on this team?
1.3 What does your role on this team entail?

**Market/Environment Orientation**

| Market/environment orientation component | Interview Questions |
|---|---|
| **2. Individual market/environment orientation** | 2.1 How do you go about identifying changes in customer needs? (What steps do you take) |
| | 2.2 How do you make sure that you stay aware of changing customer needs? |
| | 2.3 Is there any data or information that you read up on to ensure that you stay updated on your customer's needs? |
| | 2.4 How do you think your ability to sense changes in customer needs helps your team become aware of and react to these changes? |

| | |
|---|---|
| | 2.5 How do you help your team respond quickly to changes made by customers? |
| | 2.6 Has there been a situation in which you had difficulty identifying and understanding changes made by customers? |
| | 2.7 How did that affect the team's ability to understand and react to customer changes? |
| **3. Tacit knowledge sharing** | 3.1 Are there times when your team members need you to explain something to them that is challenging or complex to express? |
| | 3.2 When and how do you share necessary information? |
| | 3.3 How regularly do you participate in team meetings such as scrum meetings, daily stand ups, iteration plans etc? |
| | 3.4 What kind of information do you share during these meetings and how does it help the team understand and respond to changes in customer and stakeholder needs? |
| | 3.5 Do you ever have difficulty in sharing complex knowledge with team members? |

| | |
|---|---|
| | 3.6 How do you think this affects their ability to sense and respond to changes in customer and stakeholder needs? |
| **4. Relationship management** | 4.1 How do you go about building and managing |
| | relationships with your customers, stakeholders? |
| | 4.2 Can you think of a recent experience where the relationships you've formed with any of these groups which gave your team access to the knowledge or resources needed to respond to changes in customer/stakeholder needs? |
| | 4.3 Can you think of a recent experience where you've had difficulty in building and managing relationships with your customers, stakeholders and industry contacts? |
| | 4.4 How did this affect your team's ability to understand and respond to changes in customer or stakeholder needs? |

**Coordination Capability**

| Coordination component | Interview Questions |
|---|---|
| **5. Task metal model** | 5.1 What steps do you take to make sure that you understand what tasks your team has to complete? |

| | |
|---|---|
| | 5.2 How do you make sure that you understand how your BA tasks are related to the tasks of other team members? |
| | 5.3 How do you think your understanding of the relationship between your BA tasks and the tasks of others affects the team's overall coordination? |
| | 5.4 Has there been a situation in which you had difficulty in understanding how your BA tasks relate to the tasks of others? |
| | 5.5 How did this affect the team's coordination? |
| **6. Transactive memory** | 6.1 How do you make sure that you are aware of team members who have expertise related to your work? |
| | 6.2 How does your knowledge of where to locate certain expertise affect the team's coordination? |
| | 6.3 Has there been a situation in which you've had difficulty in locating the expertise you need in the team? |
| | 6.4 How did this affect the team's coordination? |

**Closing Questions**

7. Before we end the interview, is there anything you'd like to add?
8. Are there any documents you would like me to read? (Unit/team report)?

9. Are there any other people you think I should speak to?

## Appendix E: Developer and General Project Team Member Interview Questions

*Guideline*

**1. General Opening Questions**

**Just tell me a little bit about yourself:**

1.1 Role
1.2 How long have you been in that role?
1.3 How long have you worked on this team?
1.4 What does your role on this team entail?

**2. General BA Question**

2.1 What is the role of a BA on an agile team?

**Market/Environment Orientation**

| Market/environment orientation component | Interview Questions |
|---|---|
| **3. Individual market/environment orientation** | 3.1 How well do you think BAs help the rest of the team identify and respond to changes in customer and stakeholder needs? |
| | 3.2 How do BAs help your team align with the business? |
| | 3.3 Can you recall a time when BAs had some difficulty in helping the team recognise and respond to changes in customer and stakeholder needs? |
| **4. Tacit knowledge sharing** | 4.1 Are there times when you need BAs to share complex information with you? |
| | 4.2 When and how do they do it? |
| | 4.3 How do you think sharing this knowledge influences the rest and respond to changes in customer and stakeholder needs? |

| | |
|---|---|
| | 4.4 Do they ever have difficulty in sharing this knowledge? |
| | 4.5 How do you think that influences the rest of the team's ability to identify and respond to changes in customer and stakeholder needs? |
| **5. Relationship management** | 5.1 How well do you think the BAs manage relationships with customers, stakeholders and industry contacts? |
| | 5.2 Why do you say so? |
| | 5.3 Can you recall a recent experience where because of the BAs relationships and connections with customers, stakeholders or industry contacts, the team was given access to new knowledge or resources? |
| | |

**Coordination Capability**

| Coordination component | Interview Questions |
|---|---|
| **6. Task metal model** | 6.1 How well do you think your BA understands the relationship between their tasks and the tasks of others? |
| | 6.2 Why do you say so? (What do they do?) |
| | 6.3 Can you recall a time when a BAs lacked an understanding of the relationship between their tasks and the tasks of others? |
| | 6.4 How did that between affect the team's coordination? |
| **7. Transactive memory** | 7.1 How well can BAs identify team members who have expertise related to their work? |
| | 7.2 How do you think that that knowledge affects the team's coordination? |
| | 7.3 Can you recall a time where BAs had difficulty in locating the expertise they needed in the team? |
| | 7.4 How did that affect the team's coordination? |

**Closing Questions**

8. Before we end the interview, is there anything you'd like to add?
9. Are there any documents you would like me to read? (Unit/team report)?
10. Are there any other people you think I should speak to?

## Appendix F: Group Interview

*Guideline*

1. **General Opening Questions**

**Just tell me a little bit about yourself:**

1.1 Role
1.2 How long have you been in that role?
1.3 How long have you worked on this team?
1.4 What does your role on this team entail?

**Market/Environment Orientation**

| Market/environment orientation component | Interview Questions |
|---|---|
| **2. Individual market/environment orientation** | 2.1 What do BAs do to help the rest of the team identify and respond to changes in customer and stakeholder needs? |
| | 2.2 Can you recall a time when BAs had some difficulty in helping the team recognise and respond to changes in customer and stakeholder needs? |
| | 2.3How did this affect the rest of the team? |
| **3. Relationship management** | 3.1 Can you recall a recent experience where because of the BAs relationships and connections with customers or stakeholders, the team was given access to new knowledge or resources? |

**Coordination Capability**

| Coordination component | Interview Questions |
|---|---|
| **4. Task metal model** | 4.1 How well do you think your BA understands the relationship between their tasks and the tasks of others? |
| | 4.2 Why do you say so? (What do they do?) |
| | 4.3 Can you recall a time when a BAs lacked an understanding of the relationship between their tasks and the tasks of others? |
| | 4.4 How did that between affect the team's coordination? |

**Closing Questions**

5. Before we end the interview, is there anything you'd like to add?
6. Are there any documents you would like me to read? (Unit/team report)?
7. Are there any other people you think I should speak to?


**Department of Information Systems**
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5 March 2019

Request to conduct research and interview participation consent form

Dear Sir/Madam,

In terms of the requirements for completing a Masters Degree in Information Systems at the University of Cape Town a research study is required.

The researcher, in this case Mandlakazi Ndlela has chosen to conduct a case study entitled 'Exploring how Business Analysts affect the Dynamic Capabilities of Agile Software Development Teams'. The objective of the research is to identify how Business Analysts influence an Agile Team's Dynamic Capabilities. This research has been approved by the Commerce Faculty Ethics in Research Committee.

Your participation in this research is voluntary. All information will be treated in a confidential manner and used exclusively for the purpose of this study. No individual names will be recorded or published. You will not be requested to supply any identifiable information, ensuring anonymity of your responses. You can choose to withdraw from the research at any time for whatever reason, in accordance with ethical research requirements.

The data collection method will be one-on-one interviews, group interviews and the observation of a small group of the staff responsible for software development. The interviews will be conveniently conducted at your organization and will last 50 minutes. If you are willing to participate in this study, kindly sign the attached form and return to me at your earliest convenience.

Should you have any questions regarding this research, please feel free to contact me on email: ndlman015@myuct.ac.za

Your participation in this study would be greatly appreciated, but is entirely voluntary.

Sincerely,

**Mandlakazi Ndlela**
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## Appendix H: Management Consent Form

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06 February 2019

Request to conduct research and interview participation consent form

Dear Sir/Madam,

In terms of the requirements for completing a Masters Degree in Information Systems at the University of Cape Town a research study is required.

The researcher, in this case Mandlakazi Ndlela, has chosen to conduct a case study entitled 'Exploring how Business Analysts affect the Dynamic Capabilities of Agile Software Development Teams'. The researcher would like to request permission to conduct this case study at your organization. The objective of the research is to identify how Business Analysts influence an Agile Team's Dynamic Capabilities.

We would like to inform you that the ethical aspect of the research ensures the preservation of the identity of the participants, the data collected will be used purely for academic purposes. All personal details will be treated with the highest form of confidentiality. Please note that participation in this research is voluntary and participants can opt out of the study at any time.

The data collection method will be one-on-one interviews, group interviews and the observation of a small group of the staff responsible for software development. The interviews will be conveniently conducted at your organization and will last 50 minutes. The observations aim to understand the social interactions within the team and will take place at your organization. If you authorise this study to be undertaken at your organization, please kindly sign the attached form and return to me at your earliest convenience.

Should you have any questions regarding this research, please feel free to contact me on email: ndlman015@myuct.ac.za

Your organization's participation in this study would be greatly appreciated.

Sincerely,

**Mandlakazi Ndlela**
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