

# “SC-COST”: Small Consulting – Capability Oriented “Smart” Transformation

A Capability Oriented approach for Enterprise Transformation (ET) of Small Consultancy Firms (SCFs) in the era of “Smart”.

A thesis submitted to the University of Manchester for the degree of Doctor of Business Administration (DBA) in the Faculty of Humanities

2022

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### Abstract

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Digital Transformation offers many enterprises opportunities for new or enhanced business models. Most large consulting enterprises have the resources to utilise external capabilities for implementing their digital transformation policies, while Small Consulting Firms (SCFs) do not. Research in the field revealed the need for an intellectual framework for helping SCFs specify, analyse, and evaluate their digital transformation requirements themselves. Therefore, the main objective of the thesis was to develop a robust, intellectually defensible framework with a conceptual baseline, a way of working and a support tool to empower SCFs in a variety of business sectors to utilize this framework, with minimal assistance from modelling experts, in analyzing their requirements for digital transformation in a model-driven manner. Research in strategic management revealed that ‘capability oriented approaches offered the necessary abstraction and intellectual basis for such a framework. Following a Design Science Research Methodology (DSRM), an iterative approach was used. The start was an existing state of the art conceptual approach named eCORE to model the requirements, motivation and objectives for transformation. Leading to the design of the framework, named SC-COST, which consists of (a) a contextual basis that identifies how the approach can be used generically, (b) a modelling approach for enabling the representation of user requirements, (c) a tool to assist with the modelling, (d) a way of representing and using discovered patterns of capabilities for digital transformation. The framework was applied to 6 use cases of SCFs in different sectors, and the transition from an AS-IS to a TO-BE state through digital transformation was modelled. The results from these use cases were carefully analysed and synthesised to arrive at a set of patterns that would apply to many SCFs in a general way. The patterns were iterated via the use cases for validation purposes to ascertain whether the main objective was met. In the end, the thesis argues for the SC-COST framework and puts forth the proposition that it could be generalized for digital transformation with potential for broader implications to the rest of the SMEs, a proposition that will require further research in the future.



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### Keywords

Digital Transformation, Requirements Engineering, Capability Modelling, Small Consulting Firms, Strategic Management, Enterprise Transformation, Patterns, Pattern Theory, Design Science Research Methodology.

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### Acknowledgement

I would like to acknowledge and give my warmest thanks to my supervisor, professor Pericles Loucopoulos who made this work possible. His guidance and advice carried me through all the stages of my research. I would also like to thank all of the professors who guided me, giving me feedback and support along the way, including professors Pedro Sampaio, Ali Owark, Kavakli Vagelio, and Duncan Shaw. Also, thanks to all the Manchester AMBS staff and program directors who designed and organized ample opportunities to connect with colleagues and benefit from resources that made this work possible.

I would like to give special thanks to my parents, Dr Ibrahim Madany and Eng Nemat Aly, who were my closest sponsors and supporters in life, who supported me through all the turbulent times and helped me stay balanced with my work, family and study. Their prayers and encouragement were what made me go through it.

I would also like to give the utmost thanks to my wife and kids for all their sacrifices. God only knows how many nights and weekends were spent writing this thesis that was taken away from them, and I owe them for the rest of my life.

My ultimate thanks I would like to praise God Almighty, the Most Gracious, and the Most Merciful for His blessing given to me during my study and in completing this thesis.

Finally, I have a great expectation that my study will be beneficial for anyone interested in reading this thesis.



## Glossary of terms

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This glossary of terms is ordered alphabetically; references to the whole context are included in the description.

<b>Abstraction Layer</b>	In the context of conceptual modelling, an abstraction layer is a partial representation of the system description, which is achieved by reducing the scope of the conceptual model from that of the system description and/or by reducing the level of detail in the conceptual model from that of the system description. Both of these imply a process of simplification. “Simplifications are incorporated in the model to enable more rapid model development and use and to improve the transparency” of the model (Kotiadis & Robinson, 2008).
<b>Actor Dependency Model</b>	The actor-dependency model is a sub-component of the eCORE approach that focuses on the socio-technical components of the enterprise that relate to specific capabilities for the application (Chapter 3.2.2.3).
<b>Capability Model</b>	The capability model is a sub-component of the eCORE approach that focuses on the capacities and abilities necessary for a particular application (Chapter 3.2.2.1).
<b>Design Science Research Methodology (DSRM)</b>	A research methodology that lies in constructing new and innovative artefacts that solve relevant design problems. It refers to an organized and systematic approach for using the knowledge base and the design environment to execute high-quality design science research projects (Chapter 1.4).
<b>Digital Transformation (DT)</b>	Digital transformation is a subset of Enterprise Transformation (ET). It brings about improvements in the organization’s capabilities by transforming the organization’s technology, people and processes to leverage the changes and opportunities brought by digital technologies and their impact on the organization in a strategic and prioritized way (Chapter 1.2.3).



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<b>eCORE</b>	The eCORE Requirements Modelling Framework developed by (Pericles Loucopoulos, Kavakli, & Mascolo, 2020), and shown in Figure 4 in red and elaborated upon in Chapter 3.2.
<b>eCORE Tool</b>	The eCORE Tool is a modelling software extended from StarUML IDE to support the eCORE framework (Chapter 3.5)
<b>Enterprise Modelling (EM)</b>	Enterprise Modelling (EM) represent a widely accepted image of an enterprise and therefore constitutes a valuable basis for enterprise transformation (Chapter 2.3.1)
<b>Enterprise Transformation (ET)</b>	Enterprise Transformation theory, in general, is a subset of the change management theory that is a firm's ability to transform itself to ensure long-term survival, resulting in a radical change in the markets and customers it serves and its products and services (Chapter 2.2.1)
<b>Conceptual Framework</b>	<p>A specific exploration of an aspect of the theoretical framework. A conceptual framework is an analytical tool used to help organize and understand research. It can be used to structure a research project or analyze and communicate the results. Conceptual frameworks can be helpful in several ways:</p> <ul style="list-style-type: none"> <li>• They can provide a structure for organizing and understanding data.</li> <li>• They can help to identify relationships between different concepts.</li> <li>• They can be used to develop hypotheses or testable research questions.</li> <li>• They can help to communicate research results.</li> </ul> <p>In the context of this research, it refers to the SC-COST framework in particular (Chapter 3).</p>



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<b>Goal Model</b>	The Goal model is a sub-component of the eCORE approach that focuses on the enterprise's objectives for retaining, acquiring or developing the necessary capabilities for the application (Chapter 3.2.2.2).
<b>Inter-model relationship</b>	The Inter-model relationship is a sub-component of the eCORE approach that links all the sub-models of the eCORE viewpoints in such a way to understand the relationship between the different model sub-components (Chapter 3.2.2.23.2.2).
<b>Pattern</b>	A pattern is just "a description of a solution to a problem found to occur in a specific context" with an ability to explain the rationale for using the solution (the "why") in addition to describing the solution (the "how") (Meszaros & Doble, 1997) (Chapter 3.3).



# 1 Introduction, Motivation and Problem Area

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## 1.1 Introduction

Organizations regularly undergo significant transformations that represent fundamental changes, substantially altering their relationships with key constituencies (e.g., customers, suppliers, regulators) (Purchase, Parry, Valerdi, Nightingale, & Mills, 2011). Going through digital transformation for any Small-Consulting-Firm (SCF) causes management, employees, and customers much anxiety. Business owners and executives stress about it since, on the one hand, they understand how Digital Transformation (DT) severely impacts a firm's survivability, yet they do not know where to start with the transformation. They often do not have the capacity or the resources to make expensive mistakes during the digital transformation process (Henriette, Feki, & Boughzala, 2016; Tiersky, 2017). They are fearful of entertaining trials and errors at the risk of losing clients, partners or employees. Many also fear getting the requirements for transformation wrong (Boneva, 2018). They would prefer to either hire a specialized digital transformation consultant of, which they find expensive and unavailable or look for ready-made solutions out of the box that is often targetted to a specific process (like a project management system or a CRM), which often does not address the entire integrated need of the organization effectively (Pelletier & Cloutier, 2019).

In the era of "Smart", information technology and digitization continues to be a catalyst for change in all areas of business and industry, and digital transformation has a severe impact on any firm's survivability, and the consulting market is no exception (Berndtson, 2017; Werth & Greff, 2018). While large enterprises have the means and resources to utilise external capabilities for implementing their digital transformation policies, many SMEs do not (Nissen, 2018; Nissen & Seifert, 2018). Additionally, 70% of firms fail to transform effectively, and not enough research on factors that could improve transformation success (O'Connell, Delaney, & Moriarty, 2015; Ramesh & Delen, 2019).

The thesis focuses on small-to-medium sized enterprises (SMEs) in the consulting field, which are referred to as Small Consulting Firms (SCFs), and specifically on their digital



transformation requirements in the era of “Smart”. This research proposes a Small Consulting Capability Oriented Smart Transformation (SC-COST) requirements elicitation framework that combines the well-established research in Capability Oriented Requirements Engineering (eCORE) and the science of Patterns in SCFs digital transformation. The framework and patterns were iterated upon testing six use cases of SCFs through their self-digital transformation efforts, further enhancing the proposed framework and patterns. This research contributes to knowledge by proposing that the SC-COST framework (including their patterns) solves SCFs' digital transformation needs.

### 1.2 The motivation for the problem domain

#### 1.2.1 “Smart” Digital Transformation

In the past decade, our society has become increasingly reliant on the connectivity enabled by digital technologies. (Reis, Amorim, Melão, & Matos, 2018). With the rise of new digital technologies, e.g., social networks, mobile, and big data, firms in virtually all industries are conducting multiple initiatives to explore and exploit their benefits (Fitzgerald, Kruschwitz, Bonnet, & Welch, 2014). The concept of “smart” has penetrated every aspect of our lives, from small-scale gadgets such as smartphones and smart TVs to large-scale systems such as smart factories and smart cities. Terms such as “**Industry 4.0**” (Brettel, Friederichsen, Keller, & Rosenberg, 2014), “**Real Estate 3.0**” (David Snider, 2018), “**Construction 2.0**” (Oesterreich & Teuteberg, 2016) and “**Smart-Cities**” (Monzon, 2015), have been the subject of much research. They represent the “Next-Generation” advances in technology where on a technical level, it describes the increasing digitization and automation of the environment as well as the creation of a digital value chain to enable the communication between products and services and their environment and business partners (Lasi, Fettke, Kemper, Feld, & Hoffmann, 2014; Schmidt et al., 2015).

The “smart” era is driven by three primary motivators (Lasi et al., 2014):

**Macro/Micro Economic Changes:** Changes in the macro and micro-economies force new realities and trends in any industry. Higher labour costs, rising outsourcing, decentralised products and services, rising competition, and lower customer markets.



**Application pull:** Moreover, a considerable application pull exists, which induces a great need for changes due to changing operational framework conditions. Triggers for this are generally social, economic, and political changes. These are, in particular: Short development periods, Individualization on demand, Flexibility, Decentralization, and Resource efficiency.

**Technology push:** On the other hand, industrial practice has an exceptional technology push. This technology-push has already influenced daily routines in private areas. Buzzwords are Web 2.0, Apps, Smartphones, laptops, 3D-printers, IoTs, and more. Therefore, comprehensive approaches to a technology-push can be identified: Further increasing mechanization and automation, Digitalization and networking, and Miniaturization.

All of the above drivers are causing a natural shift into the era of “smart” digitization, where businesses, investors and governments are pushed to find newer and more innovative “smarter” ways to produce products and services at a much higher efficiency rate. State-of-the-art research shows new and innovative consulting business models that capitalize on the paradigm shift offered by digital transformation (Poulfelt, Olson, Bhambri, & Greiner, 2017; Shapira & Youtie, 2014), such as Virtual consulting (Nissen, Kuhl, et al., 2018; Nissen, Seifert, & Ackert, 2018; Seifert & Nissen, 2018b), crowdsourcing consulting models (Christ, Czarniecki, & Scherer, 2018; Hardt, 2018; Seifert & Nissen, 2018a), artificial intelligence (AI) enabled expert/knowledge consulting services (Flynn & Kowalkiewicz, 2018; Kim & Trimi, 2007), to name a few.

Moreover, most research on digitally transformed consulting business models discusses the impact of digital transformation, new opportunities presented, and new risks and benefits of the transformed businesses. While little discuss the transformation process, even fewer discussions are related to the small consulting firms. Overall, the coverage of the literature about SMEs transformation generalizes across all fields, whether consulting or not; similarly, coverage within the literature on consulting transformed models does not distinguish large consulting enterprises from small consulting firms (SCFs or SMEs) (Nissen, 2018). A gap exists at the intersection between the two coverage areas. Small Consulting Firms face many of the same “smart” digitization challenges as the rest of the SMEs, but they also have



unique challenges (Phil Stott, 2009). The research question we are interested in relates to how unique those challenges and opportunities are to SCFs. Whether innovation and the “smart” era differ from scale to scale? Is there a difference between SCFs and SMEs to merit further investigation?

### 1.2.2 Digitization, Digitalization and Digital Transformation

Digital Transformation refers primarily to a business model driven by “the changes associated with applying digital technology in all aspects of human society” (Stolterman & Fors, 2004). It is usually implemented through digitization, i.e. the “ability to turn existing products or services into digital variants, and thus offer advantages over tangible products” (Gassmann, Frankenberger, & Csik, 2013). It is also implemented through Digitalization, in which most existing papers deal with technological innovations (e.g. mobile technologies, analytics solutions, etc.) (Henriette, Feki, & Boughzala, 2015). Therefore, Digital Transformation is more encompassing; it affects an organization's digital capabilities and affects every other aspect, including but not limited to its business models, operational processes, and user (internal and external IT consumer) experience (Gemini, 2013; Heller Baird & Ban, 2012), in a way it affects its People, Process and Technology. Therefore, Digital Transformation happens at the organizational and enterprise levels, prompting the need to explore the latest literature on Enterprise Transformation, focusing on Digitalization and Digitization aspects.

### 1.2.3 Digital Transformation involves the transformation of People, Processes and Technology

In Enterprise transformation (ET), the unit of transformation addressed is a delineated system of complex activities involving a diverse network of stakeholders engaged in a common mission (Purchase et al., 2011). While *technology* is a key aspect of any digital transformation programme, it is only *one* component of any digital transformation strategy. The other *two* components can be grouped into *People* and *Process* (Alter, 2006). This is supported by the IT Sloan Management Review and Deloitte studies on digitalisation findings. (Kane, Palmer, Phillips, Kiron, & Buckley, 2015) continue to place the role of humans,



organisational culture and the need for formal strategic planning at the heart of successful digital transformation initiatives. Despite the prevalence of research on Digital Transformation for consulting firms that stress the importance of those components, most literature mentions that among several potential research gaps, future research is needed for explicit identification of practical transformation paths for each component (Christensen, Wang, & Van Bever, 2013; Deelmann, 2018; Kohlen & Holotiuk, 2017; Nissen & Seifert, 2018; Poulfelt et al., 2017; G. Westerman, Calm ejane, Bonnet, Ferraris, & McAfee, 2011).

A complete literature review by Gregory Vial (Vial, 2021) discusses the complexity of fully defining Digital Transformation (DT). At a high level, DT encompasses the profound changes in society and industries through digital technologies (Agarwal, Gao, DesRoches, & Jha, 2010; Majchrzak, Markus, & Wareham, 2016). At the organizational level, it has been argued that firms must innovate with these technologies by devising “strategies that embrace the implications of digital transformation and drive better operational performance” (Hess, Matt, Benlian, & Wiesb ock, 2016). Research has shown that technology is only part of the complex puzzle that must be solved for organizations to remain competitive in a digital world. Strategy (A. Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013; Matt, Hess, & Benlian, 2015) as well as changes to an organization, including its structure (Selander & Jarvenpaa, 2016), processes (Carlo, Lyytinen, & Boland Jr, 2012), and culture (Karimi & Walter, 2015), are required to yield the capability to generate new paths for value creation (Svahn, Mathiassen, & Lindgren, 2017).

The research discusses many notions to consider in developing a definition for Digital Transformation (Gong & Ribiere, 2021; Vial, 2019). The one we are concerned about in this research is, first, not organization-centric and is related to the concept of *digitalization*, which includes the “broader individual, organizational, and societal contexts.” (Legner et al., 2017). Second, our definition acknowledges improvement as an expected outcome of DT without guaranteeing its realization (Wacker, 2004). Finally, we purposefully do not define the means primitive using the term digital technologies. Instead, we use the definition of digital technologies provided by (A. Bharadwaj et al., 2013) to reinforce the conceptual clarity of our definition and its applicability over time as technology changes.



In conclusion, in the context of our research, Digital Transformation efforts need to consider technology, people and process in tandem (McKendrick, 2017). Operationally, this means closely aligning 'fundamental changes in corporate culture' (People and processes) with adopting a 'constellation of technologies' (McKendrick, 2017). Up-to-date research in practical frameworks and approaches for Enterprise Transformation and Digital Transformation touches upon all three components implicitly and explicitly (McCarthy, Serban, & Rouse, 2016; Reis et al., 2018). Therefore, any solution looking at Digital Transformation needs to address those components either implicitly or explicitly.

### 1.2.4 Small Consulting Firms differ from Large Consulting Firms and the rest of the SMEs.

Due to their role in local development, job creation, and innovation diffusion, governments see SMEs (in general) more and more as effective agents for poverty alleviation. They prosper through new business concepts and creative frameworks, enhancing competitiveness and improving the business environment, and their role in innovation is significant (Bianchi, Campodall'Orto, Frattini, & Vercesi, 2010; Gurria, 2013; Nissen, Seifert, & Blumenstein, 2018). Although large firms realize the bulk of innovation, the share of SMEs is growing, introducing innovative products, services and processes (Hollanders, 2009).

Small Consulting Firms (SCF), also known as Boutique Consulting firms, are a subset of the general SMEs specialising in consulting services. SMEs, in general, come in different sizes based on several employees, revenues, customer bases, and other variables. According to the European Union, small organizations tend to be between 1 to 250 employees, and large companies from 251 and above (Schmiemann, 2008). There are alternative scales for organizational size. For example, (Levenburg, 2005) divide small organizations into small (11-50 employees) and micro (0-10 employees).

SCFs offer a limited number of services to a relatively local client base. Most SCFs employ less than 100 consultants with a minimum of administrative support staff. These firms tend to be tightly focused on their consulting services and the industries they target and serve. For example, an SMFs might offer only operations improvement services to oil and gas



clients. This contrasts with the all-encompassing service lines and industry that focus on the Big Five and other global firms (Phil Stott, 2009).

Consultants have to face the increasing pressures of proving value to the client and doing so in a continuously evolving business climate (Kohlen & Holotiuk, 2017). The challenge is transforming the organization via new technologies (digitization) to develop capabilities to adapt and grow while maintaining quality and efficiency continuously.

There are multiple challenges for SCFs to meet their typical objectives: reducing cost and increasing efficiency and productivity while maintaining growth and innovation (Werth & Greff, 2018). In the context of digitization, their biggest challenge is identifying their problems and restructuring their organizations to cope with those challenges (Christensen, Wang, & Van Bever, 2013; Frederiksen, 2018; Poulfelt et al. This occurs in most enterprises, which has given rise to the term “digital transformation” or “enterprise transformation”. The same forces that disrupted traditional businesses, from manufacturing to publishing, are starting to reshape the consulting world (Christensen et al., 2013).

Although Enterprise Transformation (ET) – and subsequently Digital Transformation (DT) – has been studied in the context of large Enterprises and has been established to have a severe impact on a firm’s survivability (Ramesh & Delen, 2019), there are specific characteristics of Small Consulting Firms that make them more challenging than large consulting firms (North & Varvakis, 2016; Phil Stott, 2009). In the context of digital transformation, the most significant impact on consulting has been made by Information Systems (IS) in general and Information Technology (IT) in particular (Nolan & Bennis, 2003), and consulting firms cite advancing digital capabilities as a critical strategy in achieving competitive advantage (Dunford, 2000; Kim & Trimi, 2007).

Reviewing the literature shows that little research exists on how those digital transformation challenges in SCFs are addressed in the current ET frameworks (Frederiksen, 2018; Kohlen & Holotiuk, 2017; Poulfelt et al., 2017). Like large enterprises, SCFs need to change to survive, but they have more challenges than large firms that are not commonly addressed in the literature. The **motivation** for this research is driven by the need to understand and



identify those challenges, explore the established frameworks and models, address the gap in research on the study of sustainable digital transformation for SCFs, and extend current solutions to encompass SCFs.

### 1.2.5 Challenges of “Smart” digital transformation in SCFs

Although small consulting firms (SCFs) generally face many Enterprise Transformation challenges, the research will only focus on the digital transformation challenges established by the literature (Augenstein, 2018; Deelmann, 2018; Frederiksen, 2018; Nissen, 2018; Poulfelt et al., 2017). Despite the high research interest and increased research efforts in the general area of digital transformation in recent years, there still exist many gaps in our understanding of digital transformations instigated by Internet-related technologies (Besson & Rowe, 2012). One of the critical gaps concerns the efficacy of existing transformation frameworks and methods for SCFs. Moreover, much previous research on digital transformation was conducted in the pre-Internet era and, thus, did not have the opportunity to address this gap. Now that we know digital platforms and their service providers play an essential role in shaping the ecosystems in which companies compete and how they compete, we must also explore how they affect digital transformations.

While exploring the state-of-the-art literature on the topic, several papers conducted literature reviews on Digital Transformation in general; for example, Henriette *et al.* (Henriette et al., 2015) conducted a systematic literature review using the database (Scopus). Their work focused on the vulnerabilities and opportunities of digital transformation. Also, (Reis et al., 2018) propose a definition of Digital Transformation, deliver a general overview of the literature, along with some suggestions for future research, pointing out that different contributions arise by emphasizing the impact of digital capabilities on the digital transformation and the explanation on how digitalization transforms business models, operations processes and user experience. Those reviews on research in Digital Transformation show that whilst the area of research is expanding rapidly for theories and frameworks, qualitative analysis of practical transformations are relatively limited in number and tend to be animated by the multi-level perspective, practice theory and sociologies of complexity.



The overall consensus from the literature is that the initiative to benefit from “smart” digitization on firm structure and processes frequently involves transformations of essential business operations and affects products and processes, as well as organizational structures, as companies need to establish management practices to govern these complex transformations (Matt et al., 2015). Also, SMEs are facing a fast and radical change due to the maturation of digital technologies and their ubiquitous penetration of all markets (Ebert & Duarte, 2016). In order to add to the increased customer demand, companies are facing ever tougher competition due to globalization (G. Westerman et al., 2011) and putting pressure to go digital before others do, seeking to survive and attain competitive advantages (A. S. Bharadwaj, 2000).

It is apparent throughout the literature that the most significant impact on the operations of consulting in the past two decades has been made by Information Systems (IS) in general and Information Technology (IT) in particular (Nolan & Bennis, 2003), and consulting firms cite IT advancement in Knowledge Management (KM) as a core capability for achieving competitive advantage (Dunford, 2000; Kim & Trimi, 2007). It has become an essential tool for management consulting companies to deal with central issues of organizations like scenario analysis in strategic planning consulting, managing organisation information in a data warehouse, data-driven decision making through data mining, and business intelligence techniques (Galliers & Leidner, 2014). Some of the most common digitized systems include Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP) introduced by IT consulting firms that have played critical roles in management improvements. IS has become necessary for any management firm to achieve sustainable competitive advantage (Clemons, 1986). More and more consulting firms establish digital labs, digital think tanks, or own business units focusing on developing new, digitized business models (Berndtson, 2017).

However, the research collecting data from those consulting firms does not clarify what level of digital transformation they achieved and how small consulting firms successfully implemented and sustained that transformation efficiently. Empirical research shows that those consulting firms that succeed in building their capabilities tend to be large enterprises.



At the same time, SCFs focus their limited resources on their core competencies of consulting and do not have the extra resources to conduct their digital transformation effectively on their own, and often implement so with great difficulty, piggybacking on the growing popularity of a third-party digital platform and transforming themselves haphazardly with a few ready-made solutions (Li, Su, Zhang, & Mao, 2018). For example, while the steady invasion of complicated analytics and technology (big data) is a certainty in consulting, as it has been in so many other industries (Christensen et al., 2013), the viability of capitalizing on this big data within the confines of the constraints of the abilities and resources of SCFs is unclear. The vast majority of the research makes no distinction between large and small firms in that field and no analysis of the applicability and the practicality of applying those popular Digital Transformation theories and frameworks in a limited capacity and resource setting.

### 1.3 Research Aim and Questions

The research addresses the problem domain of Digital Transformation for Small Consulting Firms (SCFs), aiming to utilize the solutions provided by Capability Modelling from the perspective of Strategic Management, Requirements Engineering, and Conceptual Modelling.

The overall aim is to study and understand the challenges affecting digital transformation for SCFs, and to arrive at a sustainable digital transformation framework that addresses those challenges successfully, in such a way as to advance the practical implementation of existing models and approaches.

#### 1.3.1 The research questions

With that focus and goal in mind, the following research questions evolved from the Design Science Research Methodology process (see Chapter 1.4) throughout the lifespan of the thesis. In developing these research questions, there was a process of considering, revising and refining. The research started at the outset with the key questions, and as the research progressed, more refined sub-questions were articulated, as summarized below.



**RQ1: What are the existing Enterprise Transformation (ET) models in the context of Digital Transformation of SCFs?**

1. What is the state-of-the-art research in ET?
2. What gaps exist in the literature for SCF Digital Transformation solutions?
3. What characteristics distinguish SCF from the broader SME research that would justify further investigation?

**RQ2: Can a capability-oriented approach be successfully applied for SCF digital transformation?**

4. How does Capability modelling help address those challenges?
5. What are the key differences in the current capability approaches, and what are the similarities?
6. How can we extend the current capability approaches to work for SCFs?

**RQ3: How to develop a generic extended framework applicable to DT for SCFs?**

7. What is the identified intellectual framework to apply to practical applications in case studies?
8. How can this intellectual framework<sup>1</sup> apply to a specified number of SCFs<sup>2</sup>, leading to a new approach for helping SCFs specify, analyse, and evaluate their digital transformation requirements?
9. What kind of practical tools assist in the complex task of modelling based on the foundations of the intellectual framework?
10. What is the ontological framework for change derived from the different case studies?
11. Using the intellectual framework for change, could we develop patterns of DT for SCFs?
12. What is the effect of the developed SC-COST framework and process on the 6 SCFs?

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<sup>1</sup> Henceforth referred to as the SC-COST (Small Consultancy – Capability Oriented Smart Transformation), which includes extension to the eCORE framework.

<sup>2</sup> Six specific SCFs from different business domains.



13. How can the SC-COST framework and process extend beyond the 6 SCFs? (i.e. generalize to the broader SCFs?).

### 1.3.2 The thesis objectives

Based on the aims and the research questions above, the thesis objectives are summarized in:

14. Establish a gap in the literature and an opportunity to advance knowledge in Requirements Engineering for Digital Transformation for SCFs by answering **RQ1** and **RQ2**.
15. Design and develop a framework based on understanding from the gap in the literature review to address **RQ3**.
16. Iterate the framework application development and testing via case studies with the DSRM approach to address **RQ3**.
17. Apply modelling during the case studies' pre-transformation exercise to evolve the framework and tools in the spirit of **RQ3**.
18. Analyse the commonalities and draw insights to determine patterns to elaborate for **RQ3**.
19. Use the feedback and insights from the post-transformation interviews to evaluate the framework's approach, tools and patterns to elaborate for **RQ3**.

The end objective of the research is to develop a robust, intellectually defensible framework with a conceptual baseline, a way of working and a support tool to empower SCFs in various business sectors, to use this framework with minimal need for external consulting support.

## 1.4 Methodology: Design Science Research Methodology (DSRM) for Information Systems (IS) Research

### 1.4.1 Review of the DSRM

The research methodology follows the Design Science Research Methodology (DSRM). Design Science (DS) research is motivated by the desire to improve the environment by introducing new and innovative artefacts and the processes for building these artefacts (Hevner,



2007; Simon, 2019; Vom Brocke, Hevner, & Maedche, 2020). The design science research paradigm also delivers a framework to fortify the theoretical foundation of research on conceptual models (Vom Brocke & Buddendick, 2006). It provides clear, consistent definitions and guidelines for the research process. The defining feature of design science research lies in constructing new and innovative artefacts that solve relevant design problems. It refers to an organized and systematic approach for using the knowledge base and the design environment to execute high-quality design science research projects. Design science research builds on a wide range of shared quantitative and qualitative methods. Besides, clear research guidelines have led to extensive acceptance within the IS community. (Dolak, Uebernickel, & Brenner, 2013; Geerts, 2011; Peffers, Tuunanen, Rothenberger, & Chatterjee, 2008).

The DS process includes six steps: problem identification and motivation, the definition of the objectives for a solution, design and development, demonstration, evaluation, and communication.

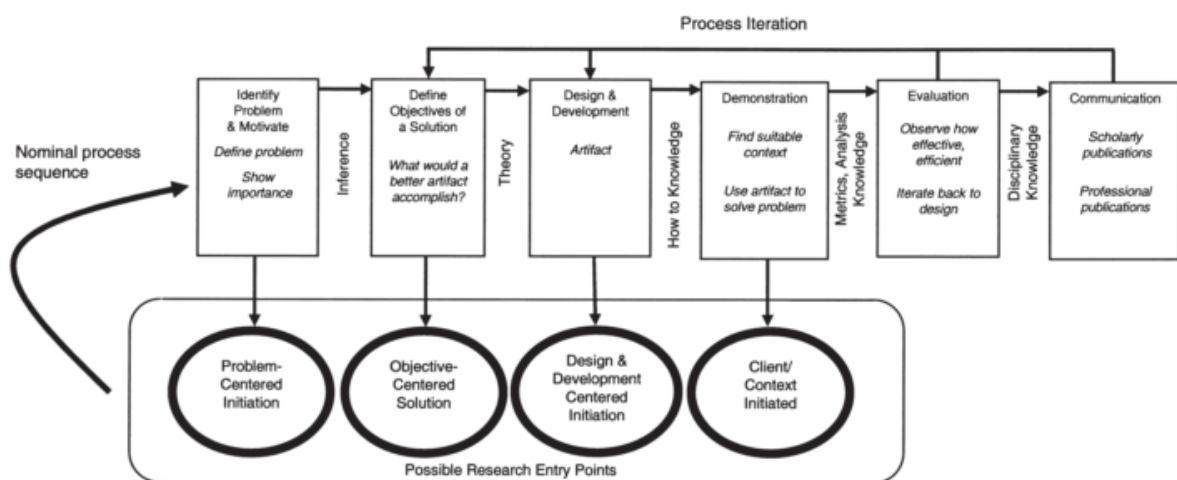


Figure 1: DSRM Framework (Peffer et al., 2008)

The research plan follows the DSRM process, with each iteration clearly defining the problem and solution. The motivation is to contribute to the industry and build on the existing body of knowledge in academia to propel one career forward and become a valuable expert and contributor. The plan for carrying over the research is to investigate the research



questions in the secondary research provided by the literature and from the empirical evidence provided via use cases.

#### 1.4.2 How the research is situated relative to DSRM

The DSRM diagram (Figure 1) is applied to the research using the following structure in Table 1 (R. Wieringa & Morali, 2012; R. J. Wieringa & Heerkens, 2007). This table indicates what this thesis offers and where to find it.

**Table 1: How the DSRM maps into the thesis Chapters**

DSRM Phase	Thesis Contribution	Relevant Thesis Part
<b>Identifying the Problem Area</b>	1. Assess the state-of-the-art research on addressing the challenges of “Smart” digitization in the context of Enterprise Transformation for SCFs	The literature review Chapter 2.2
	2. Identify the research goals in terms of priorities and KPIs by identifying the characteristics of the problem domain.	Chapter 2.2 The problem axis: Small Consultancy firms in the context of Enterprise transformation through digitization
	3. Identify the gap in the field between the state of the art and desirable improvements.	The solution axis Chapter 2.3
	4. Identify the challenges that arise by investigating digitization efforts in the industry by looking at several use cases, namely the 6 SCFs).	Modelling the use cases Chapter 4 supported by case study investigation noted in the Appendices Chapter 5 of each case study



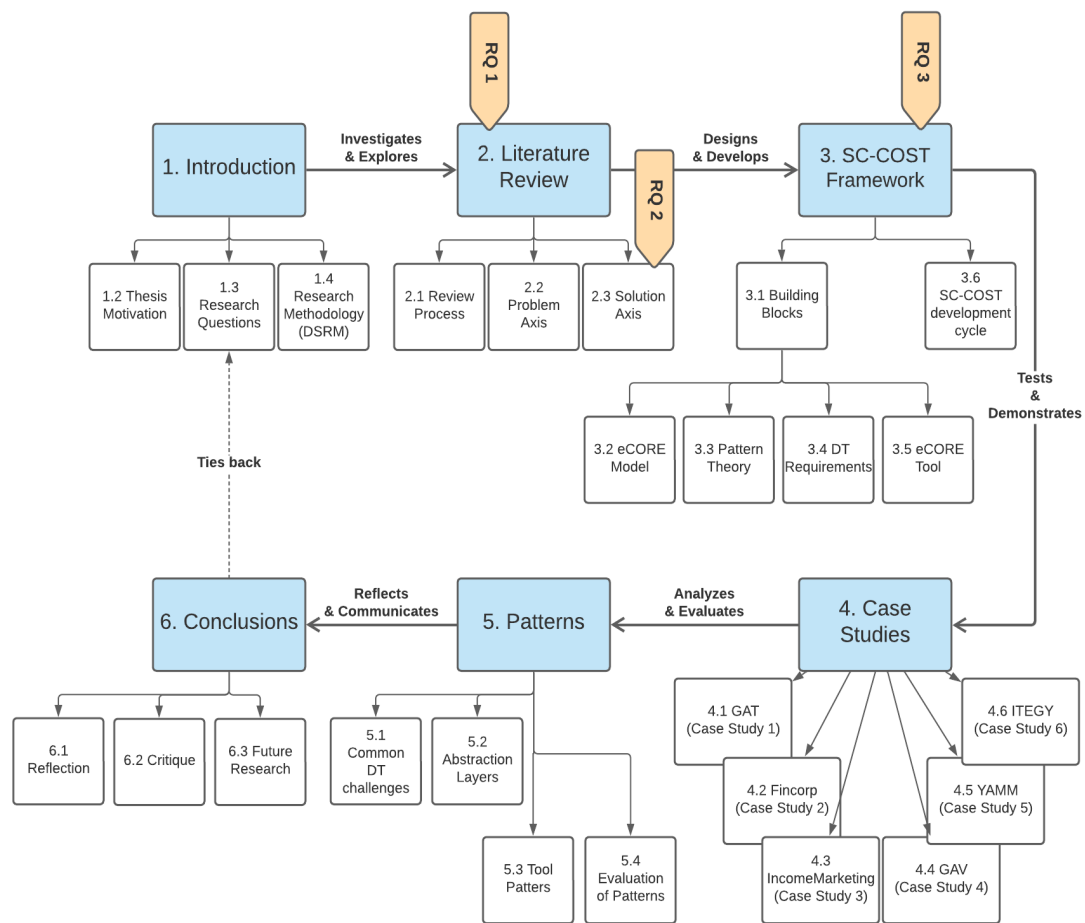
<b>Defining the Objectives of a solution</b>	<p>The research is interested in supporting design activities for the chosen problem area, so we are interested in conceptual modelling solutions. To this end, the work will need to:</p> <ol style="list-style-type: none"> <li>1- Justify the use of Strategic Management, Requirements Engineering, and Conceptual Modelling as a viable approach to bridging the research gap.</li> <li>2- Justify the use of a capability modelling approach to bridging the research gap.</li> </ol>	<p>Argued in literature review Chapter 2.3 The solution/research axis: Capability Modelling based on perspectives from Strategic Management, Requirement Engineering, and Conceptual Modelling and Chapter 2.3.2 Capability Modelling</p>
<b>Designing and Developing the new artefact</b>	<p>20. In support of the theoretical framework and its components and to be able to apply it in real-world situations:</p> <ol style="list-style-type: none"> <li>1- Research and design a new implementation framework SC-COST that extends eCORE to customise it to the needs of SCF for Digital Transformation.</li> <li>2- Develop a process of using the SC-COST.</li> <li>3- Explore the importance of pattern theory and design as part of the artefact.</li> </ol>	<p>Chapter 3 developing the SC-COST Framework</p>
<b>Demonstrating</b>	<p><b>Demonstrating</b> the approach of case studies chosen from the problem area and <b>reflecting</b> on the results. This will:</p> <ol style="list-style-type: none"> <li>1- Act as proof of concept.</li> <li>2- Extract new knowledge that can be of benefit to the research community.</li> </ol>	<p>Chapter 4 Modelling the use-cases</p>



	3- Apply the SC-COST patterns and process on the six use cases.	
<b>Evaluating</b>	<b>Evaluating</b> the artefact SC-COST framework 1- Assess whether it is feasible and useful. 2- Assess whether it offers an improvement over current practice. 3- What feedback does it offer to assess if the problem is well understood, if the assumptions are appropriate, if the quality of the design process is appropriate, and if needed, refinements for the artefact (Hevner, March, Park, & Ram, 2004)? 4- Theorize or explain why the SC-COST did or did not work in a particular environment.	Chapter 5 Analysis of the case studies and the emergence of patterns
<b>Communication</b>	<b>Communicating</b> the findings in the thesis and concluding with reflections on: 1- Assess the Managerial implications. 2- Critique in light of research questions. 3- Future research.	Chapter 6 Discussion and conclusion including Managerial implications, Critique in light of the research questions and future research.



## 1.5 Navigating the thesis



**Figure 2: Navigating the thesis**

Figure 2 maps the thesis outline. The introduction in Chapter 1.1 and the motivation discussed in Chapter 1.2 lead to research objectives and questions introduced in Chapter 1.3. The research methodology (DSRM) used for examining these research questions is outlined in Chapter 1.4.

Chapter 2 presents the literature review to answer Research Questions **RQ1** and **RQ2** and discuss the research gaps. Chapter 2.1 outlines the Literature review methodology and process, followed by examining the literature in the problem and solution domains in Chapters



2.2 and 2.3, respectively. The Literature review in Chapter 2.4 concludes with a summary of findings from the literature.

Chapter 3 introduces the SC-COST framework, which addresses the first part of Research Question **RQ3**. The framework's design is explained in Chapter 3.1, followed by a deeper discussion of its four building blocks: eCore Modelling, Pattern Theory, DT Requirements, and eCORE Tool, detailed in Chapters 3.2, 3.3, 3.4, and 3.5, respectively. The development lifecycle for the SC-COST framework is detailed in Chapter 3.6. Following a DSRM methodology, Chapter 4 then iterates over the six case studies to test, demonstrate and evaluate the SC-COST framework and its artefacts. The findings and analysis are presented in Chapter 5, where the solution proposed of Research Question **RQ3** is addressed. Commonalities in Digital Transformation Challenges are explained from the case studies in Chapter 5.1, followed by commonalities in structural and process elements layered out in the multiple Abstraction layers in Chapter 5.2, which combined formulate the patterns described in Chapter 5.3. An evaluation of those patterns is then presented in Chapter 5.4.

Finally, Chapter 6 discusses the critique and managerial implications and future research.

### 1.6 Summary and reflections

In summary, Digital Transformation severely impacts any firm's survivability, and the consulting market is no exception (Chapter 1.2.1). Digital transformation is more encompassing than Digitization or Digitalization, as it involves transforming People, Processes and Technology (Chapter 1.2.3). "Smart" Digital Transformation is SCFs are different from large enterprises because they face challenges in their Digital Transformation journey that are not commonly addressed in the literature. The **motivation** for this research is driven by the need to understand and identify those challenges, explore the established frameworks and models, address the gap in research on the study of sustainable digital transformation for SCFs, and research extending current solutions to encompass SCFs (Chapter 1.2.4 and Chapter 1.2.5).



## 2 The Literature Review

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The following Chapters analyse the findings of each concept, along with a critical review of their value to the research. Chapter 2.1 discusses the literature review methodology and process; Chapter 2.2 analyzes the state-of-the-art literature pertaining to the concepts in the Problem domain. Chapter 2.3 analyzes the state-of-the-art literature about the concepts in the Solution domain. The goal of the review is to examine the influential researchers and research groups in the field, distinguish what has been done from what needs to be done, discover essential concepts relevant to the topic, identify relationships between ideas and practices, establish a context of the topic or problem, and relate ideas and theories to applications.

### 2.1 The Literature review Methodology & Process

#### 2.1.1 Literature Review Context

The research is about Digital Transformation Requirements for Small Consulting Firms (SCFs). It was essential initially to distinguish between literature review questions (i.e., questions that can be answered by reviewing the secondary research) and empirical research questions (i.e., questions that can be answered only through primary research), with the understanding that the literature review is the primary source of the empirical research question (Randolph, 2008). That distinction led to asking the first and second research questions, which fall under the definition of secondary research:

**RQ1: What are the existing Enterprise Transformation (ET) models in the context of Digital Transformation of SCFs?**

21. What is the state-of-the-art research in ET?

**22.** What gaps exist in the literature for SCF Digital Transformation solutions?

23. What characteristics distinguish SCF from the broader SME research that would justify further investigation?



To answer this initial research question, analysis of the literature was akin to the process followed by a Systematic Literature Review. The *Motivation* (Chapter 1.2) aimed to understand the context of the problem. It represented the first step in researching the literature on problems faced by “smart” digitization for SCFs (Chapters 1.2.1 & 1.2.4). This has led to identifying different forms of research that affect the domain of consulting in digitization and touching the topic from multiple perspectives. It became clear that exploring the gap in those topics needed diving into the latest research on identifying the problems and exploring research that addresses the possible state-of-the-art solutions. Therefore, the structure of the research analysis on Digital Transformation was broken down into two axes: The problem domain and the solution domain. The identified *problem* domain we are interested in is Enterprise Transformation (ET) for Small Consulting Firms (SCFs) in the context of digitization. While the *solution* domain we are interested in is addressed via Strategic Management, Requirements Engineering, and Conceptual Modelling. If our goal is to develop a model that can identify the gaps in capabilities, then substantial research on the current state-of-the-art enterprise modelling, architecture, and transformation offers multiple approaches to analyse the *problem* and the *solution*.

Therefore, the two focus areas for answering **RQ1** were:

1. Research the state-of-the-art in the Problem Domain: Enterprise Transformation for Small Consulting Firms in the context of digitization.
2. Research the state-of-the-art in Strategic Management (SM), Requirements Engineering (RE), and Conceptual Modelling (CM) pertinent to SCF transformation and Justification of the use of these foundational topics in addressing the identified problems.

Figure 3 describes the different components of the structure and the flow of the research logic:



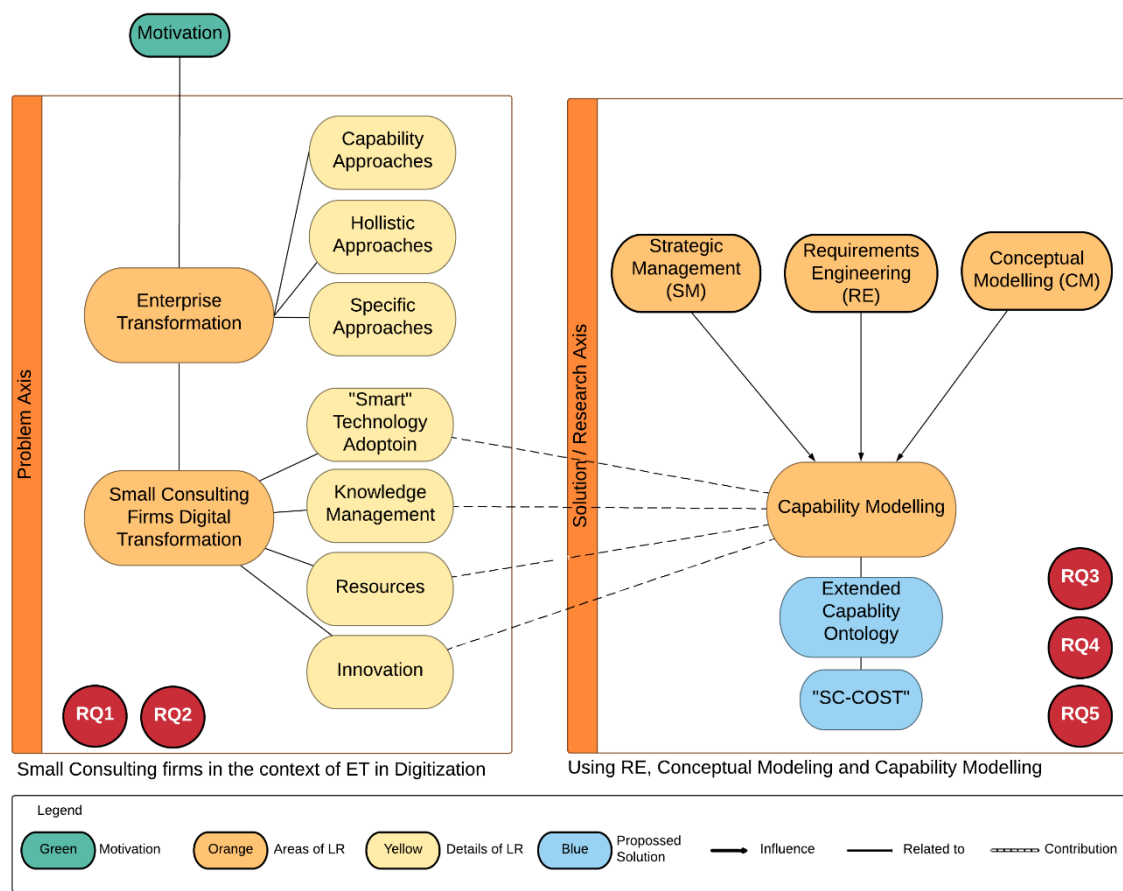


Figure 3: The Literature Review components and relationship to research questions

24. The **Motivation (Chapter 1.2)**, represented as a Green bubble, aims to understand the context of the problem axis. It represents the first step in researching the literature on problems faced by “smart” digitization for SCFs (Chapter 1.2.1 & 1.2.4). This has led to identifying different forms of research that affect the domain of consulting in digitization and touching the topic from multiple perspectives. It became clear that exploring those topics needed to split the research into a problem and solution domains.
25. The **Problem Axis (Chapter 2.2)**, represented in the Left box in Figure 3: Much of the research discusses Enterprise Transformation (ET) in multiple contexts and setups. The motivation thus led to focus on structuring the problem axis around the domains of Enterprise Transformation & Digital Transformation in the context of SCFs, by first researching the approaches used within Enterprise Transformation (Chapter 2.2.1), and



the characteristics related to the problem areas presented by the digital transformation of SCFs (Chapter 2.2.2).

**26. The *Solution Axis* (Chapter 2.3):** Reading through the literature on Enterprise Transformation, I explored three referenced fields: capabilities (in the Strategic Management Literature), requirements engineering, and conceptual modelling to address Enterprise Transformation goals and challenges. This led to identify Capability Modelling as a potential novel research area in the solution space in addressing those challenge areas in SCF digital transformation. The relationship between Capability Modelling and the identified challenges is represented as dotted lines in Figure 3. It is important to note that The three aforementioned fields heavily influence capability modelling:

- a. Strategic Management in the context of Capability Modelling: explaining the different approaches to capability modelling, whether Resource-Based or Dynamic Capabilities (Chapter 2.3.2.1).
- b. Requirements Engineering in the context of Capability Modelling: as an established underlying approach in eliciting requirements for transformation (Chapter 2.3.2.2).
- c. Conceptual modelling in the context of Capability Modelling: which is the tools (artefact) to visualize and model the As-Is, To-Be, and the required transformation of capabilities Chapter (2.3.2.3).

**27. The Research Questions and Contributions, represented in Red Circles:** The outcome of the LR process justifies the Research Questions (RQ1-4), **RQ1** in the problem domain, **RQ2**, and **RQ3** are depicted in the solution domain. The primary outcome, the artefact as referred to in DSRM, (represented in Blue Bubbles), is (a) an Extended Capability Ontology for SCFs, and (b) a framework based on this ontology and a process on the way that the framework could be used in practical situations for digital transformation, referred to as **Small Consulting – Capability Oriented “Smart” Transformation (SC-COST)**.

### 2.1.2 The literature review process

The literature review planning considers how it fits into a well-known framework for structuring Literature Reviews, namely Cooper’s Taxonomy of Literature Reviews (Cooper, 1988).



Cooper suggested that literature reviews can be classified according to six characteristics: *focus, goal, perspective, coverage, organization, and audience*.

1. **Focus:** The literature review focused primarily on *Practices or applications* of Digital Transformation for SCFs, to help establish a practical need not currently being met. Other types include a focus on *research outcomes*, focus on *research methods*, and focus on *theories*. Although it may have been touched upon non-intentionally, the latter three focuses were not the key focus of the analysis.
2. **Goal:** The literature review aims to justify a later investigation; therefore, the emphasis is on critically analyzing the literature to identify weaknesses to remedy. Other typical primary goals not followed in this analysis are integrating quantitative outcomes across studies or explicating a line of argument within a field.
3. **Perspective:** Since this is a qualitative review, preexisting biases exist, a discussion on how those biases might have affected the review follows in Chapter [TBD]
4. **Coverage:** The coverage approach considered in this literature review was to take a *representative sample* of articles and make inferences about the entire population of articles from that sample. The sampling was based on the most cited and the highest-ranked. More details on the coverage are in Chapter 2.1.2.
5. **Organization:** The organization format was a *conceptual format*, whereby the different concepts broke down according to the literature's various theories and frameworks. Other possible organization formats not followed in this analysis include *historical and methodological formats*.
6. **Audience:** The intended primary audience of this review was the supervisor and the dissertation examiners. The scholars within the field that the dissertation relates to are the secondary audience. The review was not intended for a non-academic audience, including practitioners, policymakers or the general public.

### 2.1.3 Coverage of the Literature

The overall Literature Review investigated the relevant publications deeply and broadly using aspects of the Systematic Literature Review (SLR) process (Kitchenham & Charters,



2007), combined with the relevant literature reviews conducted by other researchers on the topic area (Coombes & Nicholson, 2013; Henriette et al., 2015; Reis et al., 2018). The objective is to structure the literature review, and it was deemed appropriate to consider state of the art in both the problem and solution domains. This was to identify any research gaps in the topic of Enterprise Transformation in the context of digitalization for SCFs.

The literature review included a broad and automated search to find papers published in the period before 2019. This search was conducted using the University of Manchester library and covered Social Sciences Citation Index (Web of Science) Database (Appendix 7.1.1), and utilized the following keywords to undertake a search for relevant work using the: “Enterprise Transformation” OR “Digital Transformation” to identify papers relevant to digital transformation in the problem space. To further narrow the search, specific fields were excluded (Appendix 7.1.2). The keyword search returned 698 articles, and 286 papers were downloaded for investigation. Another search was conducted for the solution space: “Capability Modelling”, “Conceptual Modelling”, “Requirements Engineering” & “Dynamic Capabilities”, and got narrowed down to the area of Strategic Management since the resulting pool was significantly large, the result was 909 relevant articles of which were narrowed down to 610 articles. After reading the papers, a subset of papers was qualitatively identified related to our area of study and filtered out non-strategic management-related papers such as research in computer science, software engineering, medical literature, jurisprudence, or the law.

Table 2 summarizes the conceptual fields, related topics and the number of papers selected for the review, while Appendix 7 demonstrate an accurate record of the date of each search, the databases searched, the keywords and keyword combinations used, and the number of records resulting from each search.

**Table 2: Literature review papers filtered**

Field	Related topics	Number of papers
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Enterprise Transformation	ET Frameworks, Enterprise Architecture Modelling (EAM), Enterprise Modelling (EM)	146
Digital Transformation	Digitization, Digitalization	140
Requirements Engineering	Requirement elicitations, Requirement modelling	273
Conceptual Modelling	Meta Modelling, Conceptual models	223
Capability Modelling	Dynamic Capability, Capability Modelling, Resource-Based Capabilities	114

Initial findings suggest that although the number of papers on Enterprise Transformation in Digital Transformation has evolved, it was after 2014 that the numbers increased significantly. The papers on Requirements Engineering, the earlier papers since the early '60s, mainly focused on Software Engineering and programming peaking in numbers in the early 2000s. However, since 2000, many specialisations reflect developments related to social, political and business considerations. Newer research in RE shifted from software-only research into other domains, including business transformation, usability, and modelling.

## 2.2 The problem axis: Small Consultancy firms in the context of Enterprise transformation through digitization

### 2.2.1 Enterprise Transformation (ET) in the context of Digital Transformation

While digital transformation has its challenges, existing research indicates that the digital phenomenon is an opportunity to innovate and redefine how organisations do business (A. Bharadwaj et al., 2013). companies take different approaches to digital transformation and react differently to the challenges it presents to their operational and business models (G. Westerman, Bonnet, D., & McAfee, A., 2012).



A significant body of literature worth investigating is Enterprise Transformation (ET), which is well fitted within several contexts, including that of “digitization” or “digital transformation”, as repeatedly mentioned throughout the literature (Ash & Burn, 2003; Aspara, Lamberg, Laukia, & Tikkanen, 2011; Labusch & Winter, 2012; Rouse & Baba, 2006; Sarker & Lee, 1999; Teo, Tan, & Wei, 1997; G. Westerman et al., 2011). By analyzing the subset of research in the ET literature with a digitization focus, we can understand the state-of-the-art research in the problem domain.

Enterprise Transformation theory, in general, is a subset of the change management theory that has been analyzed on a spectrum: “realignment” versus “transformation” (Balogun and Hope-Hailey, 2008); “incremental” versus “radical” (Baden-Fuller and Stopford, 1995); “incremental change” versus “reinvention” (Goss, Pascale, and Athos, 1998). While process improvements and other incremental changes may be sufficient for a particular enterprise’s challenges, in some cases, addressing these strategic challenges may involve enterprise transformation, which concerns routine change and fundamental change (Rouse, 2005a, 2005b). Therefore, ET is a firm’s ability to transform itself to ensure long-term survival, resulting in a radical change in the markets and customers it serves and its products and services (Stockport, 2000).

Digital Transformation is a further subset of the ET theory, motivated by the common consensus that IT is no longer just a technological tool to improve internal processes' efficiency. By becoming an essential part of the value creation, it grows into a new competitive advantage source and thus takes a transformative role (Lusch & Nambisan, 2015). There is much support in the literature for Enterprise Transformation to adapt to Digitization and “Smart” technological challenges (Agostini & Filippini, 2019; A. G. Frank, Dalenogare, & Ayala, 2019; Preindl, Nikolopoulos, & Litsiou, 2020).

There is no doubt regarding the importance of Digital Transformation (DT) as an Enterprise Transformation (ET) strategy for organisations' survivability and success in today’s highly technology-driven world. The literature is rich with research that asserts the notion that DT is essential for the survivability of the firm, its competitiveness, and for sustaining growth (Galliers & Leidner, 2014; McKelvie, Brattström, & Wennberg, 2017; Morschett, Schramm-



Klein, & Zentes, 2015; North & Varvakis, 2016; Ramesh & Delen, 2019; Rouse, 2005b; Wirtz, Schilke, & Ullrich, 2010; Wißotzki, 2018).

However, despite the widespread research emphasizing Digital Transformation prevalence and importance as an integral part of current Enterprise Transformation efforts, 70% of firms fail to transform effectively (Ramesh & Delen, 2019). Some of the reasons attributed to this failure to poor timing (Granqvist & Gustafsson, 2016; Leng, Liu, Tan, & Pang, 2015; Schoenecker & Cooper, 1998; Whipp, Adam, & Sabelis, 2002), resistance to change, lack of a clear vision, poor leadership (Alos-Simo, Verdu-Jover, & Gomez-Gras, 2017; Kovačič, Hauc, Buh, & Štemberger, 2018), lack of transparency (Flyverbom, Christensen, & Hansen, 2015), lack of stakeholder participation (Ljungholm, 2015), ineffective gathering and leveraging of data, inflexible technology stack and development process, and marriage to legacy business models (Tiersky, 2017). Unfortunately, to many leaders, stories of the innovative firms that succeed in their Digital Transformation do not make sense for their traditional older organisations burdened with inflexible legacies (G. Westerman, Bonnet, D., & McAfee, A., 2012).

Devising theories and models for successful digital transformation is in progress and an active area of research. Over several years, the authors conducted surveys, interviews and analyses on how established companies respond to digital disruption and transformation failures (Rader, 2019), and as a result, multiple research areas emerged.

For example, an active area of research is “Digital Maturity”, which is closely related to digital transformation (G. Westerman, Bonnet, D., & McAfee, A., 2012). It explores measures to identify the level and extent of digitalization solutions on the company strategy, organization, people, technology and data (Dominguez, 2017). Multiple frameworks and models emerged from that theory to analyse the states of organizations; however, most of the methodologies emerging require further testing to verify their universality and applicability to various fields, especially in the areas of services (including consulting firms), education, medicine, knowledge management and more (Aslanova & Kulichkina, 2014).

Another active area of research involves decision support tools, for example, a digital transformation decision-support guide for managers, which would support them from an ad hoc



technology-driven approach to a more systematic integrated approach to digital transformation. However, multiple researchers suggest testing the decision support guide as part of the digital transformation strategy for multiple contexts, leaving the door for future research into its applicability (Heavin & Power, 2018).

These areas primarily research and analyze the problem domain, exposing several gaps for future research. Some of those gaps concern effective digital transformation requirement elicitation, efficient representation of the status quo (accurate modelling), organized strategic thinking, decision analysis and implementation, and impact assessment and measurements. It suggests a gap in synthesizing the state-of-the-art theory into a workable focused framework that could effectively analyse, devise, and achieve an effective and efficient problem definition that could lead to a practical solution, particularly for Small Consulting Firms (SCFs).

### 2.2.2 Problems facing the application of ET for SCFs

Although differences are present across many industries, either in production or services (Terziovski, 2010; Werth & Greff, 2018), Small Consulting Firms face unique challenges different from large consulting firms (North & Varvakis, 2016). To organize them for the review, the research divided them into four groupings: (1) Limited Resources, (2) Conflicting goals and outcomes Conflicting goals and outcomes, (3) Inconsistent strategy, and (4) Poor capacity for Knowledge Management.

#### 2.2.2.1 Limited Resources

When facing transformation, small firms' main disadvantage stems from lower resources (Laukkanen, Sarpola, & Hallikainen, 2007). These resource limitations are both human and financial:

1. **Human Resource Limitations:** Since consulting is traditionally considered a highly human-centric domain, consulting companies are mostly not a good example of scalability. There is a linear correlation between people and project activities: it requires more consultants for a consulting firm to perform more projects. This limit is further pronounced in small consulting firms, where it limits the expertise available and the



time on hand to set aside for transformation efforts, putting small firms at a more considerable disadvantage than large organizations. This limitation extends to the poorer acquisition of necessary external skills, leadership, and people to advance the transformation (Love & Roper, 2015).

2. Financial Resource Limitations: Limited External financing (Love & Roper, 2015) makes it somewhat challenging to perform a holistic and sustainable transformation and is especially pronounced for smaller, less resourceful organizations. (Karvonen, Sharp, & Barroca, 2018).

One insight into the advantages for small firms is that, due to their limited resource, they tend to be more effective in using different innovation practices when introducing new products and services on the market, whereas this is more minor for large firms. Turnover from new products in small firms is driven by intellectual property protection mechanisms, while large firms, in this case, benefit more from their search strategies (Spithoven, Vanhaverbeke, & Roijakkers, 2013).

Research has shown that providing a capabilities-focused framework, specifically IT and knowledge management capabilities, could help with scaling and stretching those limited resources beyond the traditional linear model (Werth & Greff, 2018), which justifies the need for further research into tools and frameworks working within the constraints of the limitations presented.

### 2.2.2.2 Conflicting goals and outcomes

The literature presents findings that suggest major decision and goal-setting challenges/dilemmas facing managers, such as setting the right priorities (Tiersky, 2017), focusing on aggregate data or personalising solutions (Tiersky, 2017), providing more resources to IT staff vs more self-service analytics (Panetta, 2016), storing all data vs selecting data to store that serves a specific purpose (Tiersky, 2017), work performed by people vs computing machines (Davenport & Kirby, 2016; Newman, 2017), Security vs accessibility (Filkins et al., 2016), and privacy of individuals vs understanding of an individual.



Literature concerned with this perspective typically falls under the major research fields of Requirements Engineering (Ebert & Duarte, 2016; Yang, Li, Chen, & Jin, 2014; Yue, Briand, & Labiche, 2011) and goal modelling (Horkoff et al., 2014). The incredible body of research in these two fields intersects with a subset of specialized research named Goal-Oriented Requirements Engineering (Ott, 2012). Multiple systematic literature reviews have been conducted with different focuses, goals and perspectives on those topics with multiple frameworks, ontologies and models. The importance and coverage in most Digital Transformation literature to understand goals and requirements are profound (Vial, 2019), and any practical Digital Transformation solution must encompass it in its process.

### 2.2.2.3 Inconsistent strategy

Strategies often conflict when seeking Digital Transformation (Kane et al., 2015); for example, companies confuse innovation with “Smart” Technology adoption (Laukkanen et al., 2007) (O'Connor, 2008; Spithoven et al., 2013). Companies also fail to understand the difference between information system adoption and IT alignment (Dwivedi, Papazafeiropoulou, Gutierrez, Orozco, & Serrano, 2009). Those inconsistencies present themselves across the Digital Transformation spectrum that spans from Operational strategy affecting products, markets, and processes, to Functional strategies affecting finance, human resources and IT (Matt et al., 2015). The consequences of those conflicts impact IP ownership, capital investment and equipment acquisition, decisions on in-house R&D spending and planned efforts in Design and more (Love & Roper, 2015). Combined with the concern for limited resources, Small Consulting Firms (SCFs) face great odds at failing in their Digital Transformation efforts.

Literature suggests that while the basic foundations on digital transformation strategies have been laid, there are various opportunities for further research, which can be divided into at least three different topics (Matt et al., 2015): (1) Elements and Success Patterns of Digital Transformation Strategies: whereby research could support firms by providing guidance on the assessment of their existing technological capabilities and on procedures to weigh up their current options, as well as guidance on the design of training procedures for current employees and new hires. (2) Procedural Aspects and Responsibilities: research



should provide recommendations for the concrete alignment between the new responsibility of a “Digital Officer/specialist” and the rest of the responsibilities within the organization (A. M. Johnson & Lederer, 2010). Finally, (3) Integrating Digital Transformation Strategies into the organizations’ functional and operational strategies: aligning IT strategies with other strategies has remained a problematic and controversial endeavour. Given the relatively recent appearance of digital transformation strategies, further evidence is needed on how this alignment can be conducted in practice – related to IT strategies and organisational perspectives. Research should provide guidelines for firms to help structure these processes in order to achieve shared goal-setting, the alignment of different strategies, and cooperation between various people and entities throughout a firm (Balogun & Hailey, 2008; Karvonen et al., 2018; Matt et al., 2015; Nightingale, 2015; Stockport, 2000).

### 2.2.2.4 Poor capacity for Knowledge Management

Consulting is an industry whose core product is knowledge; as one expert put it, consulting firms are in the business of “selling brain-power”(Verlander, 2012). While the broader service industry realizes that knowledge management (KM) is essential for them to remain agile in a dynamic business environment and are increasingly investing in various KM initiatives (Pee & Kankanhalli, 2009), consulting firms are even more so, since consulting firms’ primary revenue model is selling their expertise, skills and knowledge to customers. Thus, managing knowledge is the most critical process in the consulting industry (Kim & Trimi, 2007).

SCFs suffer more than Large Consulting firms in Knowledge Management capacity (Ambos & Schlegelmilch, 2009), with organizational suffering from lower abilities for the generation of new knowledge and a lower absorptive capacity of external knowledge (Love & Roper, 2015). As the importance of organizational knowledge and IT's role for KM increase, choosing the right transformation strategy for different KM strategies to enhance the generation, dissemination, retainment, and reusability is critical in boosting SCFs competitiveness. Unfortunately, with smaller consulting firms, the available KM transformation strategies pool is limited due to resource and capacity limitations (Kim & Trimi, 2007).



Digital Transformation efforts where the key emphasis of investigations was knowledge management has often been focused on IT strategies (Carr, 2003; Moffett, McAdam, & Parkinson, 2003). However, the literature emphasizes an increasing need for a coherent and comprehensible set of principles and practices to guide KM implementation, recognizing that KM is a complex undertaking involving people, processes, and technology (Wong & Aspinwall, 2004) akin to a complete Enterprise Transformation.

Therefore, research into successful solutions for Digital Transformation (DT) for Small Consulting Firms (SCFs) must satisfy the knowledge component in their transformation strategy. The literature is compartmentalized either with theories for knowledge management transformation in general (Moffett et al., 2003; Smith & Fingar, 2003; Wong & Aspinwall, 2004) or theories for the competitive advantage of knowledge management for consulting firms (Ambos & Schlegelmilch, 2009; Pee & Kankanhalli, 2009; Pilsmo, 2010). A gap lies at the intersection of both research fields concerning practical transformation strategies for small consulting firms to capitalize on those competitive advantages. This gap widens when considering the remaining challenges mentioned earlier.

### 2.3 The solution/research axis: Capability Modelling based on perspectives from Strategic Management, Requirement Engineering, and Conceptual Modelling

In this Chapter, we explore the state-of-the-art literature in the solutions axis for Enterprise Transformation and critique it in the context of Digital Transformation for SCFs (Chapter 2.3.1), followed by a discussion of the gaps for one of the selected active areas of research: Capability Modelling (Chapter 2.3.2).

#### 2.3.1 Existing Enterprise Transformation frameworks and models

Many frameworks, approaches, and strategies for Enterprise Transformation in digitization have been identified (Kohlen & Holotiuk, 2017; Kotnour, 2011; Matt et al., 2015; Reis et al., 2018). Based on the literature search, and was able to group them into three approaches as follows:



### 2.3.1.1 Holistic approaches

Some frameworks take holistic approaches, considering all facets of the enterprise and its environment, such as the *ARIES framework* (Nightingale, 2015). Also, *Enterprises as Systems* (Rouse, 2005a) whereby Enterprise Modelling (EM) in the form of Enterprise Architecture (EA) represent a widely accepted image of an enterprise and therefore constitutes a valuable basis for enterprise transformation (Aier & Gleichauf, 2010). While enterprise architecture (EA) describes the fundamental structures of an enterprise, The science of Enterprise Architecture Management (EAM) is concerned with the establishment and coordinated development of EA to respond to business consistently and IT goals, opportunities, and necessities (Haren, 2011). EAM is often found to support the management of ETs (Asfaw, Bada, & Allario, 2009; Dorsch & Häckel, 2012) by guiding the necessary efforts (Abraham, Aier, & Labusch, 2012; Harmsen, Proper, & Kok, 2009). EAM is considered a valuable source for top management information support and strategy development (Asfaw et al., 2009; Venkatesh, Bala, Venkatraman, & Bates, 2007). EAM is also supposed to support ET decision processes on various hierarchical levels (Asfaw et al., 2009). EAM also approaches ET as a Work System Method, whereby it dissects the transformation into People, Process and Technology and looks at the needs to transform within the context of a change of those three fundamental components (Alter, 2006).

Literature discussing holistic approaches is, in principle, generalized and abstract enough to apply to most contexts. Moreover, they are necessary for providing the scientific foundation for pursuing practical transformation applications. Most of the gaps lie in their applications to small contexts such as Small Consulting Firms (SCFs), primarily since most of the application research was generated by quantitative and qualitative data from large complex enterprises (Horkoff, Jeusfeld, & Persson, 2016). SCFs are not large enough enterprises to merit the complexities provided by some of those frameworks, and little evidence is shown in the research as to whether the differences were considered. Further research is needed to test their practicality in their current format for multiple contexts, such as SCFs.



## Chapter 2: The Literature Review

### 2.3.1.2 Capabilities approaches

Another interesting approach is to look at Enterprises as a **set of Capabilities** to be transformed or developed.

A Capability Driven Development Approach (CDD) integrates organizational development with Information Systems (IS) development, taking changes in the solution's application context into account. The approach is based on an Enterprise Modelling (EM) process – it is based on EM components understandable to business stakeholders, such as goals, KPIs, processes, and resources. In the CDD meta-model, patterns represent reusable solutions for designing business processes and resources and supporting IT components to deliver a specific capability in a given context (Bērziša et al., 2015). Therefore, capability-based methods assist in identifying, structuring, and managing Enterprise Architecture Management (EAM) capabilities, optimising enterprises' economic impacts of EAM, and supporting business and IT alignment (Wißotzki, 2018).

Other examples of a Capability approach are the *Agile* and *Agility Theories* and Methods, whereby strategic business management views agility as an organizational capability related to management under deep uncertainty, resource fluidity and continuous business model renewal (Dikert, Paasivaara, & Lassenius, 2016; D. Teece, Peteraf, & Leih, 2016), and Dynamic Capability approaches for to Digital Transformation (Carcary, Doherty, & Conway, 2016).

State-of-the-art research in the CDD approach literature suggests multiple avenues for future research. Insights on how capability research has evolved in the last 15 years reveal that further research is needed for new scopes & application areas (Wißotzki, 2018). Similarly, research for Capability Oriented Requirement Engineering (eCORE) focused more on industrial applications and automation systems, while there is much to be researched for further validation in multiple other contexts, including the service and consulting industries (Pericles Loucopoulos & Kavakli, 2017).



## Chapter 2: The Literature Review

### 2.3.1.3 Specialized approaches

Other frameworks are specialized such as *Enterprise DevOps Framework*, which focuses on transforming IT operations (Farooqui, 2018), *Competing Values Framework (CVF)* to analyze characteristics of organizational culture and its implications to enterprise agility transformation (Cameron & Quinn, 2011), or the *ADDIE model* which aligns business outcomes with training strategies (Chevalier, 2011). However, most of those specialized approaches are targeted to a specific sector or problem context, with much research and validation required to fit into our problem domain.

### 2.3.2 Capability Modelling

Although all the approaches, frameworks and models mentioned in Chapter 2.3.1 present ample opportunities for further research into the context of Digital Transformation for SCFs, the Capability Approach was the research choice for further investigation.

A Capability Approach offers executives the ability to anticipate and adapt to fast-changing customer preferences and environments by making their internal organizations nimble and agile by continually developing, integrating, and reconfiguring new capabilities (Lee & Day, 2019). These enterprise transformations (ET) may result in new value propositions, provide old value propositions in fundamentally new ways, or change the enterprise's inner structure (Rouse & Baba, 2006). A capability-oriented approach encourages modellers to focus on those elements deemed to be key drivers in enterprises' dynamic change and systems. Modellers focus on issues of capacity that are brought forth by examining the enterprise actors and their ability at meeting enterprise-specific goals and quality requirements. It also encourages the examination of the way that capabilities are deployed at an operational level to provide the enterprise service or product (Pericles Loucopoulos & Kavakli, 2017). Traditional enterprise modelling approaches focus on a formal static view of the enterprise architecture. Often they incorporate several complementary views, each focusing on specific aspects of the enterprise, such as organizational roles and resources (structure), business services and associated processes (operation) and business goals and requirements (motivation) (U. Frank, 2014). However, with the prevalence and volatility of today's



enterprises, most enterprises are no longer deterministic, top-down managed entities with well-defined structures and operations aligned to organizational goals. Existing models often cannot keep up with the new trends, and consultants often try to make approximations with varying sensitivities to absorb many variables. “Smart” models now have to be sensitive to the new realities of revenue and cost drivers. This requires that enterprise modelling adapts to a more dynamic enterprise configuration to embrace the idea of dynamic adaptation according to the internal and external influences that constantly (re-)shape the business environment (Molnar & Korhonen, 2014).

One particular analysis tool is the eCORE approach, which has been tested in several use cases such as in the insurance industry (Danesh & Yu, 2014), designing sustainable IT systems in the education field (Danesh, Loucopoulos, & Yu, 2015), transportation industry including smart parking, autonomous vehicle management, and smart transportation (Dimitrakopoulos, Kavakli, Loucopoulos, Anagnostopoulos, & Zographos, 2019; Gannem, 2018; Hamdi, Ghannem, Loucopoulos, Kavakli, & Ammar, 2019), Manufacturing Industry via Industry 4.0 and Cyber-Physical Production Systems (Chechina, Loucopoulos, & Kavakli, 2019), developing business capabilities for compliance in the maritime field (P. Loucopoulos et al., 2015), and Capability-Oriented Analysis and Design (COAD) used in the application of collaborative systems (Pericles Loucopoulos, Kavakli, Anagnostopoulos, & Dimitrakopoulos, 2018).

Based on this experience, eCORE has proven as a viable approach for a modelling tool that will allow the use of different conceptual models within a holistic platform whereby each viewpoint is implemented as a distinct meta-model, and the overall enterprise model is obtained as a synthesis of the information carried by the different viewpoints, ensuring consistency between the views. It enables the simulation and testing of different scenario models. Such a tool can use existing meta-modelling platforms for model-driven development, such as ADOxx (Pericles Loucopoulos & Kavakli, 2016b).

Although tested in several industrial and system settings, each with its conclusions and contribution to knowledge, it has not been tested in a service industry or consulting setting. Although it is believed to be generalizable enough to encompass all settings, it is worth



researching how it could help serve as a practical tool for serving the Digital Transformation of SCFs given the constraints of the challenges. Capability Modelling provides a viable approach well-suited for the unique Digital Transformation challenges for SCFs outlined in Chapter 2.2.2.

Further research into any solution to our problem needs to factor in a “strategy” component to solve the “inconsistent strategy” problem and a “requirements” component to solve the “conflicting goals and outcomes” problem. The solution also needs to be pragmatic to work within the constraints of “limited resources”, of which we introduce pattern theory, and comprehensive to include all facets of the Transformation in terms of People, Process and Technology, of which we introduce modelling.

Given this scope, eCORE research is done in the context of four different areas of research:

1. **Strategic Management:** as identified by two approaches, a Resource-Based View (RBV) and a Dynamic Capabilities View (RCV).
2. **Requirement Engineering:** as established underlying approach in eliciting requirements for transformation.
3. **Conceptual modelling:** offers the tool (artefact) to visualize and model the As-Is, To-Be, and the required transformation of capabilities.
4. **Patterning and Pattern theory:** an established pragmatic solution that eases application.

The following is the support from the literature:

### 2.3.2.1 eCORE from the perspective of Strategic Management (SM)

Strategic Management is concerned with developing and adapting firms’ business models to cope successfully with technological progress, competitive changes, or governmental regulatory alterations (M. W. Johnson, Christensen, & Kagermann, 2008). Researchers are increasingly interested in how environmental turbulence interacts with the business model change and investigate the effect of volatile markets on the processes by which firms seek to adjust their operations and adapt their product portfolios to remain competitive (Funk, 2008).



With the help of business model approaches, many enterprises have already started to design digital value creation concepts (Goerzig & Bauernhansl, 2018).

In the Strategic Management literature, two views are prevalent: Resource-Based View (RBV) and Dynamic Capability View (DCV) (Wernerfelt, 1995; Winter, 2003). Resource-Based View (RBV) assumes that firms can be conceptualized as bundles of resources, that those resources are heterogeneously distributed across firms, and that resource differences persist over time (Eisenhardt & Martin, 2000); therefore, researchers focus their attention on identifying possession of valuable, rare, inimitable, and non-substitutable resources of the enterprise as a source of sustainable advantage (Barney, 1991; D. Teece & Pisano, 1994). Dynamic capabilities include well-known organizational and strategic processes like alliancing and product development, whose strategic value lies in their ability to manipulate resources into value-creating strategies (Eisenhardt & Martin, 2000). In DCV, researchers focus on the dynamic aspect of capabilities and propose the “ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments”, also known as a dynamic capability, as the source of sustainable competitiveness (Barney, 1991). Successful adaptation of an established business model to new environmental conditions closes the gap between the organizations’ existing resources and capabilities and the basis of its competitive advantage in the industry as it evolves (Haveman, 1992).

Approaches for modelling enterprise capabilities have been proposed by academia (Bērziša et al., 2015; Iacob, Quartel, & Jonkers, 2012) and industry (Ulrich & Rosen, 2011) to link strategic objectives and high-level organizational requirements to technological artefacts. A business capability (represents the what) is at a higher level than a business process (represents the how) (Danesh & Yu, 2014). The business capability represents a conceptual service performed by people and processes. The people and processes are supported by the relevant application, information, and underlying technology. Business processes describe an organisation's methods to provide and leverage business capabilities (Ulrich & Rosen, 2011). According to Loucopoulos and Kavakli (Pericles Loucopoulos & Kavakli, 2016a), enterprise capability reveals the following features: (i) A capability is associated with a particular owner (a business entity such as a department, an organization, a person, a system.); (ii) A



capability denotes the fitness of its owner for achieving a particular result (business goal, customer need, project objective, etc.); (iii) A capability encapsulates the resources (processes, people, technology, assets, etc.) required by the capability owner for possessing this capability; (iv) A capability is context-specific. Its application depends on specific parameters within the enterprise environment (social context, economic context, cultural context, etc.).

While business models from the perspective of revenue-cost models are not the subject of this research, business *operating* models from the perspective of People, Process and Technology (PP&T) are supported by the Enterprise Transformation literature (Alter, 2006; McKendrick, 2017). The transformation of the operating models is crucial for existing firms' survivability in the face of a digitally evolving competitive landscape. Firms need to evolve their capabilities and resources to cope with the market's competitiveness and meet the clients' evolving needs (McDonald, 2009; Rosen, 2010; D. J. Teece, Pisano, & Shuen, 1997a, 2009).

Therefore, a capability modelling approach is well suited for Strategic Management Transformation needs (Bērziša et al., 2015; Greski, 2014; Pericles Loucopoulos & Kavakli, 2016a; Rosen, 2010). It offers a conceptual framework to analyze Business Requirements, model the current Capabilities, identify resources required (processes, people, technology, assets), identify the gap, and align Business Goals.

### 2.3.2.2 eCORE from the perspective of Requirements Engineering (RE)

Requirements engineering is the branch of systems engineering concerned with the real-world goals for services and constraints on a large and complex system. It is also concerned with the relationship of these factors to precise specifications of system behaviour and their evolution over time and across system families (Harrison & Zave, 1995; Zave, 1997). The field of RE is arguably one of the most sensitive areas in developing software and systems and organizational structures and processes supported by such systems (P Loucopoulos, 2009).

Therefore, whoever wants to focus on Enterprise Transformation, will need to look at where we are and where we want to go, which is the heart of Requirements Engineering (RE)



(Jarke, Loucopoulos, Lyytinen, Mylopoulos, & Robinson, 2010). Moreover, RE has a role in making digital transformation successful, and it addresses process, culture, and technology dimensions (Ebert & Duarte, 2016). A review of existing practice shows that systems and their ecologies are intrinsically intertwined. In innovation-driven settings, requirements become part of both the business solution and the system solution, and they constantly bridge new solutions to organizational and societal problems (Hansen, Berente, & Lyytinen, 2009).

The management of system requirements is subject to organization-oriented, product-oriented and process-oriented activities and that need to be managed at strategic, tactical and operational levels (Aurum & Wohlin, 2005), and in the past 30 years or so have witnessed the emergence of a variety of techniques for helping capture, represent, share, analyze, negotiate, and prioritize requirements. This is evidenced by the volume and impact of a plethora of requirements-related papers published in related journals and conferences (Cheng & Atlee, 2009). At the same time, the practical nature of RE has meant that some of this research has influenced the practice primarily in areas such as business and system modelling (OMG, 2011).

The literature review's goal is not to examine RE theory, which was researched extensively over the past 30 years but to use RE as a valid domain to situate the Enterprise Transformation research. At the heart of any RE is the Conceptualization principle, the ability to model what exists and what needs to be done. Therefore, the concept of “transformation” and especially “digital transformation” is at the very centre of most RE approaches.

### 2.3.2.3 eCORE from the perspective of Conceptual Modelling (CM)

One of the main objectives of RE is the communication and sharing of enterprise knowledge between different stakeholders. Therefore, an issue of concern is how to describe such knowledge so that this sharing can be significant. In practice, this question has been answered in terms of two possible alternatives: using natural language (for example, consultants' reports) or conceptual modelling. The use of natural language has the advantage of the ease of transferability but falls short on formality that hinders any potential analysis that



one might apply on such knowledge to inform decision-makers on appropriate strategies. Using conceptual modelling languages overcomes these shortcomings (V. Kavakli, 2017).

Therefore, Conceptual models represent the conceptualizations of stakeholders unambiguously in a particular domain under investigation. Models are “a representation of either reality or vision” (Whitten, 2004) that are created “for some certain purpose” (Miller & Mukerji, 2003) “with an intended goal in mind” (Bézivin & Gerbé, 2001).

The conceptual modelling framework applied in the research is based on previous theoretical contributions (Kavakli, 2002; Kavakli & Loucopoulos, 2003; V. Kavakli & P. Loucopoulos, 1999; Pericles Loucopoulos & Kavakli, 1995, 2016b) and experiences (Gongolidis, Evangelia, Loucopoulos, & Christos, 2016; Kavakli & Loucopoulos, 2006; Vagelio Kavakli & Pericles Loucopoulos, 1999; Pericles Loucopoulos & Kavakli, 2016a; Pericles Loucopoulos et al., 1998) in the field of Enterprise Modelling. Enterprise modelling has been defined as the ‘activity of externalizing enterprise knowledge’ conducive to aligning enterprise goals and processes with supporting Information Technology applications. Enterprise models present a conceptual map necessary for building an integrated business/information systems (IS) model, incorporating information about the organization from several different perspectives.

With the increasing complexity of systems, using different meta-models to represent different kinds of system characteristics is becoming a common practice. A system is modelled by a set of different models, each one corresponding to a different view of the system, devoted to representing a well-delimited set of system characteristics (Aurum & Wohlin, 2005). The conceptual modelling approach thus gives us the following advantages:

- 1- Can be designed as a Testable Artefact (verifiable and validatable) that allows us to follow the DSRM framework.
- 2- Enables abstraction to help focus on specific problems and their solutions.
- 3- Provides traceability from the problem domain to the solution domain and back.
- 4- Provides a natural way to describe real-world processes supported by software-intensive systems (Cortes-Cornax et al., 2015).



- 5- It allows us to answer what-if type of questions and both quantitatively and qualitatively collect data from the field and test subject.
- 6- Gives us a tool/artefact through which we can engage stakeholders effectively.

There are at least 16 approaches for transformation between requirements and analysis models. However, despite a significant amount of research, we still do not have a practical, workable automated solution. (Yue et al., 2011). Research in Conceptual Modelling shows that known traditional conceptual modelling standards and frameworks are quickly obsoleted by newer challenges caused by trends in technology (Lukyanenko & Parsons, 2013). For example, modelling standards such as Business Process Model and Notation (BPMN) and Unified Modelling Language (UML) have a limited ability to cope with the needs of smart digital transformation for three reasons. First, they have general applicability and, thus, focus on a higher level of abstraction—they ignore domain-specific aspects to a large extent. Second, they adopt broad adoption and stability as their core value; therefore, they feature rather long update cycles and incremental updates. Third, they hardly operationalize the knowledge that the conceptual models codify (Bork, Buchmann, Karagiannis, Lee, & Miron, 2019). Accordingly, recent business information systems engineering research has explored novel domain-specific conceptual modelling languages (U. Frank et al., 2014) and developed modelling tools that enable their efficient application (Brenner et al., 2014). Conceptual modelling has become an established research field in information systems (Recker, 2015). Simultaneously, an increasing amount of interest has examined openness in business and information systems engineering research (Van der Aalst, Bichler, & Heinzl, 2016).

Therefore, CM is the tool (artefact) to visualize and model the As-Is, To-Be, and the required transformation of capabilities.

Since the dynamic business realities of the digital transformation of SCFs require a continuous fast pace adaptation to an increasingly competitive changing landscape, traditional Enterprise Modelling does not offer flexibility due to the top-down structured view of business structure, operations, and goals. Meanwhile, a Capability modelling approach is better suited for the adaptation requirements of today's business realities in the context of “digitization” (Pericles Loucopoulos & Kavakli, 2016a; Molnar & Korhonen, 2014).



### 2.3.2.4 eCORE from the perspective of Patterns and Pattern Theory

Patterns are a useful method to describe a good solution to a recurring problem (Alexander, 1977, 1999). Patterns were developed initially in architecture as a mechanism for communicating good solutions to recurring classes of problems. Since then, many researchers and practitioners have created patterns to describe effective solutions to problems associated with disparate areas such as virtual project management, human-computer interaction, software development and engineering, and design science research (Petter, Khazanchi, & Murphy, 2010). The use of patterns to communicate wisdom and insight in computer/software systems design is no longer a new idea. Although techniques and approaches for writing patterns and pattern languages are continually improving, creative individuals try new ways to organize and communicate their thoughts (Meszaros & Doble, 1997). Patterns, in general, are vehicles for encapsulating knowledge. They are considered one of the most effective means for naming, organizing, and reasoning about design knowledge. "Design knowledge" in this sentence is applied in a general sense, meaning design in several different areas, such as Architecture and Software Engineering (Falbo, Guizzardi, Gangemi, & Presutti, 2013). According to (Buschmann, Henney, & Schmidt, 2007), "a pattern describes a particular recurring design problem that arises in specific design contexts and presents a well-proven solution for the problem. The solution is specified by describing the roles of its constituent participants, their responsibilities and relationships, and how they collaborate". Patterns describe how to model (at the conceptual level) a particular kind of problem in an application domain. They comprise conceptual model fragments that represent knowledge of the problem domain, and their goal is to aid developers in understanding the problem rather than show how to design a solution (Falbo et al., 2013). There are several types of patterns covering different abstraction levels, one of those types is called analysis patterns, and there are two main types of analysis patterns: Domain-specific and Domain-independent (Hamza, Mahdy, Fayad, & Cline, 2003).

In order to enable users to adopt and actively use patterns, tools must allow users to build applications by progressively applying patterns (Gschwind, Koehler, & Wong, 2008). However, a hot debate is how and if patterns can be built into tools (Kircher & Volter, 2007).



Following the pioneering work by Gamma et al. (Gamma, Helm, Johnson, Vlissides, & Patterns, 1995), patterns must be thoroughly described by the commonly recurring problem, the context and consequences of applying the pattern, and the solution provided by the pattern itself. Understanding the context and consequences of a specific pattern is an essential human-centred task. Tools that help users achieve this task must support selecting patterns and applying them in composition steps towards creating a complete solution for a particular scenario. The challenge is that “tools that work with patterns would have to be able to semantically understand your design as well as the pattern’s trade-offs” (Kircher & Volter, 2007).

Researchers develop artefacts within design science to solve a problem and evaluate their utility (Hevner et al., 2004; Kuechler & Vaishnavi, 2008; March & Smith, 1995). Patterns can be considered an artefact of design science research in which the artefact created (i.e., the pattern) is helping a practitioner solve a problem. Patterns have been developed for various domains based on the “best practices” derived from experts, yet they are rarely evaluated after being documented.

In design science, artefacts such as Frameworks and patterns are evaluated by identifying a set of assessment criteria for the environment in which the artefact is to be evaluated and examining how well the artefact meets the specified criteria (Jay, JNAMAKER, MINDER, & PURDIN, 1991; March & Smith, 1995). When specifying the assessment criteria and evaluation process, special consideration should be made for the type of artefact and the context and environment used by the artefact (March & Smith, 1995). There are many different methods to evaluate an artefact and can range from descriptive techniques that use logic and scenarios to demonstrate the utility of the artefact to empirical methods such as experimentation and case studies (Hevner et al., 2004). Evaluation can occur either based on the design specifications (i.e., ex-ante evaluation) or after its implementation (i.e., ex-post evaluation) (J. Pries-Heje, R. Baskerville, & J. R. Venable, 2008b). Evaluation techniques can be artificial (i.e., contrived settings such as simulations or laboratory experiments) or naturalistic (i.e., realistic settings such as case studies and action research) (Venable, 2006). Evaluation can also take a holistic approach of the artefact of patterns in which pattern evaluation



can occur both ex-ante or ex-post (Pries-Heje et al., 2008b), artificially or naturalistically (Venable, 2006), and using either hard or soft evaluation methods (J. Pries-Heje, R. Baskerville, & J. Venable, 2008a).

Therefore, evaluation needs to be part of developing a pattern. Following the DSRM (outlined in Chapter 1.4); provides evaluation and verification of its usefulness, and Chapter 5.4 presents the Evaluation of the patterns and the SC-COST Framework.

### 2.4 Summary and reflections

In the identification of the research gap, the starting point was introducing the context of the problem (SCF digital transformation), then establishing the research methodology (DSRM), and applying the research methodology steps on the Literature Review process, the outcome of which is a structure that identifies the problem and solution areas. The advantages of having that structure are that it helps focus and guide the research to solving the persistent challenges of our problem domain (SCF digital transformation) and provides a clear relationship map of the different research concepts.

In the beginning, we establish from the literature that Small consulting firms (SCFs) face different Enterprise Transformation challenges (Chapter 1.2). Due to the broad nature of those challenges, the research structured the analysis into two axes: The problem axis and the solution axis, and have limited the focus on the challenges pertaining specifically to digital transformation (Chapters 2.2 & 2.3).

Much research discusses those digital challenges from a change management perspective and often face failures (Ramesh & Delen, 2019). Those digital challenges could be addressed with Enterprise Transformation (ET) (Balogun & Hailey, 2008; Rouse, 2005b; Rouse & Baba, 2006), which is an active area of research that addresses approaches, frameworks, and methods for identifying, designing, implementing, and monitoring solutions to those challenges within any organization (Chapter 2.2.1). In the problem axis, we explore the literature within Enterprise Transformation related to the digital transformation of SCFs and claim that further research is needed (Chapter 2.2.2). The findings show that although much literature discusses the transformation in the service industry in general, few focus on the consulting



industry in particular. Consulting firms (large and small) differ from other service industries in that they are extensively knowledge management-based and traditionally had little to no automation until recently (Ambos & Schlegelmilch, 2009; Christensen et al., 2013; Dunford, 2000). Small firms have both common and different digital capabilities that can favour or hinder adapting to those digital challenges (Chapter 1.2.4). However, the challenges are more pronounced for small consulting firms than large ones (Laukkanen et al., 2007; North & Varvakis, 2016). As a result, there are four identified problem areas for digital transformation to address: namely “Limited Resources”, “Conflicting goals and outcomes”, “Inconsistent strategy”, and “Poor capacity for Knowledge Management” (Chapter 2.2.2). Although more problem areas were pointed out in the literature, those four address the most significant challenges for SCFs when successful in digital transformation (North & Varvakis, 2016; Ramesh & Delen, 2019).

Based on the Literature Review, Enterprise Transformation (ET) for SCFs can be affected by Capability Modelling, which has been studied in four referenced fields (Chapter 2.3) in the solution axis, namely Strategic Management (Chapter 2.3.2.1), Requirements Engineering (Chapter 2.3.2.2), Conceptual Modelling (Chapter 2.3.2.3), and Pattern Theory (Chapter 2.3.2.4).

First, Capability Modelling has been studied in Strategic Management (SM) in terms of two main views Resource-Based View (RBV) and Dynamic Capability View (DCV). Rarely are the two conflated in the literature, and most research literature contrasts the two views. DCV is appropriate in addressing the problem, whereas RBV is a characteristic of any enterprise that must be considered. Second, to research digital transformation, aspects of Requirements Engineering (RE) about the transformation from the AS-IS to the TO-BE are considered; also, Requirements Engineering (RE) offers a structured approach for eliciting requirements for change and ET. Third, within RE, the tool that is needed to analyse that dynamic change is Conceptual Modelling (CM), which will establish the model and test it before the actual implementation in the enterprise; the testing helps identify any issues and risks before committing the resources and costs associated with real-world implementations.



Finally, to provide a pragmatic solution, pattern theory can help speed up the application and transformation given the limited resources problem in SCFs.

Those four fields inform the choice of the solution approach: The use of Capability Modelling as a viable approach to addressing the problem domain (Chapter 2.3.1). Literature shows that Capability Modelling is a well-suited approach for addressing SCF digital transformation challenges. The questions become, how? Furthermore, will it successfully work and prove effective? In particular, eCORE (Capability Oriented Requirements Engineering) offers a practical approach to building a tool for ET for industry and has been researched for different contexts and use cases such as in the insurance, manufacturing, education, maritime and more (Chapter 2.3.1) (V. Kavakli, 2017). However, since the literature review has also shown significant differences between SCFs and those other domains and applications and between large and small consulting firms, how do those differences affect the eCORE approach? Therefore, there is a gap in the research on using Capability Modelling to address the Digital Transformation challenges for SCFs that merit further research to explore the applicability and adaptability of such models on SCFs.

The research explores the applications via case studies in the SCF industry and proposes extensions and possibly modifications to the ontology of the domain, the usefulness of patterns, and their usefulness and value to the industry. The research questions in (Chapter 1.2) put forth a series of inquisitive questions that aim the research to bridge that gap.

In conclusion, the vision for the research project is to establish a novel capability-oriented approach (the SC-COST framework), explicitly targeted at SCFs, where this approach would be the basis for effective and efficient elicitation of requirements for the digital transformation of SCFs, using a related ontology and patterns that would enable the externalisation of the transformation process in a user-centric manner.



### 3 Developing the SC-COST Framework

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The following Chapters will elaborate on the SC-COST framework's development process, with the aim is to answer the following research questions:

**RQ3: How to develop a generic extended framework applicable to DT for SCFs?**

28. What is the identified intellectual framework to apply to practical applications in case studies?
29. How can this intellectual framework<sup>3</sup> apply to a specified number of SCFs<sup>4</sup>, leading to a new approach for helping SCFs specify, analyse, and evaluate their digital transformation requirements?
30. What kind of practical tools assist in the complex task of modelling based on the foundations of the intellectual framework?
31. What is the ontological framework for change derived from the different case studies?
32. Using the intellectual framework for change, could we develop patterns of DT for SCFs?
33. What is the effect of the developed SC-COST framework and process on the 6 SCFs?
34. How can the SC-COST framework and process extend beyond the 6 SCFs? (i.e. generalize to the broader SCFs?).

#### 3.1 The building blocks of the SC-COST framework

The main building blocks inside the SC-COST framework are:

- 1- **eCORE Framework:** The eCORE Requirements Modelling Framework developed by (Pericles Loucopoulos et al., 2020) and shown in Figure 4 in red and elaborated upon in Chapter 3.2.

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<sup>3</sup> Henceforth referred to as the SC-COST (Small Consultancy – Capability Oriented Smart Transformation), which includes extension to the eCORE framework.

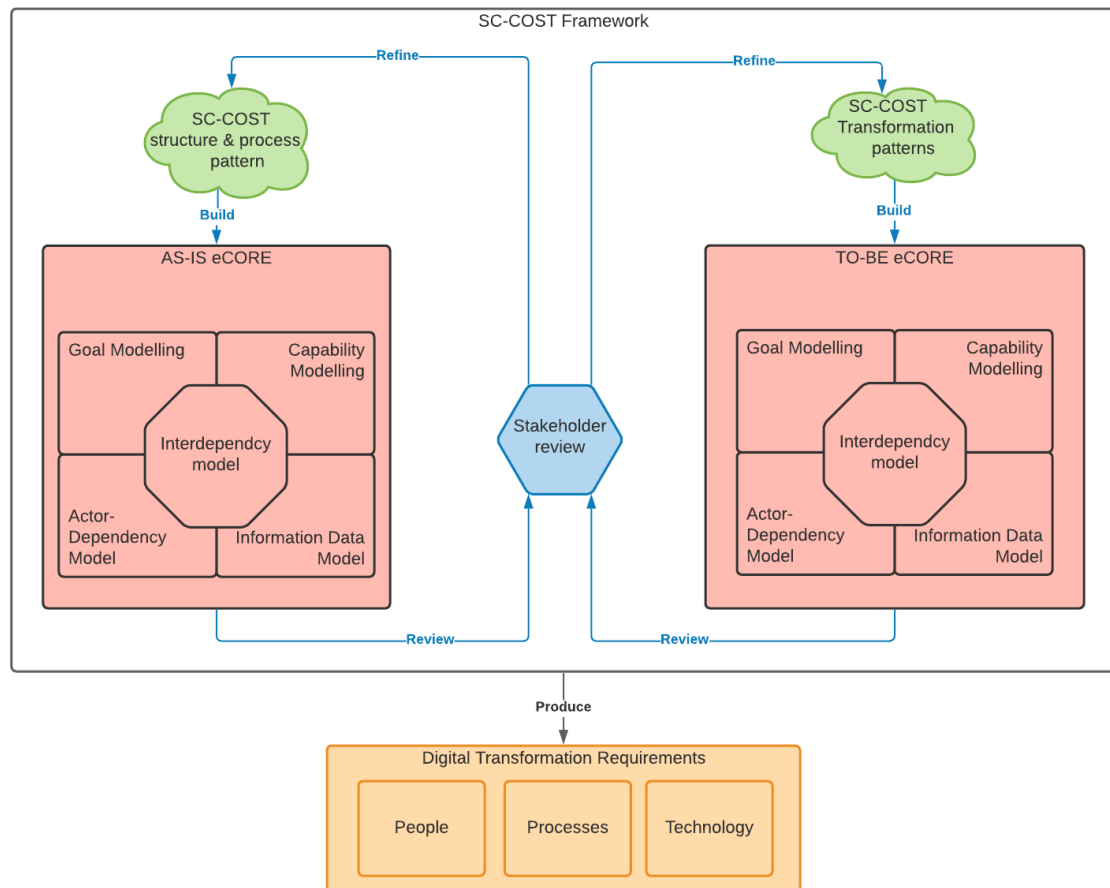
<sup>4</sup> Six specific SCFs from different business domains.



- 2- **Patterns:** The development and use of patterns extend the work done by (Pericles Loucopoulos et al., 2020) by identifying the structure and processes commonalities in the AS-IS state and facilitating transformation outcomes in the TO-BE state. Those patterns are the second principal component in the SC-COST framework and are represented in Figure 4 in green and elaborated upon in Chapter 3.3.
- 3- **Requirements:** An outcome is produced named “Digital Transformation Requirements” in the form of formal and informal requirements, shown in Figure 4 in orange, described in Chapter 3.4 and demonstrated in the Appendices for each case study.
- 4- **eCORE Tool:** One of the main contributions of this thesis is the development of the eCORE tool, which is a software modelling solution that implements the eCORE notation, utilizes patterns, and outputs the Requirements statements, and is described in Chapter 3.5.

Following a Design Science Research Methodology (DSRM) approach (see Chapter 1.4), the SC-COST framework was developed by iterating through the case studies. Every iteration helped enhance the framework until reaching case studies 4 and 5, whereby the framework has reached a stable point with little to no enhancements added. By case study 6, it was clear that patterns were established, and those patterns were applicable without further enhancements; those iterations are the final major component in the SC-COST framework, which is presented in Figure 4 in blue. In applying the SC-COST framework, we apply the eCORE framework in a new context, that of SCFs, which has the added benefit of testing the application of the eCORE framework and drawing on lessons learned to enhance it.





**Figure 4: The SC-COST Framework**

### 3.2 The eCORE top-level meta-model

At the heart of the SC-COST framework is the first component in Figure 4 highlighted in red, which is constructed based on the eCORE conceptual framework developed by (Pericles Loucopoulos et al., 2020) and applied in recent work (Dimitrakopoulos et al., 2019; Pericles Loucopoulos, 2016; Pericles Loucopoulos & Kavakli, 2016a, 2016b)



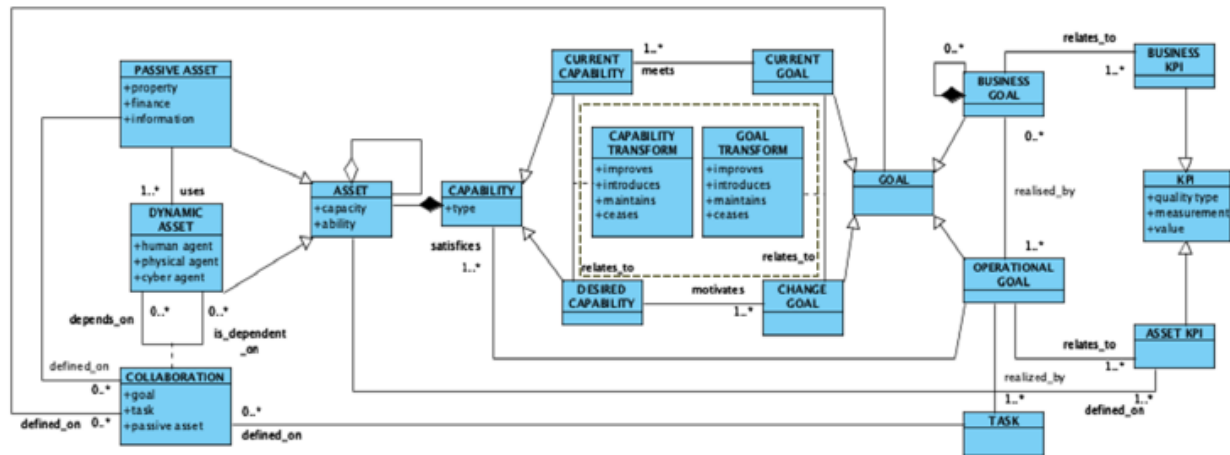


Figure 5: The eCORE top-level meta-model (Pericles Loucopoulos et al., 2020)

Referring to the meta-model in Figure 5, one can see that a CAPABILITY is a composition of ASSETS (capacities and abilities) where ASSETS are distinguished between PASSIVE and DYNAMIC. PASSIVE ASSETS are enterprise resources that have no behaviour by themselves, but instead, they facilitate other assets with dynamic behaviour. DYNAMIC ASSETS represent the social dimension, focusing on the COLLABORATION between human, physical and cyber agents, defining their dependencies. These dependencies may involve the exchange of PASSIVE ASSETS, the execution of some TASK, or the achievement of a GOAL.

In a RE setting, we are interested in both CURRENT CAPABILITIES and DESIRED CAPABILITIES to model the necessary transformations from the former to the latter. There is a symmetry between CURRENT CAPABILITIES and DESIRED CAPABILITIES in the sense that each set is related to enterprise goals, the former to CURRENT GOALS and the latter to CHANGE GOALS.

In eCORE, requirements are modelled and analysed using the juxtaposition of CHANGE GOALS against CURRENT GOALS and their corresponding capabilities. In this sense, eCORE, in its treatment of requirements, extends *Goal-Oriented Requirements Engineering (GORE)* (Dalpiaz, Franch, & Horokoff, 2016; Dubois, Yu, & Petit, 1998; Horkoff et al., 2016; Horkoff et al., 2014; Van Lamsweerde, 2001) by incorporating the concept of capability transformation at the same time as considering goals transformation.

Methodologically, the identification, modelling and analysis of goals are driven by the concept of capability. In eCORE, there is a distinction between CURRENT GOALS and CHANGE



GOALS and their respective capabilities, as explained above. This distinction is central to eCORE, and it is introduced as an additional concept to the existing GORE approaches. Therefore, as shown in the meta-model of Figure 5, in eCORE, CURRENT CAPABILITIES are modelled using a notation conducive to representation and analysis of the said capabilities. These models lead to a set of CURRENT GOALS using a notation familiar to Requirements Engineers from practice with GORE methods (further elaborated in Chapter 3.2.2.2 and demonstrated in the application of eCORE in Chapter 3.7). Requirements for change are captured to represent DESIRED CAPABILITIES that are also modelled using the same notation used for CURRENT GOALS. These models are then analysed to identify and subsequently model the new capabilities by developing a DESIRED CAPABILITIES set of models.

Another important characteristic of eCORE shown in the meta-model is the contention that human agents, physical agents, and cyber agents make up what is regarded as ‘social networking and that this networking needs to be modelled in terms of different facets of collaboration. In eCORE, this is achieved by using an established notational approach known as the i\* strategic dependency model (Eric, Giorgini, Maiden, & Mylopoulos, 2011) (also elaborated in Chapter 3.2.2.3 and demonstrated in the application of eCORE in Chapter 3.7).

### 3.2.1 The eCORE Requirements Modelling Framework

We use the term ‘requirements engineering’ as an inclusive term that characterises all requirements issues that need to be addressed at the crossroads of business development, software engineering, and industrial design.

We used a modelling framework motivated by ontological and teleological considerations rather than operational ones. We were interested in developing representations of enterprise concepts showing their properties and relations and their purpose for their designed existence. The framework considers four interrelated viewpoints, each facilitated by a distinct conceptual modelling perspective, whilst ensuring that consistency is achieved across all four through appropriate inter-model interactions.

35. The *capability* model focuses on the capacities and abilities necessary for a particular application.



36. The *goal* model focuses on the enterprise's objectives for retaining, acquiring, or developing the application's necessary capabilities.
37. The *actor-dependency* model focuses on the enterprise's socio-technical components related to the application's specific capabilities.
38. The *informational* model focuses on the logical structure of the informational resources that are part of the enterprise's capabilities and acts as the medium of communication between enterprise actors to meet specific enterprise goals.

This model-driven approach encourages modellers to focus on those elements deemed key drivers in enterprises' dynamic change and systems. Modellers focus on issues of capacity that are brought forth by examining the enterprise actors and their ability to meet enterprise-specific goals and quality requirements. It also encourages examining how capabilities are deployed at an operational level to provide the enterprise service or product and the information necessary for delivering the service or product.

These four different types of modelling represent the dimension of abstraction being applied. Orthogonal to this is the dimension of requirements lifecycle, a set of phases for progressing from an existing situation to a new desired situation. The relationship between abstraction and lifecycle with details of what is involved in each intersection is provided in Table 3.

**Table 3: Modelling abstractions in the context of requirements definition lifecycle**

Abstractions Lifecycle	Enterprise Capabilities (Capability Modelling)	Enterprise Motivation (Goal Modelling)	Enterprise Functioning (Actor-dependency Modelling)	Enterprise Information (Informational Modelling)
Enterprise AS-IS	Capacities & Abilities	Existing Goals & KPIs	Actors & dependencies	Information Objects
Enterprise Requirements		Change Goals & New KPIs		



Enterprise TO- BE	Capacities & Abilities	Future Goals & KPIs	Actors & de- pendencies	Information Ob- jects
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The approach adopted strove first to conceptualise the current situation for each use case in terms of their capabilities, goals, actors, and informational objects. The set of models resulting in this work describes the 'AS-IS' situation. It is important to describe the AS-IS state to set any requirements for change in the context of the enterprise, for, without this understanding, it will not be possible to analyse the impact of these requirements.

By juxtaposing requirements for change against the AS-IS situation, one can then begin answering questions of its nature, such as: “does the enterprise have the capabilities to satisfy these requirements?”, “if not, then what kind of capabilities does the enterprise need to develop or acquire?”, “what will be the effects of meeting these requirements in the functioning of the enterprise?”, “Is there a need for a new configuration of actors?”, “and if so, what will be the new collaborative environment that will result from this new configuration?”, “what will be the financial implications of migrating for the AS-IS to the new situation (TO-BE)?”, “does the enterprise have the right informational sources, or does it need to develop a new informational structure?” “What will be the systemic implications, i.e. what will be the impact of the new configuration on other operational matters of the enterprise?”, “Are there likely to be any unintended consequences?” None of these questions can be answered satisfactorily without first having a description of the AS-IS situation and then using the requirements for change to begin the process of answering these questions as a first step towards defining the TO-BE situation.

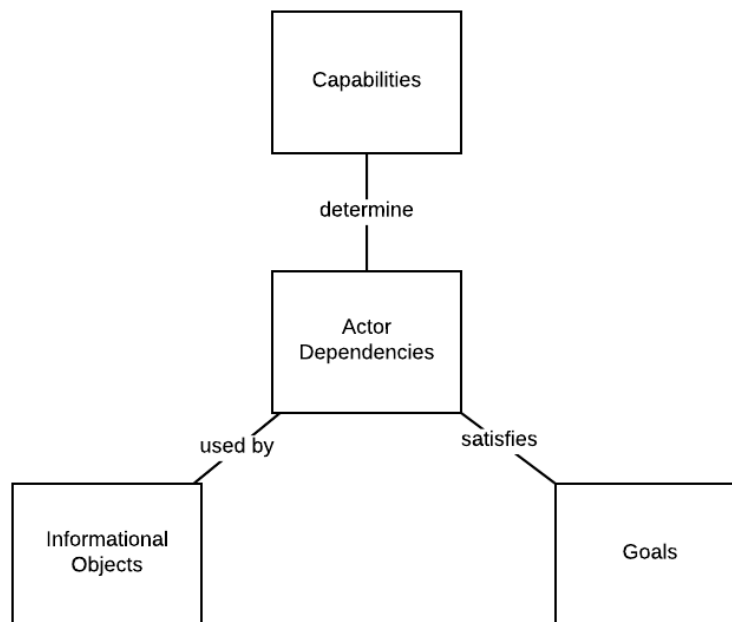
For all use cases, the AS-IS situation is defined first, and the requirements for change follow this.

### 3.2.2 The eCORE Conceptual Modelling Perspectives

This Chapter focuses on the ontological considerations of the four types of the conceptual model, capability, goal, actor-dependency and informational models. Whilst every kind of model deals with specific concepts, it should be noted that the approach also considered the inter-model relationships. At an abstract level, these relationships are shown in Figure 6.



On a detailed level, these relationships materialise by identifying commonalities between these models.



**Figure 6: Inter-model relationships**

The close synergy between the four model types has essentially two advantages.

First, during the iterations of models, requirements engineers can refine the models by examining the influences of the concepts in one model on the others. For example, in the actor model, we can define dependencies on informational resources, and identifying this dependency can ensure that the informational resource is also present in the informational model.

Second, when models are being reviewed, requirements engineers can verify the information contained in the models by examining that all concepts are necessary and sufficient. For example, if there is an informational object in the actor model that is not presented in the informational model, then it is evident that either of the models is not complete, which will trigger further investigation and re-modelling.

These two factors assisting the RE process will be further explicated in Chapter 4 when the models for all the use cases are presented.



### 3.2.2.1 Capability Modelling

The consensus is that an enterprise capability represents a conceptual service that a group of processes and people, supported by the relevant application, information and underlying technology, performs (Danesh & Yu, 2014; Rosen, 2010).

Historically, the notion of capability is seen as originating from competence-based management, which complements traditional enterprise modelling approaches by representing organisational knowledge from a results-based perspective. Within strategic management, one can distinguish between two prevailing views: the Resource-Based View (RBV) and the Dynamic-Capability View (DCV). In RBV, researchers focus their attention on identifying valuable, rare, inimitable and non-substitutable resources of the enterprise as a source of sustainable advantage (Barney, 1991; D. J. Teece, Pisano, & Shuen, 1997b). In DCV, researchers focus on the dynamic aspect of capabilities and propose the “ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments”, a dynamic capability, as the source of sustainable competitiveness (Barney, 1991).

The Open Management Group defines capability as the abilities and capacities that the business may possess or exchange to achieve a particular outcome (OMG, 2013). The Department of Defense Architecture Framework (DOFAF) defines capability as the ability to achieve the desired effect under specified (performance) standards and conditions through combinations of ways and means (activities and resources) to perform a set of activities (DoD, 2008). The NATO Architecture Framework (NAF) defines capability as the ability of one or more resources to deliver a specified type of effect or a specified course of action (MoD, 2013).

Capability is a higher-level concept that allows us to consider the essential elements on which the enterprise functions without finding how this functioning comes about. We utilise this abstraction to progress from the abstract to detailed descriptions gradually. It offers us the opportunity to scope the ‘universe of discourse’ and at the same time to focus on the most fundamental properties of the enterprise. Using these as the starting point, one can



begin investigating and analysing what lies behind these properties, what goals govern them, what services they deliver, etc.

If we deconstruct the term capability, we arrive at two intertwined terms: “capacity” and “ability”. In our modelling of capabilities, we interpret these as follows:

For **capacities**, we focus on the physical (e.g. machines, land, labour, etc.) or non-physical (e.g. software, funding, etc.) resources that the enterprise processes. For **abilities**, we focus on the means or skills inherent in the resources or used for the enterprise to deliver value to shareholders or society.

A distinction is made between internal capabilities and external capabilities. The details of external capabilities owned by some other enterprise may not be essential to know, or indeed not possible, since such capabilities are considered a competitive advantage to the owner enterprise. What matters, however, is that such an external capability is required to deliver a service by the use case enterprise. In the context of our project, where the “smart” components play a significant role, it would be possible and indeed desirable to consider some aspects of external capabilities if the participating user companies are interested in collaborating with other enterprises. In this case, it may be necessary to publicise some aspects of the respective capabilities for the collaborating enterprises to achieve some common business goals.

Capabilities collaboration may be defined on both internal and external capabilities. The collaboration connector is used to signify these collaborations. Collaborations may be defined for either internal capabilities collaboration or external capabilities collaboration


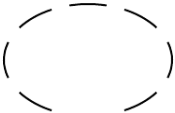

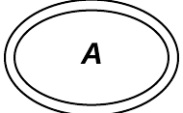
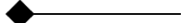

### *3.2.2.1.1 Capability model typology*

In capability-modelling, the graphical notation presented in Table 4 is used.

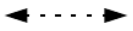
**Table 4: Graphical notation used in capability modelling**

Notation	Description	Example
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	<p><b>Capability:</b> An aggregation of the capacities and abilities necessary for the enterprise to function</p>	<p>'Data Gathering' capability. This is a capability that belongs to the enterprise under investigation</p>
	<p><b>External Capability:</b> An aggregation of the capacities and abilities that belong to another enterprise whose collaboration is needed for some business objectives to be met</p>	<p>'Land surveying' capability that some engineering company has with which the enterprise under investigation collaborates for the site investigation</p>
	<p><b>Capacity:</b> The human (e.g. staff), physical (e.g. machines, land, etc.) or non-physical (e.g. software, funding etc.) used by the capability owner to possess this capability.</p>	<p>ERP System, Project Planner, Modelling software</p>
	<p><b>Ability:</b> the means or skills possessed by a resource that enable some enterprise function to take place.</p>	<p>Resource allocation, network configuration</p>
	<p><b>Aggregation:</b> shows that a particular capability encapsulates some capacity and ability.</p>	<p>The 'market study planning' capability encapsulates the capacity of the 'market research planner' who possesses the 'resource allocation' and 'network configuration' abilities</p>
	<p><b>Collaboration:</b> denotes inter or intra-organisation interaction of capabilities towards the realisation of a common end-result.</p>	<p>The market study planning capability collaborates with the modelling scheduling capability to manage valuation exercise</p>



	<b>External capability collaboration:</b> denotes collaboration between external capabilities	The 'Supply' capability collaborates with the 'Transportation' capability for the timely delivery of supplies
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### 3.2.2.2 Goal Modelling

Goal-oriented approaches such as the Knowledge Acquisition in automated Specification (KAOS) method (Van Lamsweerde, 2001) and the Enterprise Knowledge Development (EKD) framework (V. Kavakli & P. Loucopoulos, 1999) state that enterprises are purposefully designed and implemented systems. Consequently, enterprise goals are recognised as the primary factors that govern/explain the current and potential enterprise configuration.

Goal models can define formally business intentions and causal relationships between business intentions and how automated and human agents realise these. Business goals form the baseline information upon which any change will be sought to apply. They help to establish KPIs against which any new development will be measured.

A goal model describes the 'causal transformation' of strategic goals into one or more sub-goals that constitute achieving desired ends. Each step can identify new goals linked to the original one through causal relations, thus forming a hierarchy of goals. Goals can be of different types (Achieve, Maintain, and Avoid) depending on the behaviour required for realising these goals. The leaf goals in this hierarchy are operational goals assigned to human or automated systems (system goals).

Several quality requirements are related to business goals (referred to as soft goals), e.g. production line efficiency or production process effectiveness. These soft goals motivate the analysis for discovering the KPIs that affect the operationalisation of related goals and provide the basis for evaluating or revising current enterprise behaviour.

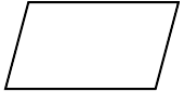



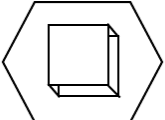
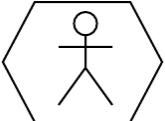

#### 3.2.2.2.1 Goal model typology (the general case)

The notation used in this model is based on the KAOS (Dardenne, Lamsweerde, & Fickas, 1993; Matulevičius & Heymans, 2005) and i\* (E. Yu & Mylopoulos, 1998) frameworks as




implemented in the RE-Tools modelling toolset (Supakkul & Chung, 2012b). The following Table 5 provides an overview of the symbols used in goal modelling and their meaning.

**Table 5: Graphical notation used in goal modelling**

Notation	Description	Example
	<b>Business Goal:</b> A high-level goal that an enterprise wishes to achieve/avoid/cease	To manage multiple inputs from new “smart” sources of data
	<b>Operational Goal:</b> An operational objective whose fulfilment is assigned to certain human or automated agent	To extract relevant sample data for use as comparatives
	<b>Soft Goal:</b> A desired quality	Accuracy
	<b>Operationalised soft goal:</b> A soft goal that can be measured	Maximise data understanding
	<b>Automated Agent:</b> A software or other physical system	ERP or GIS system
	<b>Human-Agent:</b> A person, team or organisation	Market Research Analyst
	<b>AND Decomposition:</b> a way of refining high-level goals into more operational sub-goals. If all sub-goals are achieved, then the initial goal is also achieved. On	The goal ‘To ensure efficient data gathering’ is AND decomposed in two sub-goals ‘To ensure



Notation	Description	Example
	the other hand, failing to achieve a sub-goal means that initial goal cannot be achieved either.	efficient choice of data channels' and 'To ensure efficient collection scheduling.'
	<b>Assignment:</b> shows that a certain agent is responsible for achieving an operational goal.	'Market research data collection' is assigned to 'Market research team.'


#### 3.2.2.2.2 Goal model typology (the requirements for change case)

Change goals provide a way of identifying and reasoning about the requirements for change from an intentional perspective and their KPIs.


Change goals are based on the premise that the desired changes (whether they reflect radical business re-design or incremental improvements) are derived by comparing the 'desired' vision against the 'present' reality (the current goal model). Rather than prescribing a solution based on experts' assumptions, this process aims to re-interpret each change requirement in relation to the existing enterprise goals.

This activity results in constructing a revised goal model (the Change Goal Model) detailing how stakeholders' requirements for change may be realised. This model may contain alternative ways of realising the desired change; it is a model of the change process. Two additional notations are introduced in the change goal model detailed, as shown in Table 6.

**Table 6: Additional graphical notation used in change goal modelling**

Notation	Description	Example
	<b>Requirement Goal:</b> An operational objective whose fulfilment is assigned to the target system	To gather data from manual and automated sources



Notation	Description	Example
	<b>Target system:</b> The system to be developed to satisfy the above requirement	Decision Support Toolkit

Change goals are labelled as introducing or improving depending on the adaptations required for realising these goals. In particular, ‘improve’ goals correspond to improving the current behaviour (existing capabilities), whilst ‘introduce’ goals correspond to new behaviour (new capabilities). For example, the goal ‘To ensure efficient data gathering’ is an *improve* goal. It suggests improvements to the existing enterprise behaviour, whilst the goal ‘To enable smart data gathering’ is labelled as *introduction* as it requires the introduction of entirely new behaviour. The way to refine an ‘improve’ goal often leads to the addition of ‘introduce’ goals. Less common are cease goals that require the cessation of an existing behaviour (e.g., abolishing an existing goal and its sub-goals). Finally, there is the maintaining goal, which implies no requirements for change as far as this current business goal is concerned.

### 3.2.2.3 Actor Dependency Modelling

Actor-oriented approaches such as the Intentional Strategic Actor Relationships modelling (i\*) framework (Eric & Mylopoulos, 1994; Eric Yu, 2011), or Role-Activity modelling (Ould, 2005) are based on the premise that enterprises are social systems and, therefore, the essence of an enterprise’s operation lies in the interaction between involved social agents. Such approaches provide opportunities for modelling enterprise processes at a sufficiently high level of abstraction, particularly relevant and useful at the early requirements phase of any project. These approaches have proved to be of great value to many technological domains, for example, in general, business process descriptions (Badica, Teodorescu, Spahiu, & Badica, 2005), in safety-critical applications (Dawkins, 1998), and health care (Patel, 2000), to name but a few.




For “smart” applications in which ICT plays a key role, a recent report to the European Parliament (ITRE, 2016) states that “....the boundaries between the real world and the virtual



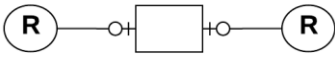
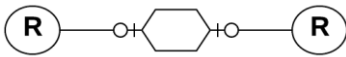
world become increasingly blurred”. This implies that these hybrid systems should be regarded as “.... online networks of social machines that are organised in a similar way to social networks” (Deloitte, 2015). It was, therefore, desirable in our project, while we were considering early requirements, to address the issue of enterprise functioning in terms of actors (human, physical, and digital) and their interdependencies.

There is a clear intermodal relationship between enterprise goals and enterprise actors. The goal model shows how business goals are assigned to different organisational actors (human agents and automated systems). The actor dependency model (Eric & Mylopoulos, 1994; Eric Yu, Liu, & Li, 2001) focuses on the dependencies between actors in fulfilling their goals. It describes the expectations and commitments among organisational actors. In addition, it indicates the vulnerabilities that the actors will be exposed to if the dependencies fail. The notation used for actor-dependency modelling is shown in Table 7.

**Table 7: Graphical notation used in actor-dependency modelling**

Notation	Description	Example
	<b>Actor:</b> An active entity (software or physical system) that carries out actions to achieve goals by exercising its capabilities.	ERP system, Database
	<b>Human-agent:</b> A sub-type of actor. It can refer to a person, team or organisation.	Surveyor, Valuator
	<b>Goal Dependency:</b> describes the fact that one actor depends on the other for something so that the former may attain some goal.	The ‘Valuator’ depends on the ‘Surveyor’ to attain his goal ‘To understand the optimal design-mix for the real-estate’.



Notation	Description	Example
	<b>Resource Dependency:</b> describes the fact that one actor depends on the other actor for the availability of an entity (physical or informational).	The 'Valuation Department' depends on the 'GIS system' for knowing the 'comparatives' regarding certain locations.
	<b>Task Dependency:</b> describes the fact that one actor depends on the other actor for carrying out an activity.	The 'Valuator' depends on the 'Surveyor' for 'Collecting the data'.

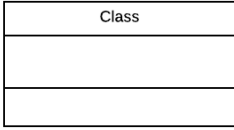

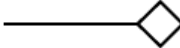
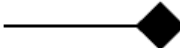
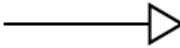
#### 3.2.2.4 Informational Object Modelling

Informational models such as the entity-relationship (ER) model (Chen, 1976) or UML class diagrams (Hofmeister, Nord, & Soni, 1999) describe inter-related objects of interest in a specific domain of knowledge. An informational model comprises entity types (which classify the objects of interest) and specifies relationships between instances of those entity types. In RE, an informational objects model is commonly formed to represent the information required to perform business processes. Consequently, the informational object model becomes an abstract data model that defines a data or information structure implemented in a systems' database.

We use the well-known terminology of the Unified Modelling Language (UML) for information-related concepts, known as Class Association Diagram (CAD), to model the semantics of such objects that are found to be resources in the capability model or of resource dependency between actors.

**Table 8: Graphical notation used in actor-dependency modelling**



Notation	Description	Example
	<b>Class:</b> An entity type, described by several attributes	Product, Production request, Production Line
	<b>Association relationship:</b> specifies a logical connection between classes	A 'Product' corresponds to a 'Production Request.'
	<b>Aggregation relationship:</b> denotes that a class is a collection of other classes	The 'Available Capability' is an aggregation of 'Material Availability', 'Personnel Availability' and 'Equipment Availability.'
	<b>Composition relationship:</b> denotes that a class is composed of other classes	The 'Production Line' comprises 3 'Automatic Lines' and 1 'Manual Line.'
	<b>Generalisation relationship:</b> indicates that one of the two related classes (the subclass) is considered to be a specialised form of the other (the supertype)	The 'Control Machine' is a subclass of the 'Machine.'

### 3.2.3 eCore and its relationship to the Digital Transformation: People, Process and Technology

Business Capability Modelling consists of three major components: business processes, people, and physical assets (Greski, 2014). For Digital Transformation, the focus for physical assets are on Technology-related assets such as PCs, systems, measurement tools, databases, and related technologies (Alter, 2006). Therefore, for modelling in the context of Digital Transformation for SCFs, the three significant transformation components are People, Processes and Technology (PP&T), whereby interaction between all three is modelled in the



eCORE model. The following table summarizes the involvement of each one of the three aspects of transformation in the eCORE framework.

**Table 9: Representation of People, Process and Technology in the eCORE model**

Model Component	Capability	Goals	Actor-Depend- ency	Information
People	A person or a team are represented as a <b>Capacity</b>	A person or a team is represented as a <b>Human-Agent</b> .	A person or a team are represented as a <b>Human-Agent</b>	A person or a team are represented as a <b>Class</b>
Processes	A process is embedded in a <b>Capability</b>	Processes are embedded in the relationship between the components of the model.	A process is embedded in a <b>Dependency</b> .	A process is represented as an <b>Attribute</b> inside a Class or a <b>Relationship</b> between Classes.
Technology (and other physical assets)	Technology is represented as a <b>Capacity</b> or as a <b>Capability</b> .	Technology is represented as an <b>Automated Agent</b>	Technology is represented as an <b>Actor</b> .	Technology is represented as either a <b>Class</b> or an <b>Attribute</b> within a class.

All four viewpoint component models represent the People aspect in the eCORE model and the transition from the AS-IS state to the TO-BE state. The *Capability Model* represents *People* as a **Capacity**, whereby a person is a resource that could be improved, repurposed, replaced or eliminated during the Digital Transformation. For the *Goal Model*, the *People* components are represented as a **Human-Agent** whereby they can either have a primary role and are responsible for achieving that goal, or a secondary role in assisting or needing to achieve that goal. Their transformation in the context of modifying their AS-IS goals to achieve a new TO-BE goal involves either relocation of goal responsibilities or introduction



and elimination by introduction of new human-agents or replacement with other human-agents or technology. Similarly, the *Actor-Dependency* model represents the *People* component as a **Human-Agent**, whereby a transformation that involves a change of dependencies by introducing new goals, resources, or tasks would affect people by either improvement repurposing or replacement or elimination. The *Information Object Model* represents a person or a group of people as classes with attributes and relationships to other information objects. An instantiation of a class representing a person or group includes attributes that store information and interact with other classes via composition, aggregation, association, or generalization. A transformation in the model is reflected on the *People* as a change in scope, function, interaction and responsibility. Finally, the inter-model relationship analysis addresses the *People* component of each model representing the four viewpoints by either highlighting person or people commonly represented in each model (i.e. coupling them) or highlighting the interaction within each model and its parallel in another model. Similarly, in the transformation, the inter-model relationship shows the change in that cross-modal interaction involving those *people* components.

The *Process* aspect is represented in all four models and their transformations. In the *Capability Model*, a *process* can be represented as a **Capability** (Harmon, 2011; Rosen, 2010). In most capability models, if a person defines a capability as something like a business component or a recurring activity, they use the capability as a synonym for a process or an activity. In a *Goal Model*, a process is embedded in either the goal itself or its relationship with other goals, and a process could be the means to achieve the goal or achieve its transformation. In the *Actor-Dependency Model*, a *process* is embedded in the **dependency** between the actors. In a goal-dependency relationship or a task-dependency relationship, a *process* could be the way of achieving that goal or completing that task, while in a resource-dependency relationship, a *process* could be the way of handling that resource between the dependent actors. In the transformed TO-BE model, a process is modified (improved, deprecated, or introduced) by either introducing or removing a new *actor-dependency* relationship or modifying the relationship between existing dependencies. For the *information object* model, a *process* is an **attribute** of a class, and during a transformation, it could be introduced,



improved or eliminated. Finally, in the inter-model relationship, a *process* is identified across different models by coupling them, and in the transformation, the inter-model relationship shows the change in the cross-modal interaction involving those *process* components.

The *Technology* component is presented in all four viewpoint models in multiple ways. In the *Capability Model*, Technology can be presented as a **Capacity**. Depending on the context of the technology and its application, *Technologies* could be physical such as personal computers, printers, vehicles and any physically attainable technological tool, or could be a non-physical technology such as software systems, patents, know-how, or otherwise technological capacity that the capability owner can use to possess the *Capability*. Their transformation involves introducing new technologies, deprecating old ones, or repurposing existing ones to obtain a transformed capability. In the *Goal Model*, *Technology* is presented as an **Automated-Agent**, assigned to achieve a goal, and the transformation of the goal will inadvertently either introduce a new Automated-Agent, remove an old one, or repurpose an existing one.

Additionally, two notations directly related to technology in the *Goal Model* involve the **Requirement Goal** and the **Target System** notations, whereby *Technology* is embedded in the TO-BE requirement and represented in the Requirement Goal. At the same time, the Target System in a Digital Transformation context is often Technologically enhanced. The *Actor-Dependency* model represents *Technology* as an **Actor** whereby it is involved in a dependency relationship with other Actors or other Human-agents as a resource or to achieve a goal or task. The transformation of a *Technology* in the Actor-Dependency model involves introducing, removing or improving actors in the model or modifying the dependency relationship between those actors and other actors or human agents. The *Information-object* model represents *Technology* as either a **Class** or an **Attribute** within a class. A system could be a class that composes other technology classes; for example, an ERP system could have a composition relationship with a Database, a server and a system operator, or an ERP system could have those components as attributes within its class. The modeller can represent the system as they see fit as long as the model is consistent at its level of abstraction and the detail level involved to serve the transformation exercise. A transformation involves modifying the



class diagram by introducing, removing or updating classes, attributes, or relationships. Finally, The *Inter-model* relationship connects all the technology components across all four models, and in the transformed TO-BE model, the inter-model relationship highlights the modified relationship accordingly.

In conclusion, the eCORE modelling framework, in its representation of the AS-IS and the TO-BE models, address all three aspects of the Digital Transformation components of *People, Process* and *Technology*.

### 3.3 Patterns and pattern theory

Pattern theory, initially founded in Architecture, was adopted by the software and systems community for relevance to problems that have long plagued software design and systems engineering (Alexander, 1999). The use of patterns in Requirements Engineering and Business Modelling is well established in the literature (Gschwind et al., 2008; Hruby, 2006; Kolp, Giorgini, & Mylopoulos, 2003). A pattern is just “a description of a solution to a problem found to occur in a specific context” with an ability to explain the rationale for using the solution (the “why”) in addition to describing the solution (the “how”) (Meszaros & Doble, 1997).

One of the main design elements of the SC-COST Framework is the use of patterns. There is some agreement on the principles for creating patterns. First and foremost, patterns have a particular format, which includes a meaningful name, a problem statement, the context for the problem, the applicable forces and constraints, a solution, one or more examples, the context after the pattern has been applied (which may include side effects), the rationale, a listing of related patterns, and known uses of the pattern (Appleton, 2000).

Although there is no single right way to write patterns, the pattern language of choice used in this thesis was widely referenced in the research literature as demonstrated by (Meszaros & Doble, 1997; Wellhausen & Fießer, 2011). Table 10 shows the components of the pattern language and the structure of this pattern language.

**Table 10: The glossary of terms used in the Pattern Language**



<b>Pattern Name</b>	A name by which this problem/solution pairing can be referenced.
<b>Context</b>	The circumstance in which the problem is being solved imposes constraints on the solution. The context is often described via a “situation” rather than stated explicitly. Sometimes, the context is described in terms of the patterns that have already been applied. The context determines the relative importance of the forces (those that need to be optimized at the expense of others).
<b>Problem</b>	The specific problem that needs to be solved. Use Context-Free Problem to ensure that the problem is kept separate from the constraints on the solution.
<b>Forces</b>	The often contradictory considerations must be considered when choosing a solution to a problem. The context implies the relative importance of the forces (those that need to be optimized at the expense of others).
<b>Solution</b>	The proposed solution to the problem. Note that many problems may have more than one solution, and the “goodness” of a solution to a problem is affected by the context in which the problem occurs. Each solution takes specific forces into account, and it resolves some forces at the expense of others, and it may even totally ignore some forces. The most appropriate solution to a problem is the one that best resolves the highest priority forces as determined by the particular context. Use Solution Related to Forces to ensure that the reader understands why this solution was chosen.
<b>Rationale</b>	An explanation of why this solution is most appropriate for the stated problem within this context.
<b>Examples</b>	Concrete examples that illustrate the application of the pattern
<b>Related patterns</b>	Related patterns that work in conjuncture with this pattern.

The resulting patterns have evolved through the repetitive application of the Framework to the six use cases. Although there are several abstraction layers, this particular pattern



language was used to articulate and codify the emerging eCORE Tools patterns for the end-user, as outlined in Chapter 5.3.

### 3.4 Output: Digital Transformation Requirements

The output component is a set of formal and non-formal high-level business requirements written in pseudo requirements language that describe the business transformation on a strategy and structure level and not on an implementation or solution specific level. The thesis proposition is that at this level of abstraction enough to sufficiently scope and outline the high-level goals, dependencies and relationships necessary for transformation. This proposition is tested and evaluated during the post-transformation feedback and analysis phase, of which the findings are presented in the last Chapter of each use case.

There are three requirement categories, each representing the transformation requirements for the *Technology component (TC)*, *Process Component (PR)*, and the *People Component (PP)*. Their demonstration is summarized in the *output: digital transformation requirements* tables of each use case, which summarises the *Digital Transformation Requirement List* as demonstrated in the Appendices of each use case.

For each operation in the use case, the requirements are summarized by exploring:

#### ***Technology component (TC):***

- 1- As-Is Technology: Identifies the pre-transformation existing technology of the firm.
- 2- How it is used: Describes the operations covered by those technologies.
- 3- Why was it used that way?: Describes the goals behind them.
- 4- Problems: Describes the gaps in their goal achievement.
- 5- Why change?: Describes the new goal post-transformation.
- 6- To-Be Technology: Describes the post-transformation technology requirements.
- 7- How it solves the problem: Addresses how it improves the desired operation.

#### ***Process Component (PR):***

- 1- As-Is Process: Identifies the pre-transformation existing process for each operation.



- 2- How it is managed: Describes how the process and workflow are implemented pre-transformation.
- 3- Why was it managed that way?: Describes the goals behind them.
- 4- Problems: Describes the gaps in their goal achievement.
- 5- Why change?: Describes the new goal post-transformation.
- 6- To-Be Process: Describes the post-transformation process requirements.
- 7- How it solves the problem: Addresses how it improves the desired operation.

### ***People Component (PP):***

- 1- As-Is People: Identifies the pre-transformation existing roles for each operation.
- 2- How roles do their job: Describes how they operate in the pre-transformed organization and their dependencies.
- 3- Why was it set up that way?: Describes the goals behind them.
- 4- Problems: Describes the gaps in their goal achievement.
- 5- Why change?: Describes the new goal post-transformation.
- 6- To-Be People improvements: Describes the post-transformation role requirements.
- 7- How it solves the problem: Addresses how it improves the desired operation.

This structure provides the business decision-makers with the requirements map to properly implement the transformation, aided by the modelling tool described in Chapter 3.5.

## 3.5 The eCore Tool

### 3.5.1 The need for the use of the eCORE tool for the modelling exercises

The main reason for using the eCORE Tool during the modelling exercises is because the sheer amount of information collected from the case studies needed a manageable way of doing the modelling, and textual and tabular representations were insufficient to capture the entire model. The tool features the ability to build the model object classes, relationships, attributes, instances, and statuses, which aids the analysis as it enables the exploration of multiple relationships across multiple viewpoints. Furthermore, the tools facilitate



the use of model objects across multiple viewpoints, which are all integrative and therefore, intermodel relationships can be observed and analysed.

Some of the advantages of using the eCORE Tool in building and analysing the models:

- 1- Usage of templates speeds up the development of models.
- 2- Compartmentalizing viewpoints allows for deep diving without losing sight of the big picture.
- 3- Redeployment of components across different viewpoints eliminates mistakes from repeating or copying.
- 4- Interoperability of components and relationships across the different viewpoints facilitates analysis of gaps and transformation.
- 5- Standardization allows for comparability across different case studies.
- 6- The option of using attributes and properties allows for storing context-specific data across all viewpoints.

As a result, the tool was used during the use cases, starting with the exploration, verification and stakeholder review phases. The resulting modelling diagrams are outlined in their respective case studies in Chapter 4, and screenshots of the outputs within the tool are demonstrated in each case study Appendices.

### 3.5.2 The design of the eCORE Tool (using the StarUML IDE)

The underlying software that eCORE Tools is built upon is StarUML. StarUML is a sophisticated software modeller aimed to support *agile* and *concise* modelling. The main targets of users are Agile and small development teams, Professional persons, and Educational institutes (MKLabs Co., 2020). However, similar to other modelling tools, it supports a few pre-dispositioned notations, hindering requirements engineers from using the most appropriate notations for the particular modelling task. However, the software allows modellers to build custom notation and modelling rules based on their desired ontological concepts and modelling frameworks. Custom applications of the same nature have been previously used in research, and one particular example was “RE-Tools for Requirements Engineering” by (Supakkul & Chung, 2012a).



As a result, a significant effort was undertaken to develop eCORE Tools as a custom tool inside StarUML software that incorporates the entire eCORE notation and modelling framework. Over 20,000 lines of code were written in 20+ code files, and 60+ notational elements were created. More details about the development history, features and capabilities of the eCORE Tool are described in Appendix 7, and screenshots and details of the models from the use of the tool are shown in the appendices of each case study.

The developed eCore Tool aims to provide many essential features that constitute the central capabilities for our modelling purposes, including:

- 1- **Templating:** The modeller can create models from template files that are pre-populated based on best practices that have evolved over his/her experience. This feature improves the quality and speed of the modelling exercise as it enables the reusability of previous knowledge and experience.
- 2- **Inheritance:** The modeller can use inheritance laws, by which new objects inherit the attributes of their parent, thus enabling easy validation rules and interoperability across viewpoints. For example, in modelling a Human-agent “Engineer”, the modeller can choose to make the sub-class “Technical Team” and therefore inherits all the parent attributes, constraints and relationships automatically. The main benefit of this feature is that it exposes hidden relationships and implications of changes that would typically have been difficult to notice otherwise.
- 3- **Polymorphism:** Instances of objects created in the model can morph into different viewpoints. For example, a Human-agent “Marketing” is the same object represented in the Goal Model as a Human-Agent, Actor-Dependency Model as an Actor, and in the Capability Model as a resource. The advantages are many: A) it allows for the understanding of the role of this object across multiple viewpoints as it auto-generates the inter-model relationships, B) It reduces the risk of duplications and errors in missing relationships or associations, and C) It carries the attributes and validation rules across all the viewpoints. All of the above advantages enable the modeller and the stakeholder to understand the role of each object in the model as it relates to the viewpoint it is represented



in and the overall context of the entire framework across multiple viewpoints and multiple relationships schemes.

- 4- **Obfuscation:** Object representations can obfuscate specific details or view them as the modeller sees fit, without the need to delete components or modify the attributes and embedded information. This feature is convenient to de-clutter the model without causing painful validation errors.
- 5- **Groupings & Abstractions:** The modeller can group objects utilizing composition rules. For example, the “Technical team” represented in the Goal model contains individual “Actors” in the Actor-dependency model. The advantage of this feature is that relationships built on the “Technical team” are automatically carried forward to its sub-component “Actors”. Therefore, associations and relationships become more evident and apparent for the modeller and stakeholders, enabling them to understand better the complex relationships between the different components of the models across the different viewpoints and the transformation.
- 6- **Verification rules:** The modeller can use validation rules to verify the model. Several types of rules can be coded. Some examples include completion rules; the modeller can make a rule in the Actor-Dependency model that a model is not complete unless all instantiated Actor objects are presented, and at least one dependency must be made among them. Other rules include building constraints rules, such as the number of relationships allowed or their directions, or Attribute rules where filling certain fields in the object are mandatory.



## Chapter 3: Developing the SC-COST Framework

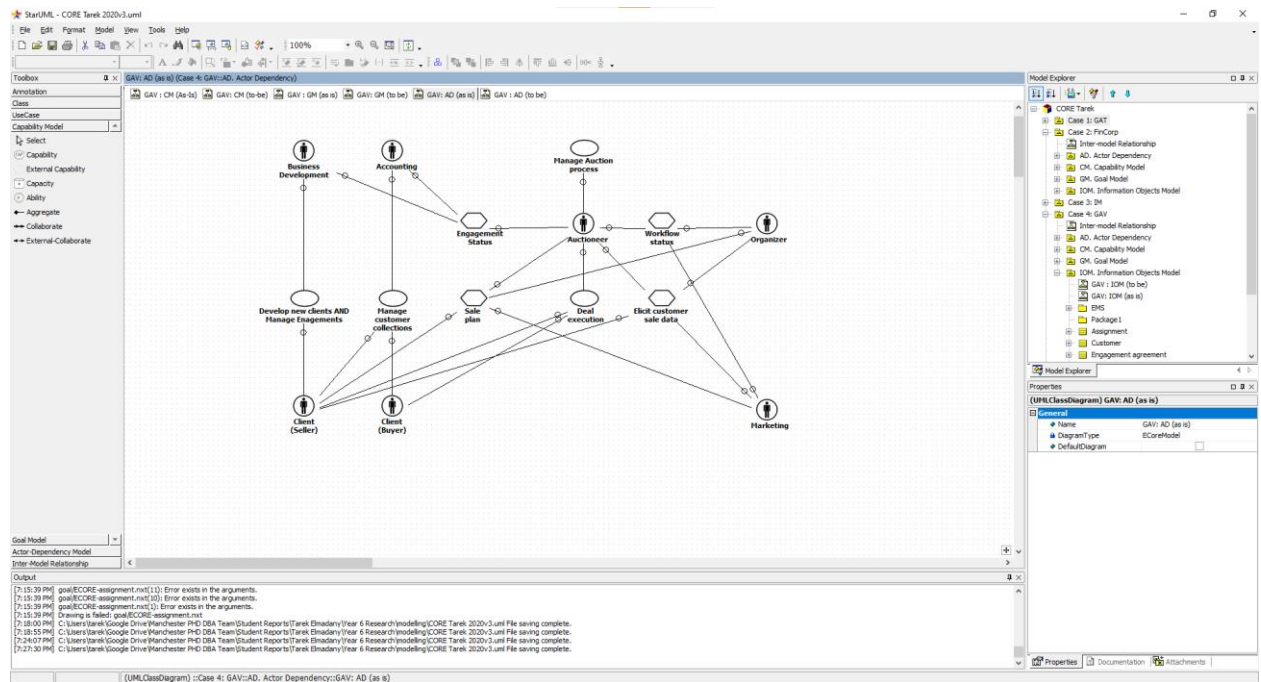


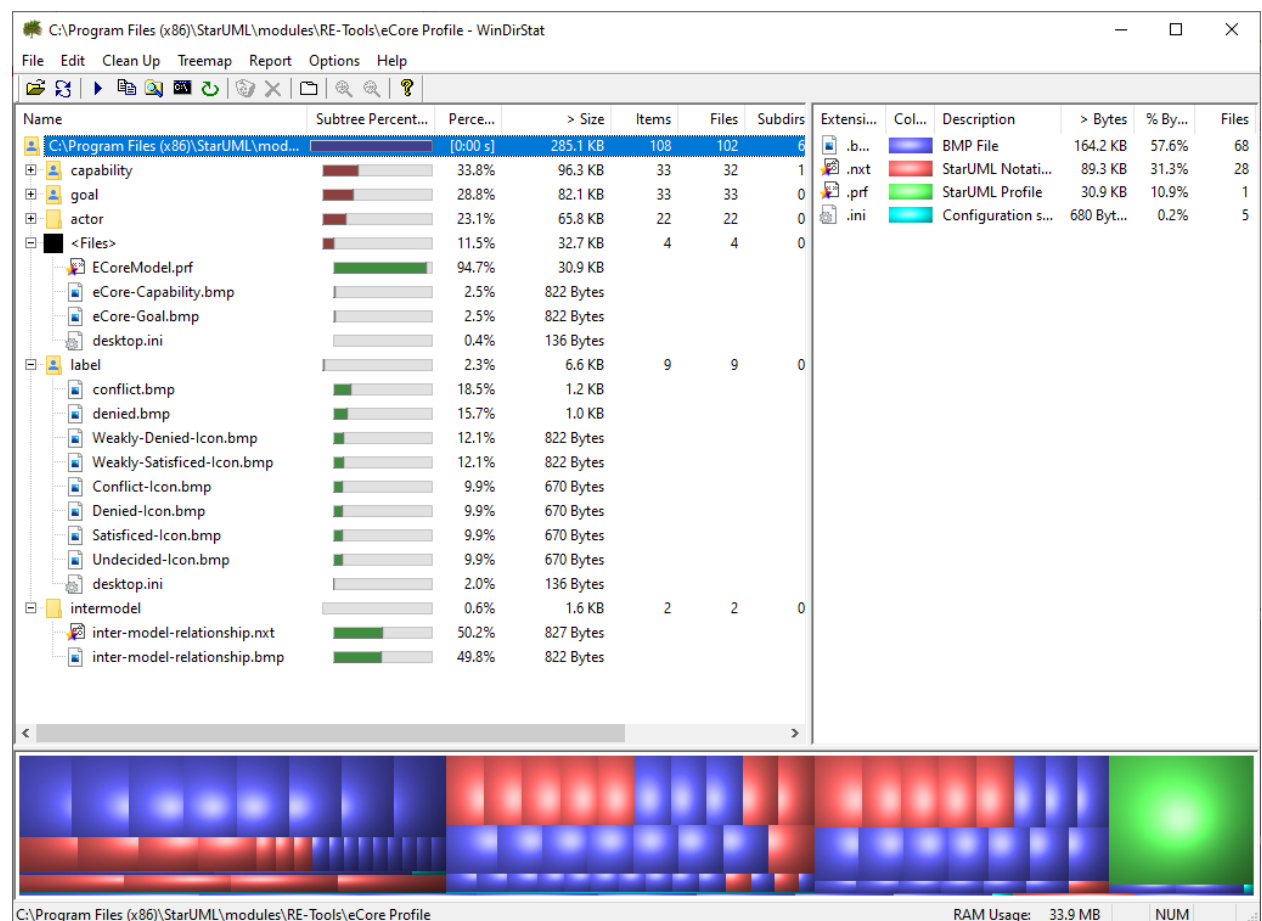
Figure 7: Screenshot of the eCORE tools inside the StarUML IDE

### 3.5.3 The eCore Tool project and code

The eCORE Tool code was developed almost entirely from scratch to accommodate the needs of the eCORE modelling framework. A significant effort was undertaken in the development phase, resulting in 200,000+ lines of code (LOC) distributed over 20+ files, and a notation with over 60+ icons (see Figure 8). The code defines the classes, inheritance, attributes, allowed relationship types, and validation rules (see Figure 9).



## Chapter 3: Developing the SC-COST Framework



**Figure 8: Screenshot of the Project Folder showing the number of files and sizes**

The tool was tested and iterated throughout the research phase, bugs were fixed, and features were added throughout the case studies. The activity of modelling the use-cases, including requirements gathering, analysis, stakeholder reviewing, and output, has enhanced the tool and exposed some of its limitations. Although the tool is not entirely free of bugs, and sometimes workarounds had to be made for the sake of practicality, the tool has proven vital in building and verifying the model throughout the research phase.



## Chapter 3: Developing the SC-COST Framework

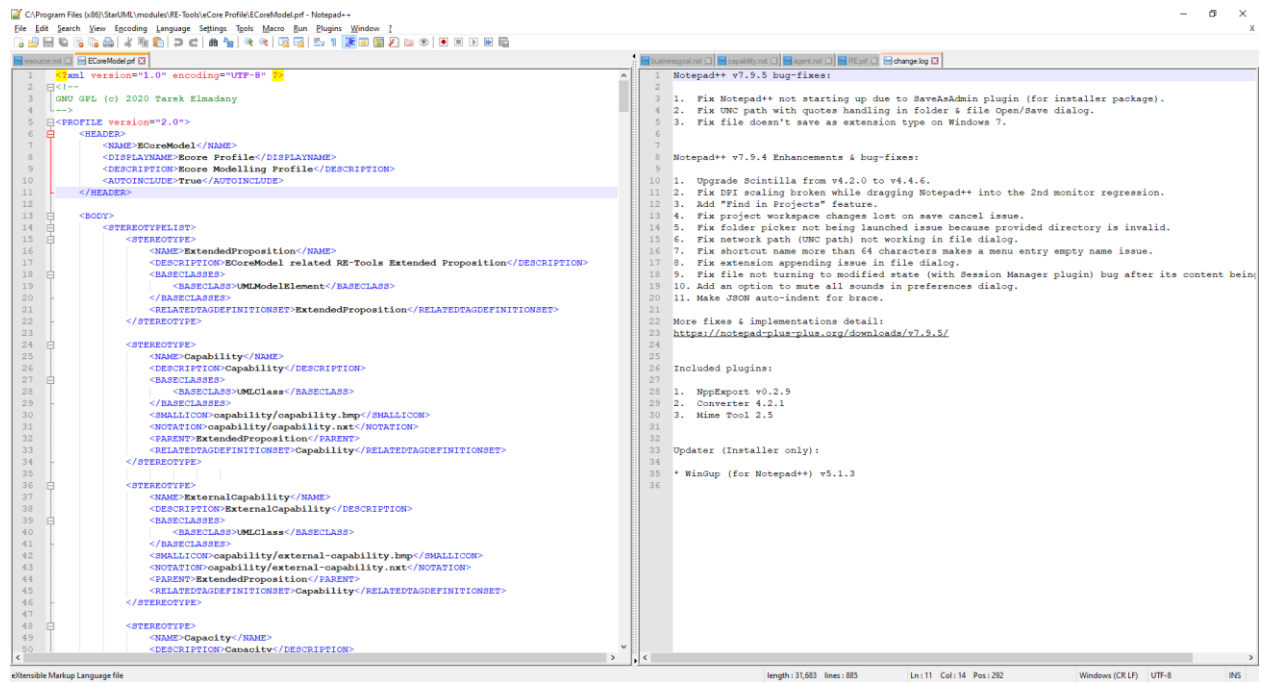


Figure 9: Screenshot showing a sample of the underlying code for the eCORE Tool

The development effort was significant, and sometimes roadblocks were reached that required communicating with the founders of a similar tool: ReTools for inspiration and help. Initial communication with professor Sam Supakkul (Supakkul & Chung, 2012a) helped kick-off the initial learning curve.

### 3.5.4 The use of the eCORE tool

Similar to many modelling tools and integrated development environments (IDE), familiar features and affordances are allowed. Figure 10 demonstrates some of the central features that showcase the eCORE tool modelling capabilities.



## Chapter 3: Developing the SC-COST Framework

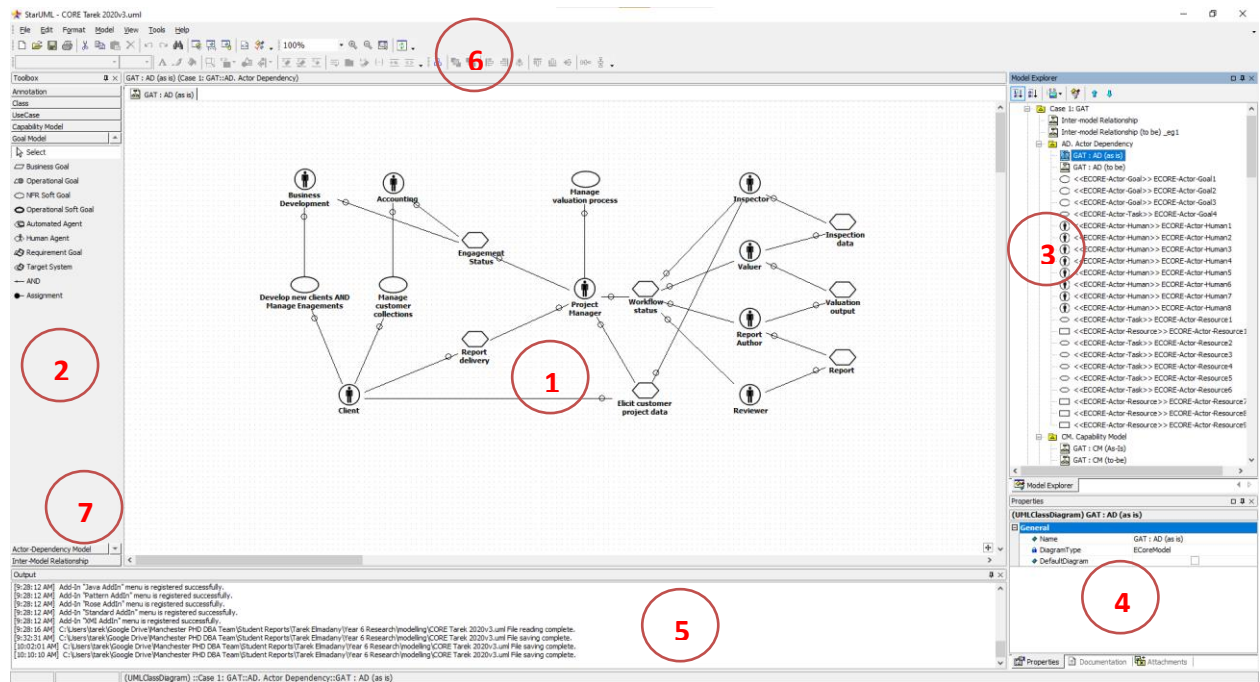


Figure 10: Screenshot of eCORE tool IDE main features

Highlighted and numbered in Figure 10, the central components and features of the eCore Tools are as follows:

- 1- **Canvas:** The canvas allows the user to arrange and link the object components using easy manipulation of pictorial representations. Objects can be dragged from the model explorer or the Notation toolbox to add or modify easily, and relationships can be quickly built between objects via dragging the mouse over to connect the objects.
- 2- **Notation toolbox:** Provides a sub-set notation for all the eCORE viewpoints. The Goal modelling toolbox, Capability modelling toolbox, Actor-dependency modelling toolbox, Information Object modelling toolbox, and the interrelationship annotation toolboxes are presented easily to use the Chapter on the left side.
- 3- **Model Explorer:** The model explorer provides a hierarchical representation of the model, with the properties and attributes identified in a tree-like structure.
- 4- **Properties and Attributes:** Class and object properties and attributes can be directly added and edited from this sub-window to ease access and display.
- 5- **Debugging and validation:** Rules for validating the model such as missing or double associations, missing attributes, or invalid directional relationships, and any satisfaction



criteria coded into the validity rules of the viewpoint is displayed in the form of errors and warnings.

- 6- **Additional annotation capabilities:** Typical authoring features allow for additional demonstration annotations, colouring or emphasising by font or size.
- 7- **Additional productivity automation:** Automation rules such as autofocus on the respective toolkit for the viewpoint in focus or automatic validation errors upon saving are additional productivity features that enhance the modelling experience while in session at the client.

Many other features are typically provided with integrated modelling tools, such as printing the model in graphical and tree formats, exporting in XML formats, commenting and re-views, and much more. The user

### 3.5.5 SC-COST modelling with the eCORE Tool

The modeller (user) would go through the following steps to model their transformation:

- 1- **Create a New Project from Template:** The user would kickoff the modelling exercise by starting a new project. During the creation project, a pre-set template can be selected, which were developed based on the patterns identified in Chapter 5.3
- 2- **Edit the templated model:** The user would then expand the generic model created by the template to fit the organization's specific design and structure.
- 3- **Expand the relationships and cross-modal links:** The user would then explore how each viewpoint relates to its counterpart in the other models. For example, how the Business Development Main Goal in the Goal Model relates to the Business Development dependencies in the Actor-Depencey Model. This exploration exposes more dimensions to the relationships between the Technology, Process and People components and thus can help the user enhance the model and understand its implications better.
- 4- **Produce the High-Level Business requirements:** The tool is able, through relationship tags ("Achieve", "Improve", "Deprecate", etc.), list all the high-level design decisions made in the model and list them as a print-out of requirements.



- 5- **Verify the requirements:** The user from the list of requirements can double-check if all look fine, and if something he feels is missing can trace back to the model and check if they modelled it correctly or not.

All of the above was iterated upon over six use cases. The process yielded the SC-COST Framework, the patterns, the eCORE Tool, and the conclusions.

### 3.6 The development cycle of SC-COST Framework

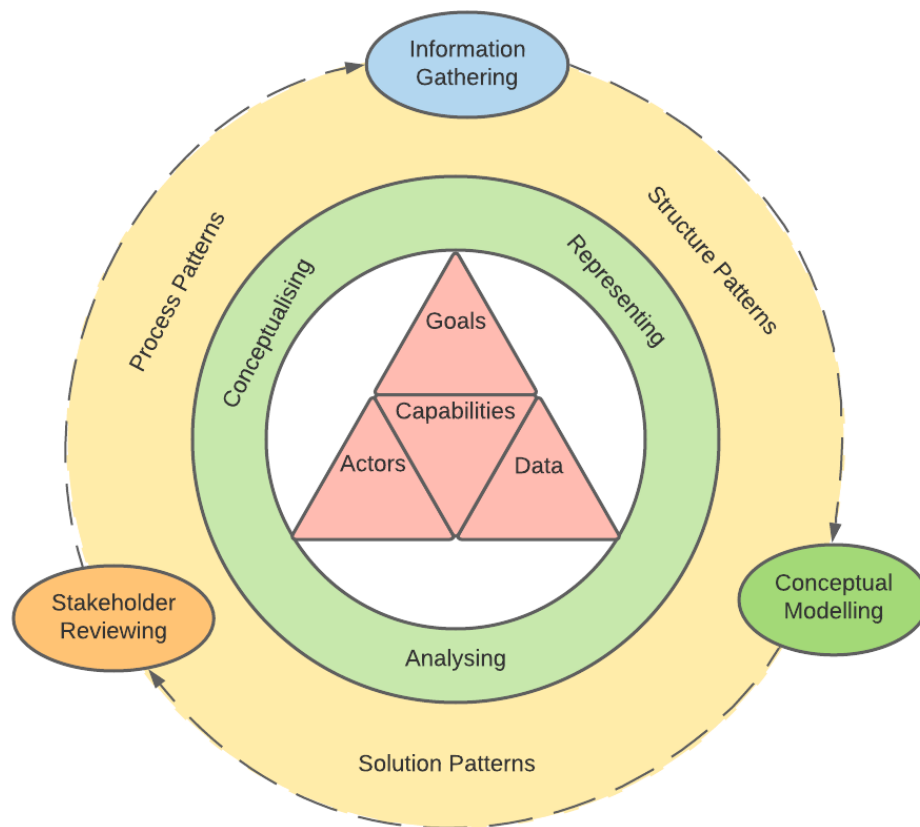
Building the SC-COST framework involved iterating through the uses cases to elicit the requirements, construct the models, extract the patterns, and enhance the eCORE Tool features and capabilities. The process involves a 'lifecycle' and is graphically shown in Figure 11.

A key and critical element in this process are the developed conceptual models. Developing a model for each SCF includes gathering data from multiple scenarios in the case study, devised based on the many options available, limited by the constraints gathered from the data-gathering exercise, and discussions with the key decision-makers in the SCF under study. The requirements elicitation phase is critical for ensuring that the project delivers system components aligned with the user partners' business goals.

Requirements engineering (RE) manages the transition from an initial organisational or system situation to the desired situation where a problem is treated or an opportunity is realised (Lamsweerde, 2001). In the use cases, the requirements elicitation process resulted in a set of validated business goals and requirements that the new system will need to possess for the system to meet these business goals.

A common approach was adopted in the use cases, involving the three main activities of 'information gathering', 'conceptual modelling' and 'stakeholder reviewing', as shown in Figure 11. These activities were carried out in an iterative manner resulting in a stepwise refinement of the produced results.





**Figure 11: Activities involved in the eCORE model building process**

#### 3.6.1.1 Information Gathering

Information gathering refers to collecting information relating to the case-study use-cases modelling and decision making. The case studies started with a collaborative white-board brainstorm session via face-to-face meetings, then formalized in use-case language. They were also refined while iterating through the conceptual modelling phase. The stakeholders walked through the use-cases and conveyed details about the AS-IS state, including current resources and interactions, capabilities, actors, and more. Similarly, information on the desired transformation of People, Process and Technology was gathered and used during the modelling phases. See each case study in Appendix Section 2 and 5 for use-case details and the Digital Transformation Requirement List, respectively.



### 3.6.1.2 Conceptual Modelling

The eCORE framework was used to model the use cases, which included a set of complementary and intertwined modelling paradigms based on enterprise capabilities, goals, actors, and information objects, as shown in the inner part of the diagram's concentric circles in Figure 11.

The representation of these models is done using graphical notations and relationships in order to provide a high-level of visualisation of the conceptualised aspects being considered, which in turn helps, on the one hand, requirements engineers to construct models that can be easily and often formally verified, and on the other hand, domain stakeholders in their reviewing and validating of the captured knowledge (see Chapter 3.6.1.4).

It should be noted that the conceptual models do not merely constitute more formal representations of the information gathered during the stakeholder meetings. Instead, they are developed collaboratively with the stakeholders through the creative analysis (transformational, exploratory, combinatorial) of the gathered information by exploring captured assumptions, suggesting new concepts, refinements of and new connections between documented concepts, and evaluating elicited ideas' effectiveness.

In the use cases, the four modelling dimensions were applied to the user company. The results are presented and analysed in Chapter 4.

### 3.6.1.3 The use of patterns: Structure & Process patterns, Transformation patterns, and Solution patterns

In this thesis, three patterns are developed: the Structure & Process pattern, the Transformation pattern, and the Solution pattern. Those patterns were designed and refined from the iterating through the case studies and observing the commonalities in the construction of the eCORE model for the AS-IS and the TO-BE states, which was named "Structure & Process pattern"; the transition between the two, which was called "Transformation pattern"; and the end-state of the TO-BE systems, which was named the "Solution pattern". The process of iterating through the case studies is detailed in Chapter 4, whereby those patterns



were recognized, evolved and tested. The formal definition and writing of the patterns using pattern language were outlined in Chapter 3.3 Table 10.

### 3.6.1.4 Stakeholders reviewing

A key challenge in developing systems is the engagement of domain experts in their articulation, agreement, and validation of requirements. This challenge is particularly pronounced at the so-called initial requirements phase. Decisions taken at this stage have a profound effect on the technical and economic feasibility of the project.

The degree of client stakeholders' involvement distinguishes early requirements from late (or support system) requirements. Client stakeholders' communication almost exclusively drives early requirements. Issues of early requirements include: (a) the customer profiles of a business process, (b) the likely demand for product or service made by each type of customer, (c) the level of desirable service that the business process should strive to achieve, (d) the resources that are required in order to achieve these levels of service and (e) the trade-off between levels of service and requisite resource between all client stakeholders of a business process. Only when these issues have been resolved can one begin developing requirements for support systems. The analyst will need to know how the support system interacts with other systems, what kind of levels of service it must achieve and so on before engaging in further analysis on functional and non-functional properties of the intended system.

The analyst benefits from the use of patterns (see Chapter 3.6.1.3). This phase results in additional and revised information (see Chapter 3.6.1.1) about the modelled domain, which progresses with a new round of modelling activities (see Chapter 3.6.1.2) and review.

In the use cases, stakeholder reviewing was carried out in various ways and at different project phases. Specifically:

- During information gathering with each company's representatives, there were face-to-face meetings and teleconferencing sessions of requirements modellers. These sessions clarified the collected information using forms for capturing business capabilities, goals, actors and informational objects.



- During conceptual modelling, there were similar sessions with the same project personnel. During that time, the requirements modellers guided the user representatives through the models, and they, in turn, clarified and validated the abstract knowledge about their companies within the models. As a result of this interaction between modellers and users, the models were incrementally refined.

These two main project activities were repeated at regular intervals until there was a consensus that the models were correct concerning the current AS-IS and the future TO-BE situation, and the user requirements were adequately represented.

In our SCF modelling exercise, the modellers utilize the patterns to help structure the AS-IS conceptual model, use the *Structure & Process* patterns, and help structure the TO-BE transformed conceptual model using the *Transformation* and *Solutions* patterns (see Chapter 3.6.1.3).

### 3.6.1.5 Verification

A model is as good as the assumptions put into it, and those assumptions are only strengthened by the data gathered in the previous step and the ability to substantiate it. It is thus one of the responsibilities of a modeller to make a verifiable model to the best of his/her ability. With the introduction of all the new data gathered from the different stakeholders and the capabilities offered by “smart” platforms and technologies, the challenge is how to come up with verifiable Key performance indices (KPIs) that measure both the correctness of the models and the effectiveness of the planned Digital Transformation.

The process of verifying the AS-IS models with the stakeholders was conducted with the assistance of the capabilities provided by the eCORE Tool (See Chapter 3.5 for more details about the tool). The KPIs used were as follows:

- 1- **People component:** Ensuring all the Human elements were represented in all the viewpoints.
- 2- **Process component:** Ensuring all the central processes (core to the business) were represented in all the viewpoints.



- 3- **Technology component:** Ensuring the central Digital and Non-digital technologies that enable the work to be done is well represented in the viewpoints.
- 4- **Relationships:** All the relationships were present and represented correctly in the model.

### 3.6.1.6 The output: A model for Digital Transformation Requirements

The output of each use case was *a) An eCORE model* that outlines the complex relationships between the four viewpoints and helps to guide the understanding of the transformation, and *b) The output component* is a set of business requirements written in pseudo requirements language that describe the business transformation on a strategy and structure level and not on an implementation or solution specific level. These follow the structure in Chapter 3.4 and are demonstrated in each case study in Chapter 4 and their appendices. Both outputs combined serve late system requirements, where well-known modelling paradigms (e.g. UML, SysML, etc.) can be adopted.

## 3.7 Summary and reflections

The SC-COST framework utilizes the eCORE Framework, the theory and application of patterns, and the capabilities of the eCORE Tool (Chapter 3.1). It was developed and applied in an iterative development lifecycle to analyse and aid in understanding the Digital Transformation requirements of an SCF (Chapter 3.6). The eCORE framework provides the underlying theoretical foundation whereby the analysis is conducted by modelling four viewpoints: the *capability model*, the *goal model*, the *actor-dependency model*, and the *informational model* for both the AS-IS state and the TO-BE state of the organization (Chapter 3.5). The inter-model interactions between those four different perspectives and their transformed TO-BE states provide vital insights into the roles of the *technology*, *process*, and *people* in the organization and how they will be affected by the transformation (e.g., improvement, addition, elimination or reconfiguration). Patterns are a central component of the SC-COST framework (Chapter 3.3), as they capitalize on commonalities from past digital transformation experiences with similar contexts. They are practically translated to templates in the eCORE Tool (Chapter 3.5), which provides an integrated modelling environment with a pre-



populated list of commonly used model components that aid the modeller in constructing the AS-IS and TO-BE eCORE models of the SCF and analyzing the desired Digital Transformation requirements.

The SC-COST framework addresses **RQ3**. It is an intellectual framework that offers a robust approach to help SCFs specify, analyse, and evaluate their digital transformation requirements. It can be tested on practical application use cases with practical tools (development cycle, useable tool and template patterns) to assist in the complex task of modelling based on the foundations of its intellectual framework. The eCORE framework (Chapter 3.2) is in its centre, which provides the underlying structure of the AS-IS and TO-BE models. This structure is pragmatically modelled via the eCORE Tool, an essential component of the framework, as it aids the modelling exercises and data collection in a more manageable way. It allows the stakeholder engagement of the case studies to collect valuable observations and insights that could not be done with a narrative approach. Meanwhile, pattern theory is materialised as templates within the eCORE Tool, which lends itself to being used, evaluated, and evolved when applied to the SCFs use case. Therefore, the eCORE Tool also allows for testing templates, representing patterns, and thus evaluating and improving the patterns and the framework (Chapter 3.5.1).



## 4 Modelling the use-cases

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### Introducing the Case Studies

Background about the 6 SCFs

The scope of these digital transformation projects is to characterise the next generation of consultancy digital practices that cope with the evolving consultancy industry in the era of “smart”.

The aims of the study were:

- To understand the pre-transformation operational model of the SCF, including defining the pre-transformation capabilities, goals, assets, and relationships.
- To understand the desired outcome of the digital transformation, including defining the change goals and the desired capabilities.
- To analyse the requirements for transformation, including building the transformation model for each case.
- To identify the patterns for transformation in the context of SCFs.
- To verify the SC-COST Framework in meeting the transformation requirements of all the SCFs.

Six case studies represent six SCFs under review:

- 1- Global Appraisal Tech (GAT): A small consulting firm specialised in Real Estate Appraisal
- 2- FinCorp: A small financial services advisory firm.
- 3- Income Market Research (IMR): A small Market research consultancy firm.
- 4- GAV: A small agency specialising in scrap and liquidated real estate auctions.
- 5- YAMM: A small project management firm specialising in construction management.
- 6- ITEGY: A small IT consulting firm specialising in IT services.



When performing the SC-COST framework's conceptual modelling exercise (Chapter 3.6.1.2), we ultimately identify the following:



The key is identifying the “*As-Is*” (pre-transformation state) and the “*To-be*” (desired post-transformation state), and then we identify the “*gap*” (the missing components that form the requirements for transformation) and model the Digital Transformation components.

Note: The approach used in the research context was similar to the one used by the DISRUPT project by E. Kavakli and P. Loucopoulos (Pericles Loucopoulos et al., 2020; V. Kavakli, 2017) in the context of “smart” factories.

The selection process and criteria for the 6 SCFs:

To find SCFs, the mailing lists of several Small Consulting Associations in the MENA region were solicited. Those interested in participating were selected based on the following selection criteria.

**Table 11: The factors used in the selection criteria for the case studies**

Criteria	Selection	Rationale
<b>Number of employees</b>	(including consultants): between 20 and 100.	Tiny consulting firms below 20 employees often lack processes and controls, and they are often run with intimate communication around one or two core people, with people wearing many hats at once, making it challenging to split the roles and understand the different team dynamics. Meanwhile, medium to large consulting firms above 100 employees often have systems in need of larger enterprise transformation endeavours and



		often hire a dedicated transformation consultant, which impacts their drive to self-transform and limits the framework analysis. Therefore, somewhere between 20 and 100 lies the need for the framework, and thus its impact can be better demonstrated.
<b>Turnover</b>	between \$500,000 to \$3,000,000 annually	Besides the number of employees, consulting firms that run 20-100 employees can sometimes be substantial in the market in terms of revenue and profit. Therefore, a limit was made for the subset that faces budgetary constraints for transformation and would find it expensive to hire dedicated transformation companies.
<b>Accessibility (Location &amp; Data)</b>	They had to be accessible for physical or online communication	Proximity to researcher location for physical interviewing their decision and operation key person for several meetings for several hours. As brainstorming and whiteboarding sessions are intended.
<b>Susceptibility for Digital Transformation</b>	They had to either be willing to go through a digital transformation, or already going through one, or have already gone through one.	The research is primarily on transformation; therefore, it necessitates an existence of transformation in order to conduct an analysis and evaluation.



<b>Diversity</b>	I wanted to explore several contexts for SCFs	Halfway through the exploration, it became clear that the digital transformation model and requirements were almost identical across SCFs that operate their business model on delivering and results (such as a report or a recommendation). Starting from the fourth study, the research shifted the filtration criteria to different consulting firms that offer continuous consulting service support, as shown in case studies 4, 5 and 6
<b>Internationalization</b>	SCFs to have their services in various international contexts	So that conclusions are not locally skewed.
<b>Availability for Feedback</b>	They had to be open to sharing the experience of their journey through their transformation	To evaluate and assess the impact and usefulness of the models.

In the following Chapters, a step-by-step application of the eCORE framework with the case studies is outlined. Case Study #1: GAT will be elaborated on more in writing since it will be the first iteration of describing the process. However, the following case studies will be outlined with fewer explanatory details as the logic is the same, outlining only the specific unique characteristics of the use cases.



### 4.1 Case Study 1: Global Appraisal Tech (GAT)

Global Appraisal Tech (GAT) is one of the leading regional Real-estate-development-appraising consulting firms headquartered in Egypt. While it holds many local certifications, it is also a member of the International Valuations Standards Committee (IVSC) and the Royal Institute for Chartered Surveyors (RICS) based in the U.K. One of the main objectives of GAT is the development and initial validation of a development model, tools and methods aimed at improving the competitiveness and sustainability of its consulting services in the era of “smart”.

Real-estate-development-appraising models are complex, involving hundreds of transactional data, market research inputs and market dynamic assumptions from multiple sources. Moreover, it must comply with regulatory constraints, international and professional standards, and city code requirements.

The Digital Transformation process aims to have the capabilities to rapidly adapt to benefit from the new introductions of the “smart” era while complying with the restrictions in the standards and regulatory environment.

#### 4.1.1 Information gathering

A series of interviews were conducted with the key decision-makers in the organisation to identify the current context and the general business and system status. The interview goals were to:

- a. Determine the key stakeholders in the SCF to gather explanation, elaboration and validation.
- b. Understand the core use cases that characterise the day-to-day operations.
- c. Identify the current business and associated technology goals.
- d. Record the current capabilities for achieving these goals.

Throughout the interviews with the key stakeholders, concepts were discovered by analysing the descriptions corresponding to the eCORE concepts. The analysis of those interviews revealed several business capabilities that can be informally mapped onto eCORE, detailed



## Chapter 4: Modelling the use-cases

in terms of the assets (in the form of human physical and software actors) that the company possesses, and the ability (in the form of means or skills), inherent in these assets. A detailed requirement-gathering exercise is outlined in Appendix 1, and an overview of the use cases under study is summarised in Table 12.

**Table 12: Overview of the GAT use cases**

Use Case 1		Valuation
<b>Context</b>		Core business operation/service
<b>Needs for change</b>		The current activities that need change: 1- Report Authoring and Calculations 2- Data Collection and Management 3- Mapping 4- Resource planning, workflow management and Project Management
<b>Business vision</b>		Improvements in: 1- Collaboration. 2- Tracking. 3- Status awareness. 4- Accessibility. 5- Knowledge management.
Use Case 2		Engaging a new client
<b>Context</b>		Sales & Marketing
<b>Needs for change</b>		The current activities that need change: 1- Client service and satisfaction. 2- Engagement followup and measurement.
<b>Business vision</b>		Improvements in: 1- Quality of service. 2- Followup and tracking.



	3- Efficiency of client conversion rates (higher revenue and lower costs)
<b>Use Case 3</b>	<b>Collections</b>
<b>Context</b>	Account management
<b>Needs for change</b>	The current activities that need change: 1- Invoicing and collections. 2- Followup. 3- Status awareness and workflow.
<b>Business vision</b>	Improvements in: 1- Collection times. 2- Workflow integrations.

#### 4.1.2 Modelling GAT AS-IS models

##### 4.1.2.1 GAT Current capability modelling

The analysis of the information gathered from the use cases and the physical and virtual meetings with the user personnel resulted in the agreed capability model, shown in Figure 12.

The AS-IS capability model defines seven main capabilities denoted in the model as Project Management, Inspection, Valuation, Report Authoring, Data Management, Business Development, and Collections, in addition to one external capability: Data suppliers.

These capabilities exist because of certain capacities (in the form of resources) that the consultant firm possesses and the ability (in the form of means or skills inherent in the resources) to be of functional use. For example, *Data Management* is a capability of GAT (use case 1) that deploys resources such as Market research team (that include market surveyors), having the knowledge and expertise to gather and organise data from first-hand surveys, third party market research data, including demographical data, transactional data, activity data, cost of construction indices, real-estate inventories, etc. In the model of Figure



12: GAT current business capabilities Figure 12, capacities and abilities are indicated for each capability.

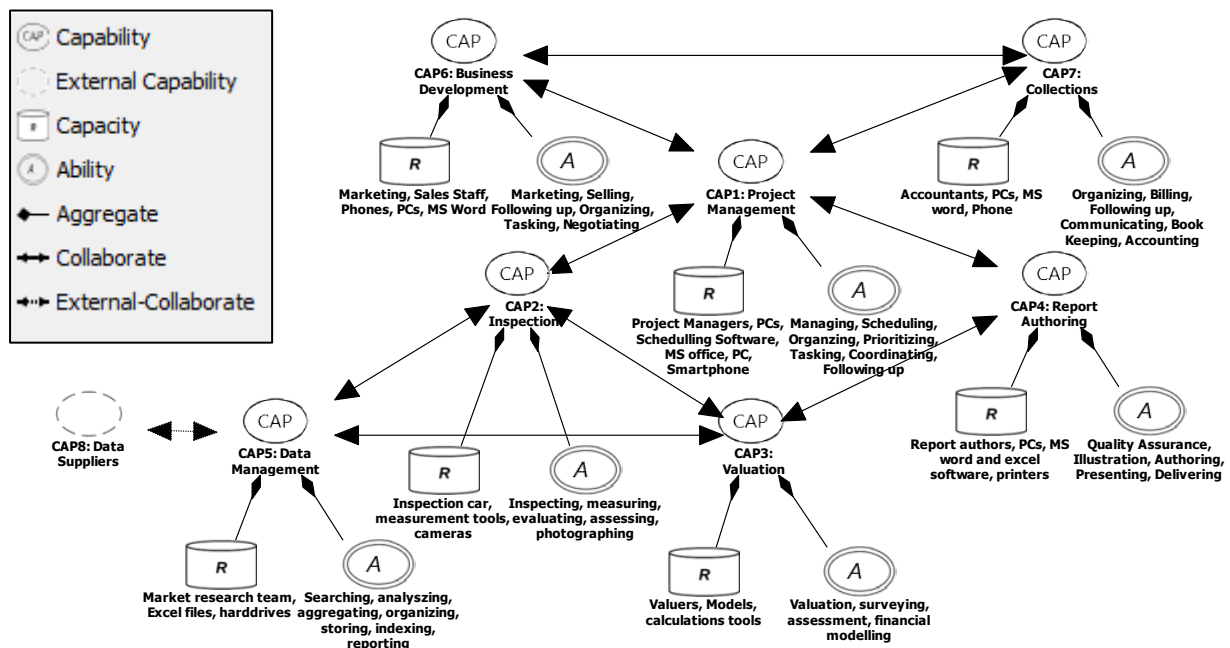


Figure 12: GAT current business capabilities

The functionality of the chosen use application is possible because GAT is the owner of capabilities CAP1-CAP8 and the collaboration between these capabilities. For example, Project Management, which is deployed daily, collaborates with five other capabilities to make sure tasks are fulfilled and proper procedures are followed to push the workflow of the appraising process forward.

Capabilities CAP1-CAP7 are considered internal capabilities, i.e. they are wholly owned by GAT and therefore can review and update their configuration of capabilities. In the GAT use case, such re-configuration will need to take place in order for GAT to utilise “smart” capabilities.

In addition to these internal capabilities, there is one external capability, CAP8, owned by enterprises with which GAT collaborate but whose capabilities are not owned, controlled or subject to any influence by GAT. External capabilities are included in the capability model to externalise these relationships, which may be very significant if, in the TO-BE situation,



there may be opportunities for a closer collaboration of GAT with external entities, such as suppliers of data and data companies perhaps making use of IoT functionalities.

The model of Figure 12 provides the scoping for the GAT application. It acts as an anchor point for the rest of the models, which will use this model for defining: “why does the enterprise need these capabilities?” (answered by the goal model), “what socio-technical actors are involved and how do they co-operate in order to meet these enterprise goals?” (answered by the actor dependency model), and “what kind of information is used in this co-operation?” (answered by the informational object model).

Therefore, this capability model represents a high level of abstraction in identifying the key levers of the current operation in this specific application of GAT. If GAT needs to meet some other new goals (which will be detailed in the change goals model), one would need to answer the questions of “which one of these ‘levers’ need to change?” the answer to which will lead to a new TO-BE situation.

### 4.1.2.2 GAT Goal Model

The GAT business goal model development was based on the information gathered from the users and executives at GAT via interviews and iterative feedback. The initial model was verified, corrected and expanded through repeated face to face workshops and online meetings with GAT stakeholders.

In this Chapter, and for reasons of readability and understandability, we present the goal model stepwise, following their causality decomposition.

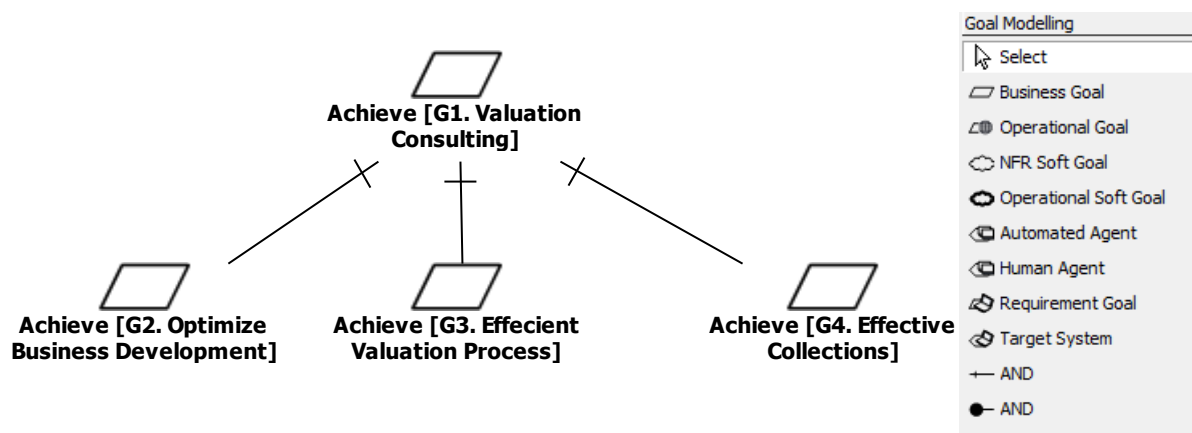
Initially stated goals were often rephrased during this process to avoid ambiguous goals or identify synonymous goals and relationships between goals. In many cases, stakeholders were aware of the operational goals but could not see how these fit the overall GAT business strategy. In other cases, it was found that two (or more) of the expressed goals partially contributed to each other, leading to a ‘goal tangle’ which was too hard to understand. This was solved by additional refinements of each goal and identifying common sub-goals.

Furthermore, stakeholders often focused on measurable ‘hard’ goals linked to the behaviour of GAT actors, paying less attention to ‘soft’ goals related to the quality of this



behaviour (e.g., efficiency). Such qualities were usually stated only informally often integrated within a hard goal (as adjectives), so a special effort was made to distinguish these soft goals and state them explicitly in the goal model.

Early in this process, it became evident that GAT use cases share the same strategic objective; G1: to have the data and capability for valuation consulting. This was refined in three sub-goals, namely, G2: To optimise business development, G3: To efficiently manage the valuation process and G4: To manage collections effectively, respectively, leading to the goal model shown in Figure 13, which provides a top-level view of the current GAT business goals.



**Figure 13: Top-level GAT business goals**

The AND relationship between the top-level goal and the three sub-goals means that the achievement of the three sub-goals is sufficient to ensure the satisfaction of the strategic GAT objective. However, these sub-goals are still too general, providing little information about the way these are operationalised. Goal operationalisation encompasses its 'causal transformation' into more concrete sub-goals that constitute achieving desired ends. Each step can result in identifying new sub-goals (more focused and often smaller in scope) linked to the original one through causal relations, thus forming a hierarchy of goals. The operationalisation aims to reach a level of detail whereby specific enterprise actors can realise each leaf goal.

The goal hierarchy depicted in Figure 14 illustrates the operationalisation of goal G2: To optimise business development work, Figure 15, G3, and Figure 16 G4 goals.



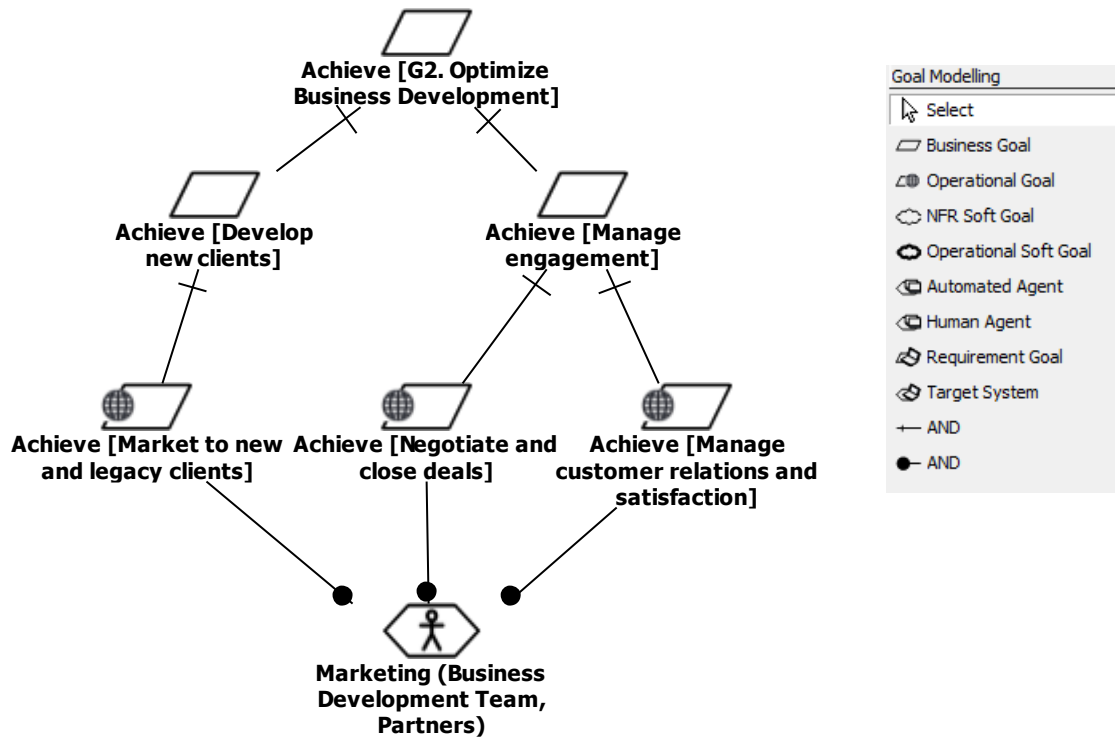
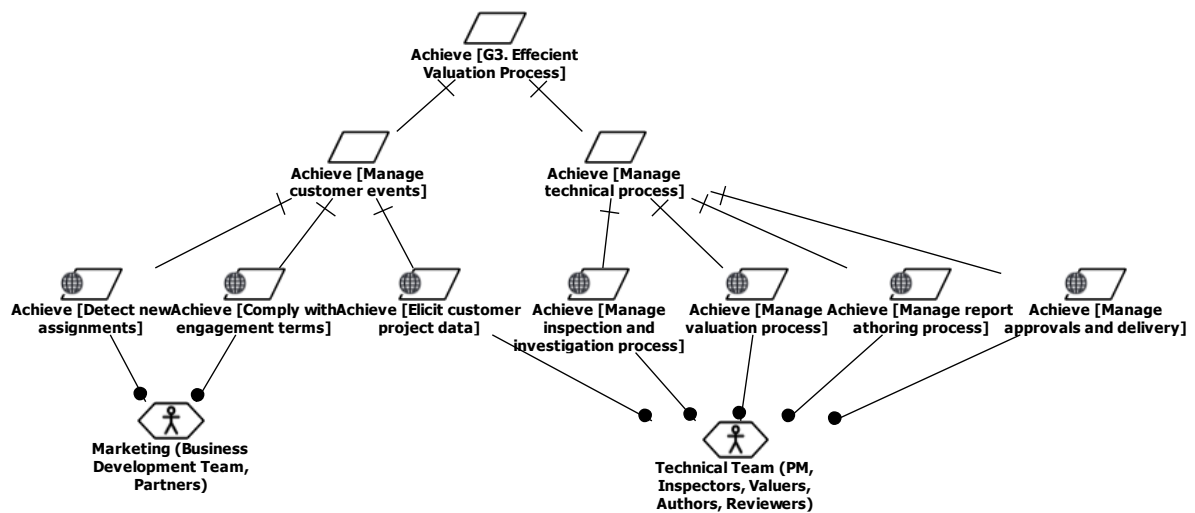


Figure 14: G2: To optimise business development work

To achieve goal G2: To optimize business development work, two sub-goals are identified: To develop new clients and To manage engagement. Three new operational goals are created, namely to Market to new and legacy clients, To Negotiate and close deals, and to Manage customer relations and satisfaction. All those goals are handled by the business development role, which could be one person or a group of people and is represented by the Human-Agent: Marketing. The role of Marketing is to achieve those goals within that organization.





**Figure 15: G3: To manage the valuation process efficiently**

To achieve G3: To manage the valuation process efficiently, two subgoals were identified: To Manage customer events and to Manage the technical process. Both of those goals are at the core of the consulting work and are divided into seven operational goals. The first goal relates to dealing directly with the customer, and it is divided into three operational sub-goals as follows: To Detect new assignments, To Comply with engagement terms, and to Elicit customer project data. Meanwhile, the second goal is related to dealing with internal teams. It is divided into four operational sub-goals: To Manage inspection and investigation process, To manage valuation process, To Manage report authoring process, and finally, To Manage approvals and delivery process. Those operational sub-goals are derived and verified by iterating the model via Use Case 1 (See Table 9: Overview of the GAT use cases, operationally detailed in Appendix 1.2 GAT Use Cases). The first two operational goals are under the responsibility of the Business Development team, which is represented in the model as a human-agent named `Marketing`, and the last five operational goals are under the responsibility of the technical office, which includes several actors such as an assigned project manager, inspectors, valuers, authors and reviewers. In the model, the technical team is grouped into one human-agent abstraction named `Technical Team`.



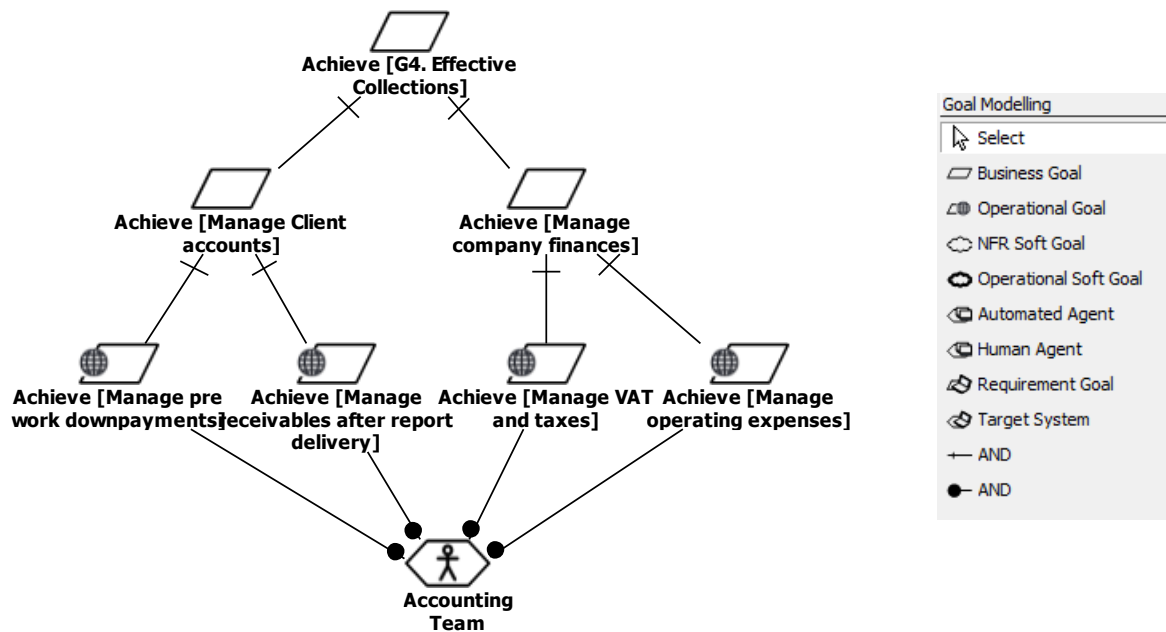


Figure 16: G4: To effectively manage collections

To achieve G4: To effectively manage collections, two sub-goals were identified: To Manage Client accounts and to Manage company finances, which are further divided into four operational goals as follows: To Manage pre-work down-payments, To Manage receivables after report delivery, To Manage VAT and taxes and finally To Manage operating expenses. All of those operational goals are under the responsibility of an accounting team. This team is represented in the model as human-agent by the name Accounting Team; the details are outlined in Use Case 3 (See Chapter Table 12: Overview of the GAT use cases, and detailed in Appendix 1.2).

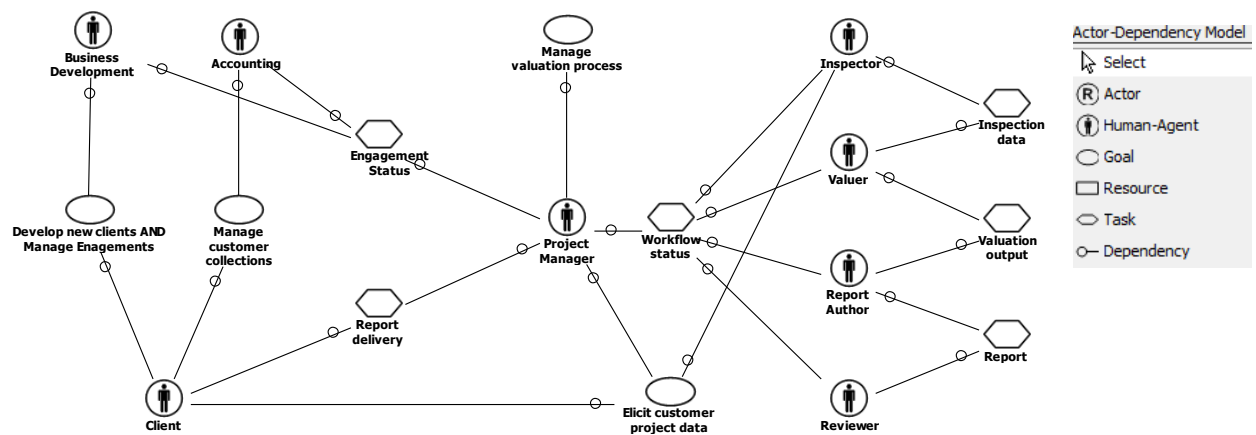
Note that the model could dive into deeper analysis and a lower implementation layer, whereby clear operational goals for each actor with detailed descriptions could be modelled; however, we will draw the line at this abstraction level for our comparative and pattern analysis with other SCFs.

#### 4.1.2.3 GAT Actor-Dependency model

The goal model described in the previous Chapter gives an intentional description of the GAT case. By associating business goals to specific actors, it provides the reasoning for



retaining them as enterprise capacities. The actor-dependency model, on the other hand, provides the socio-technical context of the identified capabilities. Unlike typical process models such as dataflow diagrams or activity diagrams which focus on information flow or control flow, the actor-dependency model is a higher-level abstraction that depicts what actors expect from each other. Figure 17 illustrates the Actor dependency model.



**Figure 17: GAT AS-IS Actor Dependency Model**

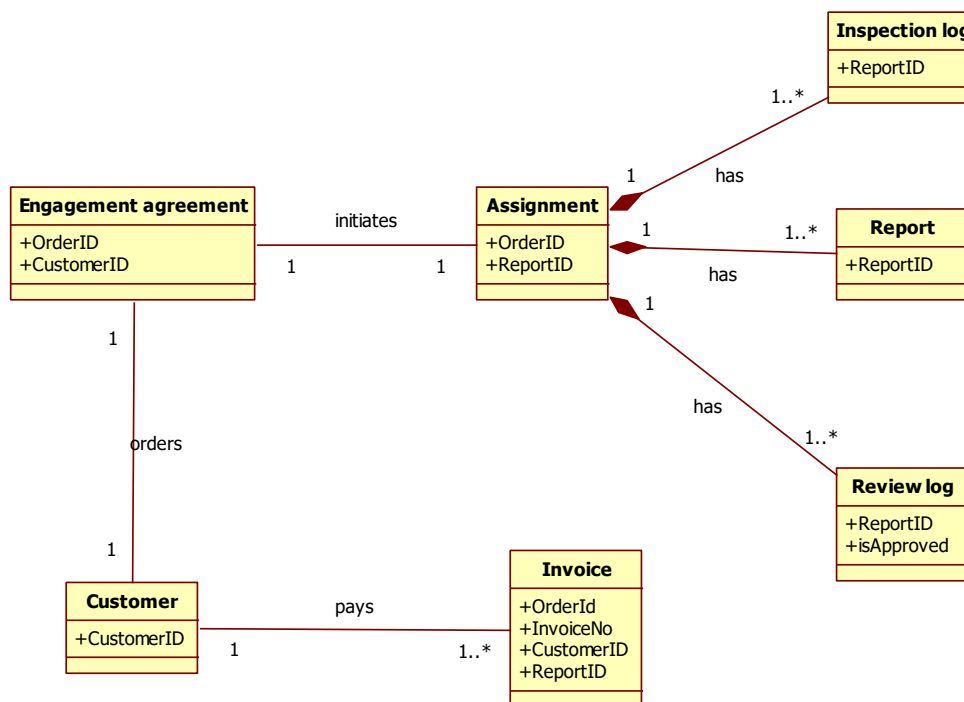
As shown in this model, there is a complex network of dependencies between the GAT actors. [Agent : Business Development] has a goal-dependency with the [Agent : Client] whereby to achieve their set goals of [Goal : Develop new clients and Manage Engagements], they need to interact with the [Agent : Client] while also managing the [Task : Engagement Status] with the [Agent : Project Manager]. The [Agent : Project Manager] as shown is a central role, whereby many central tasks and goals depend on him/her, such as [Goal : Manage valuation process] by managing [Task : Engagement Status], [Task : Elicit customer project data], [Task : Workflow Status] and [Task : Report delivery], each dealing with different actors as shown in the model. In turn, the technical team [Agent : Inspector], [Agent : Valuer], [Agent : Report Author], and [Agent : Reviewer] all have a dependency with the [Agent : Project Manager] for the [Task : Workflow status], and dependency among themselves with [Task : Inspection data], [Task : Valuation report], and [Task : Report] respectively. Finally, the [Agent : Accounting] is dependent on the [Goal : Manage customer collections] with respect to the [Agent : Client] and is in sync with the [Agent : Project Manager] via the dependency on the [Task : Engagement status].



### 4.1.2.4 GAT Informational Objects model

The GAT informational object model deals with the essential elements used to utilise the necessary data required to coordinate its various operations through information transmission channels. Such information transmission facilitates actor-dependencies; therefore, there are close synergies between the two models. On the one hand, when modelling the dependencies of actors, specifically those requiring resource collaboration where the resource is informational, it is possible to identify components of the informational model. On the other hand, when focusing on the informational model, relationships between the objects may reveal an actor dependency, which means that the actor-dependency model will need to be revised and refined.

The GAT informational model depicted in Figure 18 contains all informational objects used as part of the GAT capabilities.



**Figure 18: GAT AS-US Informational Object Model**

As shown in this model, the informational objects are representations of artefacts or encapsulating knowledge-critical content. For instance, an [Engagement agreement]



represents all the information, statuses, IDs and documents, both physical and soft, that describe the relationship between the [Agent: Client] and the SCF. Similarly, the [Assignment] is an instance that represents the initiation of the job which encapsulates (by composition) the Information objects [Inspection log], [Report] and [Review log], which in turn are each Task-Dependent on two Agents as represented in the previous Actor-Dependency model. An [Invoice] describes the instantiation of an instance that encapsulates the artefacts, statuses, and information related to the task-dependency between the [Agent: accounting] and [Agent: Client].

### 4.1.3 Validating the GAT AS-IS models for completeness

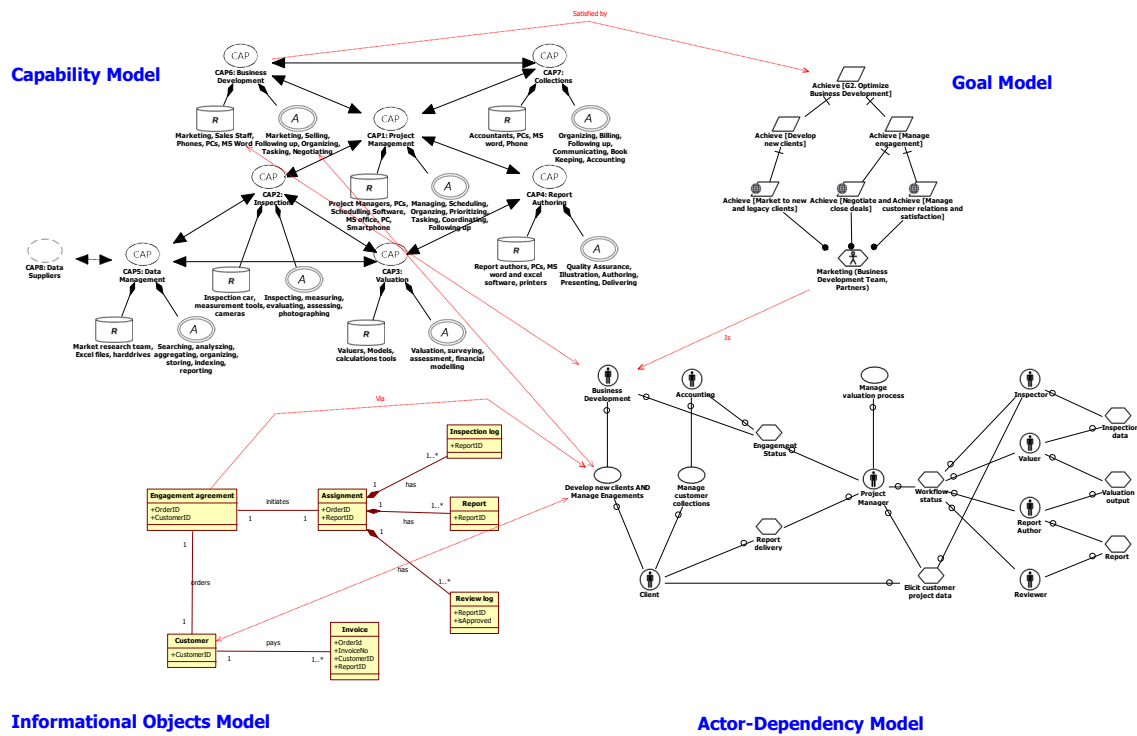
In Chapter 3.2.2, we introduced the idea of inter-model relationships.

In the process of developing the models presented in Chapter 4.1.2, this inter-model consideration proved to be profoundly important since it acted as a way of engaging the stakeholders in answering increasingly detailed questions and at each stage of the lifecycle of “information gathering-conceptual modelling-stakeholder reviewing” (see Chapter 3.6.1.4) to ensure that the modelled concepts were necessary and sufficient.

This concept of inter-model relationships is demonstrated in Figure 19, which shows a small fragment of these relationships in the context of [Business Development]. In practice, these relationships were discovered using correlation relationships utilizing the power of the eCORE Tools in connecting the different components of the model during construction, which were updated during each reviewing cycle, until all stakeholders were confident that the models represented were agreed upon and validated for the production application for the GAT use cases.



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**Figure 19: Inter-model relationship highlighting the relationship for [Business Development] as an example.**

For instance, the Capability [CAP6: Business Development] with Resource [Marketing and Sales Staff] achieves the Goal [G2: Optimise Business Development] and its sub-goals, via the Human-agent [Marketing (Business Development Team)], which in terms is the Actor [Business Development] using the Information Objects [Engagement Agreement] and [Customer]. More details on the correlation matrices are outlined in Appendix 1.3 and programmed in the eCORE program files.

### 4.1.4 Modelling GAT requirements for Change

#### 4.1.4.1 The GAT goals for change

Change goals express GAT's needs, wishes, and perceived opportunities concerning digital transformation technologies (which the users commonly referred to as "smart"). They have been co-operatively formulated through deliberating and agreeing with GAT's stakeholders during face-to-face and online workshops and offline revisions of the models.



The typical overarching question in Digital Transformation asked during our sessions is, “What kind of new capabilities does the organisation need to have to exploit the advantages of new technologies?”. The baseline for identifying and refining change goals has been the current business goals model (see Chapter 4.1.2.2). In particular, the hierarchy of change goals was constructed in a top-down manner, step by step, by generating the change goals either as improvements of the current goals or by introducing new goals. The process followed iterated on three main activities:

1. Determine the impact of perceived ‘smart’ on current business goals, by
  - a. Identifying new goals as adaptations (improvements) of the current goals: *improve*
  - b. Identifying new goals as newly introduced goals: *introduce*
2. Modify the current goal hierarchy to reflect these changes.
3. Re-assign operational goals to existing or foreseen actors (“smart” components).

Initially, the change goals identified by GAT stakeholders were very narrow, limited by their perceptions of the digitally transformed system's capabilities and components. The initial change goals reflected how users thought that the system might affect the current situation rather than the improvements sought by GAT through introducing the transformed systems. However, by juxtaposing them to the current goals hierarchy, it was possible to refine and re-express initial goals focusing on the organisations’ objectives rather than perceived transformed system functionality.

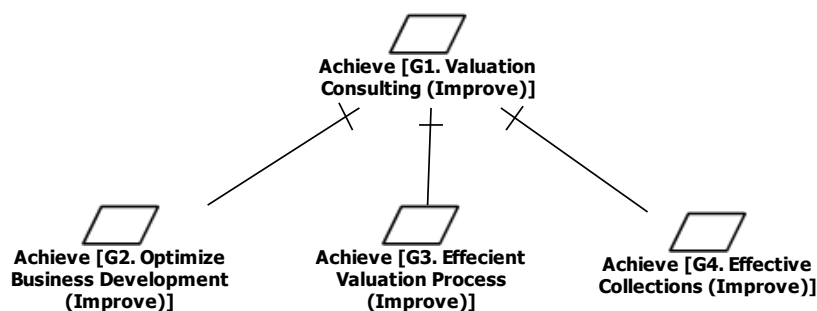
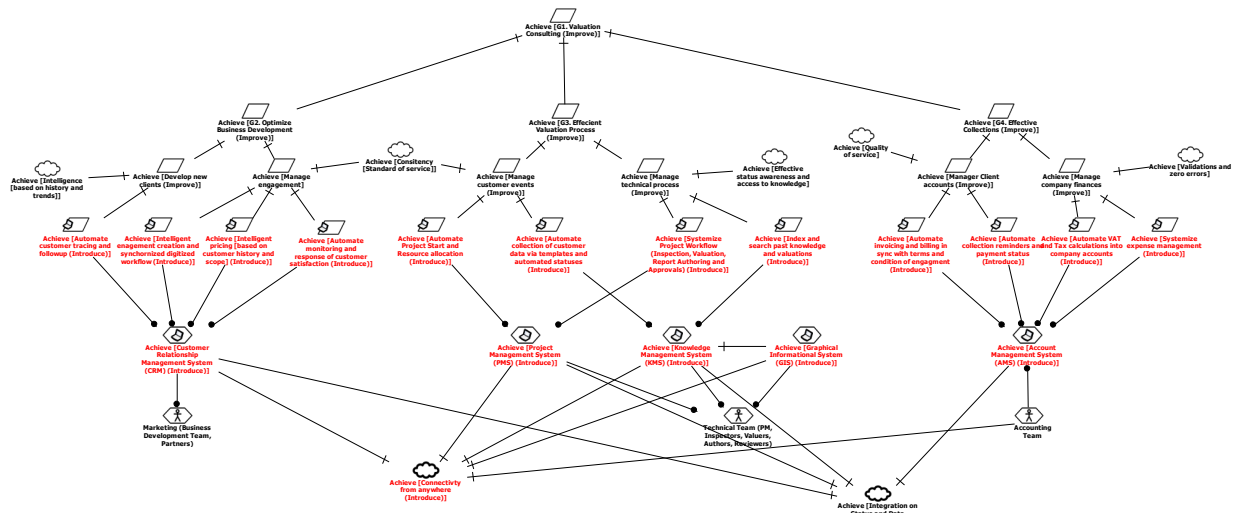


Figure 20: The GAT goals for change



Figure 20 illustrates the high-level change goal hierarchy corresponding to Goal 1: Valuation Consulting (improve). As shown in this model, the initial requirements gradually transformed into a number of operational goals that represent system goals; as shown in Figure 21, These system goals are related to future system components.



**Figure 21: The GAT Transformed goals**

Thus, it was possible to provide a clear causality between GAT requirements and expected system functionality through this analysis. This causality works in both directions. It is possible to justify a new system to track high-level business goals to system components. Alternatively, it is possible to trace the reasoning from desired system components to business goals.

Also, in the case of change goals, special attention was given to identifying associated soft goals, as these will be used to determine the (possibly) new performance indicators against which any new development will be measured. In the change goals model of Figure 21, each business goal for change has at least one soft goal associated with it.



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### 4.1.4.2 From change goals to desired GAT capabilities

As described in Chapter 4.1.4.1, the initial GAT requirements are gradually operationalised by introducing several new goals, ultimately assigned to new system modules. These modules will represent a new set of assets and, therefore, capabilities. These new capabilities will give GAT use case a competitive advantage and deal with current difficulties in solving problems mentioned in Chapter 4.1.1.

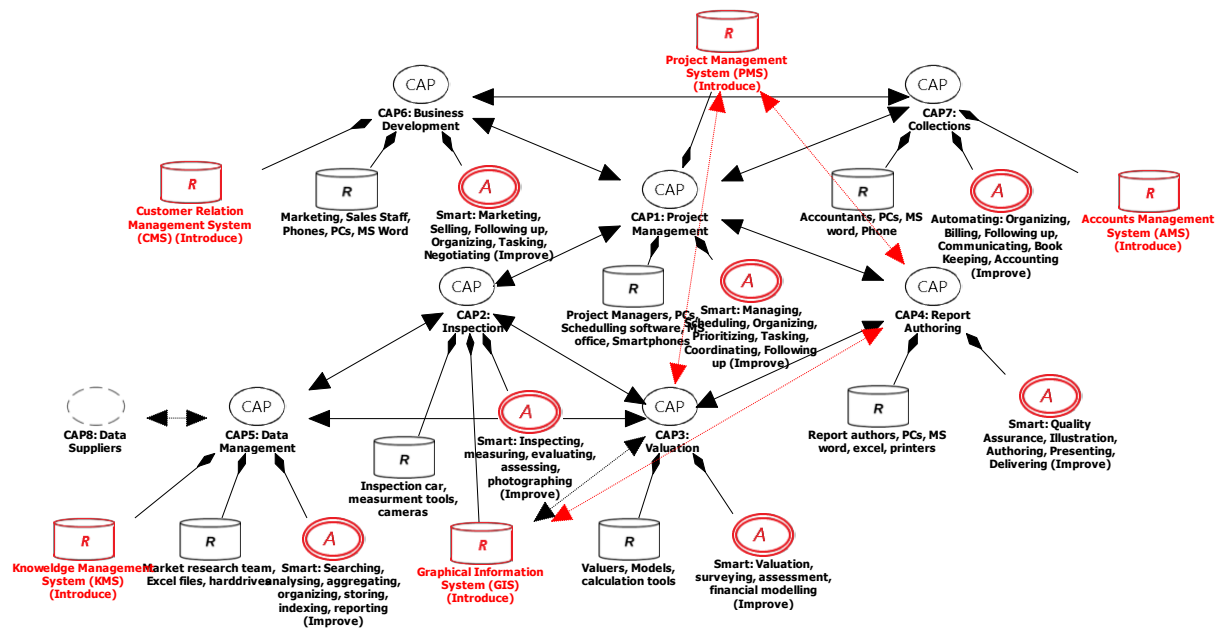


Figure 22: GAT transformed Capability model

Some of these system goals replace existing current goals previously assigned to specific human actors. For example, improve Goal 2 to optimise business development by improved sub-goal Develop new clients is assigned to new system requirements to automate and add intelligence to the process, which then is linked to a new Target System Customer Relationship Management System (CRM) instead of being directly followed up manually by a Human Agent Marketing (Business development team). Thus, it becomes evident that the improvement sought by GAT transformation will affect the dependencies between current actors and associated capabilities.



## Chapter 4: Modelling the use-cases

### 4.1.4.3 From change goals and change capabilities to desired improved Actor-Dependency

The new set of capabilities also gives rise to new collaborations between capabilities and involved actors. The identification of these relationships is significant because it enables us to define the way that actors coordinate between themselves in order to make capabilities re-usable.

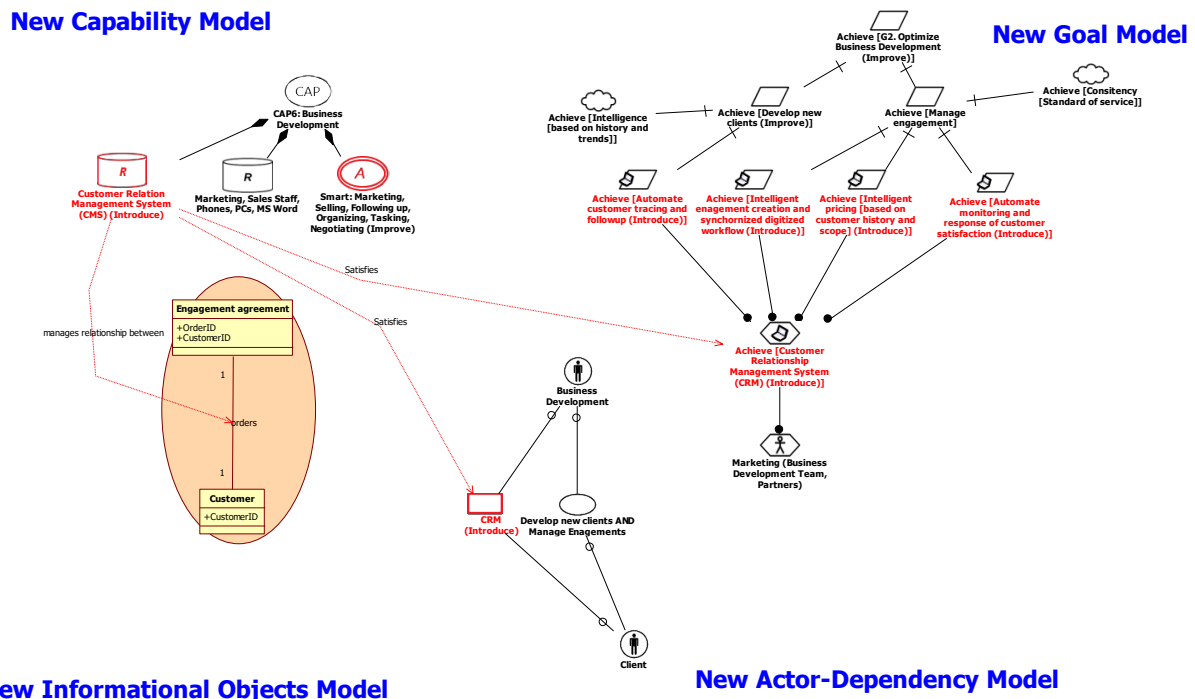


Figure 23: New Inter-model relationship (To-Be) – focusing on the CRM addition

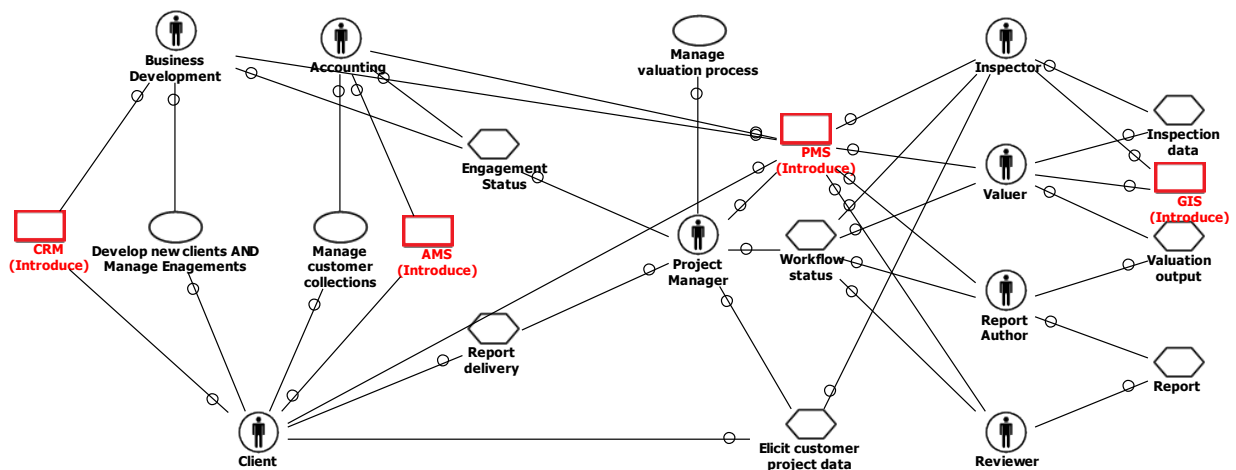
The changed goals and changed capabilities introduce new actor dependencies. Dependencies between human-actors will now benefit from the introduction of new digital capabilities. For instance, as shown in Figure 23, the introduced goal of Automating customer tracing and follow-up, Intelligent engagement creation and synchronized digitized workflow, Intelligent pricing based on customer history and scope, and finally, the goal to Automate the monitoring and eliciting customer satisfaction all introduce a new Capability Automated Agent: Customer Relationship Management System (CRM) in the Capability Model. In turn, it is satisfied in the dependency between Business Development and the Client by having a



newly introduced dependency on a Customer Relation Management System (CRM) in the Actor-Dependency Model.

Similarly, by expanding this analysis across all newly added goals and capabilities, we will find that the dependency between Accounting and the Client will benefit from introducing a new Accounting Management System (AMS) that auto-tracks billing and integrates with the remaining business processes. Other systems include a Project Management System (PMS) and Graphical Information System (GIS) that create new dependencies between different actors in the model.

Figure 24 shows the overall new actor-dependency model that achieves the TO-BE digital transformation.



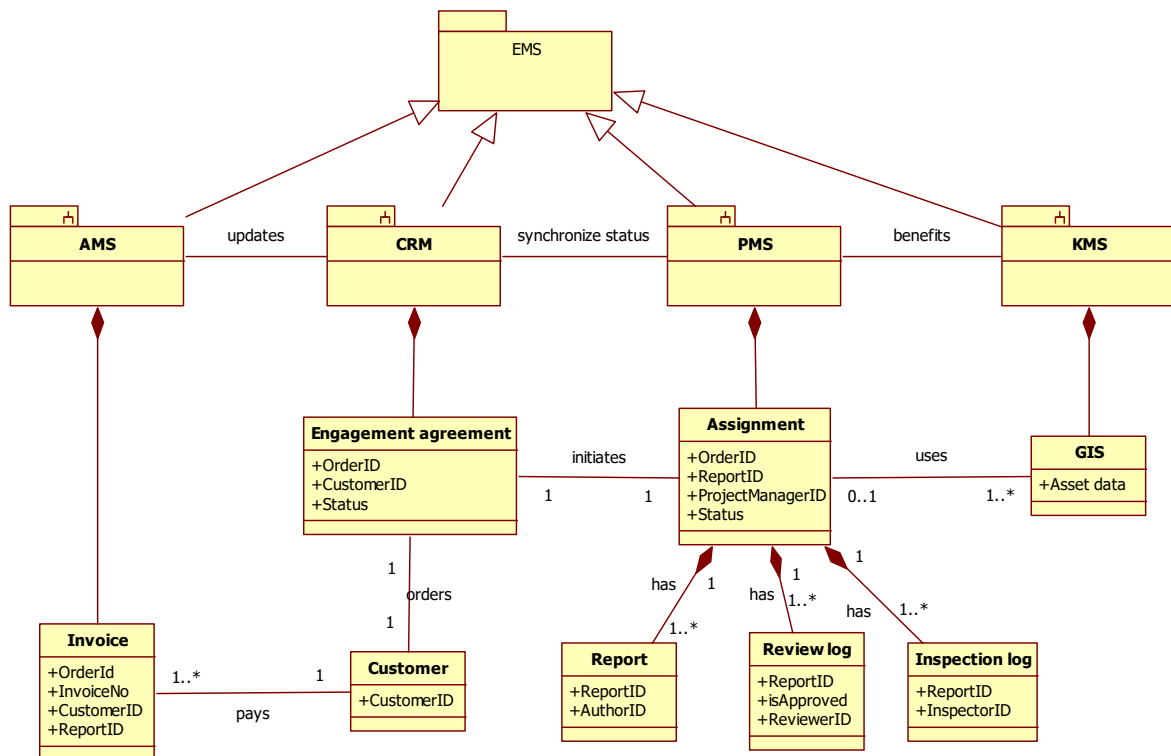
**Figure 24: GAT transformed Actor-Dependency**

#### 4.1.4.4 From changed goals, capabilities and actor-dependencies to updated GAT information objects model.

Thus, starting from change requirements, new capabilities are modelled, and these, in turn, give rise to details in a new actor model, which essentially defines operational requirements. This is even more explicit in the information model, where the relationship between the pre-transformation information objects get arranged in the newly transformed information structure. Figure 25 outlines the new information object model where the new Enterprise Management System (EMS) is introduced with a suite of sub-systems: Account



Management System (AMS), which handles the invoicing, the Customer Relationship Management system (CRM), which manages the engagement with the customer, the Project Management System (PMS) which manages the core tasks of the consulting work, and finally the Knowledge Management System (KMS) which owns the Graphical Information System (GIS) that holds all the data from previous work and market data that could be mined and analyzed to produce new outcomes for the consulting job on hand. The Information Object model organizes the storage of the data and updates the statuses throughout the process workflow. At the same time, the “smart” functions lie in the automation of standardized process workflow, status awareness, harnessing existing knowledge, and enhanced connectivity across teams and functions.



**Figure 25: GAT transformed Object Information Model**

### 4.1.5 The output: GAT Digital Transformation requirements

The following Table 13 describes the high-level Digital Transformation Business requirements. The People, Process and Technology division co-aligns with how organizations



transform (see Chapter 3.2.3). Analysis of each use case for all three divisions is detailed in Appendix 1.5

**Table 13: GAT High-level Digital Transformation Business Requirements**

#	Title	Explanation
<b>Technology component (TC)</b>		
<b>TR.1</b>	Switch to Cloud-Based Enterprise Management Systems (EMS): Install Customer-Relationship-Management-System (CRM), Account Management System (AMS), Project Management Systems (PMS), and a Knowledge Management System (KMS), particularly a Graphical Information System (GIS)	Enterprise Management Systems (EMS) need to go online to address Omni-presence and connectivity. The PMS and GIS will enhance Use case 1, the CRM and the AMS will enhance use cases 2 and 3.
<b>TR.2</b>	Integrate the different EMS components with status awareness (“smart” element)	The consultants and employees should be able to track the status and content of an “assignment” or “task” across its multiple “forms” (in the engagement process, project management process, collections process)
<b>TR.3</b>	Integrate the use of Smart-phones	There is a growing need to use mobility beyond email and chat, the EMS need to benefit from direct entry and status to phone apps, and even use sensors, cameras, GPS capabilities in smartphones as extended capabilities to the whole system.



<b>TR.4</b>	Connectivity of Assets	Resources like vehicles, laptops, measurement toll stations, and meeting rooms need to be traced and tracked as a useable resource in the system.
<b>Process Component (PR)</b>		
<b>PR.1</b>	Integrate workflow across ERP systems	The steps to conduct each of the three main uses cases can be represented in a workflow in each ERP system. Data, statuses, assignments, responsibilities, checklists, and reminders are tracked and recorded.
<b>PR.2</b>	Program “smart” features across process workflows	With the new digitally transformed tools, the smart program capabilities include automated workflow transitions, smart reminders, validity checkers, automated traceability and alarms.
<b>People Component (PP)</b>		
<b>PP.1</b>	Training of employees on the systems	There is an element of transition from the old ways of doing business to the transformed way. This will require a period of training and possibly co-existence with old technologies.

#### 4.1.6 Feedback and conclusions from the GAT case study

A total of five sessions were conducted with GAT; three pre-transformation at the beginning of the exercise and two post-transformation three years after to gather further feedback and assess the framework's transformation and effectiveness (See Appendix 1.6).

Since this was the first use case, the exercise was completely exploratory; the eCORE Tool was still rudimentary, with no templates yet available to provide any blueprint on how to start, and the majority of the structure and understanding on how and SCF should be modelled was unknown. The sessions’ primary focus with the stakeholders, given the theoretical understanding of the eCORE framework, was to meet three goals: 1) Understand the main



use-cases of the SCF, 2) Understand how to breakdown the SCF into its different *People*, *Process*, and *Technology (PP&T)* sub-components, and 3) Develop the eCORE Tool to build the four viewpoints reflecting the use-cases and the PP&T aspects. On the other hand, the primary research focus based on the sessions was to understand how to improve the SC-COST framework and what themes emerge from applying the eCORE framework to this context.

The pre-transformation sessions resulted in the discovery of the three core functions performed inside the SCF:

- a) The Business Development and Marketing functions, which is crucial in bringing in new clients and work, and why the main partners (the executives) focus a lot of their attention on and dedicate a lot of their time and company resources tracking and improving.
- b) The Project Management functions, which manage the central implementation and advising functions, are the core value proposition of the SCF and the service sold to the client. The SCF stakeholders focus on improving the capabilities and qualities of these functions to deliver the correct value to the client.
- c) The Collections and Accounting (including HR and Asset management functions) manage the “back of the house” maintenance operations of the firm to ensure proper client collections, billing, taxation, payrolls, etc. Executives consider this a key health indicator of the firm since it involves all the operational checks and balances functions.

The pre-transformation sessions also produced most of the “generic” naming conventions (the ontology) used through the remaining case studies as it became clear that those structure and process themes are repeated (as it will become apparent in the subsequent case studies). The pre-transformation sessions also were vital in improving the functions of the eCORE Tools, as they were the first to test the tool outside of its development confines and thus provided the necessary feedback to enhance its features, fix bugs, and improve its performance.



Post-Transformation, the feedback from the stakeholders provided insights on how effective the digital transformation was and how the tool enabled the guidance towards that transformation. The initial response for this use case was a resounding approval from the stakeholders for the digital transformation process; however, several unanticipated struggles arose. The biggest hurdles were either implementation related, such as difficulties in digitizing the enormous backlog of artefacts and data since it required a lot of resources and quality checks, or organizational behaviour, such as the resistance to change from a percentage of the workforce. The executives solved both by sheer brute force, first by allocating more resources (people and budget) to overcome the initial backlog hurdle, and second by a system of oversight and incentives and hiring a new role named *process control employee*, who offered support, training and review to assist in complying with the new digitally transformed systems and combat the resistance to change. One executive said that a few “casualties” were an expected outcome of any challenging transition, referring to having to let go of some people who could not adapt to the new digitally transformed organization.

Nonetheless, none of those feedback points impacted the representations or abstractions used in the initial eCORE models. According to the stakeholders, the modelling exercise provided sufficient high-level requirements that were the blueprint for implementing the transformation. Their value was immense in breaking down an otherwise complex problem into understandable parts while considering the interdisciplinary functions, relationships and consequences of change across multiple stakeholders. The distinction between People, Process and Technology (PP&T) was particularly of great value.

In summary, the GAT use-case was the trendsetter in testing many of the initial theories on the SC-COST framework and understanding how eCORE would apply in an SCF digital transformation context. The subsequent use cases enhance the framework’s understanding and explore the commonalities and patterns.



### 4.2 Use Case 2: Fincorp

Fincorp is a Small-Consulting-Firm (SCF) specialising in financial advisory services. The firm is registered in Egypt and Saudi Arabia and operates throughout the MENA and Africa region, concentrated in North Africa and GCC countries.

Typical customers include Banks, Corporations, Private Equity Funds, Tax Authorities, Financial portfolio managers, Public and Private Companies, Governments, and Courts. A few individuals also use Fincorp's services for personal use.

Financial advisory services rely heavily on a rapid understanding of customer needs, producing reports that comply with regulators and standards and capitalising on institutional knowledge and history to solicit sound advice. The nature of this business is that it is heavily human skill-based, and the key competitive advantage one firm can gain over the other is the ability to reduce the cost of the services by reducing time and mistakes. This can be achieved by utilising digital technologies to automate error-prone processes and give a higher quality of advice, which can be achieved by utilising efficient knowledge management systems.

#### 4.2.1 Information gathering

Similar to the previous use case, interviews were conducted with key decision-makers and influencers within the firm. The exact process was followed as with the previous case studies, and the use cases were identified in Table 14 (see Appendix 2) for details. Note that this use case is noticeably similar to the previous use case except for a few key differences that reflect the current stage of digitalization of the firm. GAT was digitalized to a certain degree, while Fincorp was slightly behind because many of the artefacts were still paper-based, and many of the communication channels were still person to person. Those differences do not appear extensively when modelling the case study at a high abstraction level. However, it is demonstrated much more profoundly when we materialize the Digital Transformation at a lower abstraction level, as seen in the Technology-related DT requirements list in Appendix 2.5.1.

**Table 14: Overview of Fincorp use cases**



Use Case 1 Financial Advisory	
<b>Context</b>	Core business operation/service
<b>Needs for change</b>	<p>The current activities that need change:</p> <ol style="list-style-type: none"> <li>1- Report Authoring and Calculations</li> <li>2- Data Collection and Management</li> <li>3- Quality Control*</li> <li>4- Efficient meetings*</li> <li>5- Timeline per assignment*</li> <li>6- Digitization of Data*</li> <li>7- Resource planning, workflow management and Project Management</li> </ol>
<b>Business vision</b>	<p>Improvements in:</p> <ol style="list-style-type: none"> <li>1- Collaboration.</li> <li>2- Tracking.</li> <li>3- Status awareness.</li> <li>4- Accessibility.</li> <li>5- Knowledge management.</li> </ol>
Use Case 2 Engaging a new client	
<b>Context</b>	Sales & Marketing
<b>Needs for change</b>	<p>The current activities that need change:</p> <ol style="list-style-type: none"> <li>1- Client service and satisfaction.</li> <li>2- Engagement follow-up and measurement.</li> </ol>
<b>Business vision</b>	<p>Improvements in:</p> <ol style="list-style-type: none"> <li>1- Quality of service.</li> <li>2- Followup and tracking.</li> <li>3- Higher contract rewarding*</li> </ol>
Use Case 3 Collections	



<b>Context</b>	Account management
<b>Needs for change</b>	The current activities that need change: 1- Invoicing and collections. 2- Followup. 3- Status awareness and workflow.
<b>Business vision</b>	Improvements in: 1- Collection rates*. 2- Workflow integrations.
<b>* To highlight the new differentiation in the use case from the previous one.</b>	

#### 4.2.2 Modelling Fincorp AS-IS models

##### 4.2.2.1 Fincorp Current capability modelling

The analysis of the information gathered from the use cases, and the physical and virtual meetings with the user personnel resulted in the agreed capability model, shown in Figure 26.

The AS-IS capability model defines seven main capabilities denoted in the model as Financial Advisory, Analysis, Report Authoring, Data Management, Business Development, and Collections, in addition to one external capability: Data suppliers.

These capabilities exist because of certain capacities (in the form of resources) that the consultant firm possesses and the ability (in the form of means or skills inherent in the resources) to be of functional use. For example, *Data Management* is a capability of Fincorp (Table 14) that deploys resources such as Market research team (that include market surveyors), having the knowledge and expertise to gather and organise data from first-hand surveys, third party market research data, including demographical data, the financial performance of the market, systematic and non-systematic risk data. In the model of Figure 26, capacities and abilities are indicated for each capability.



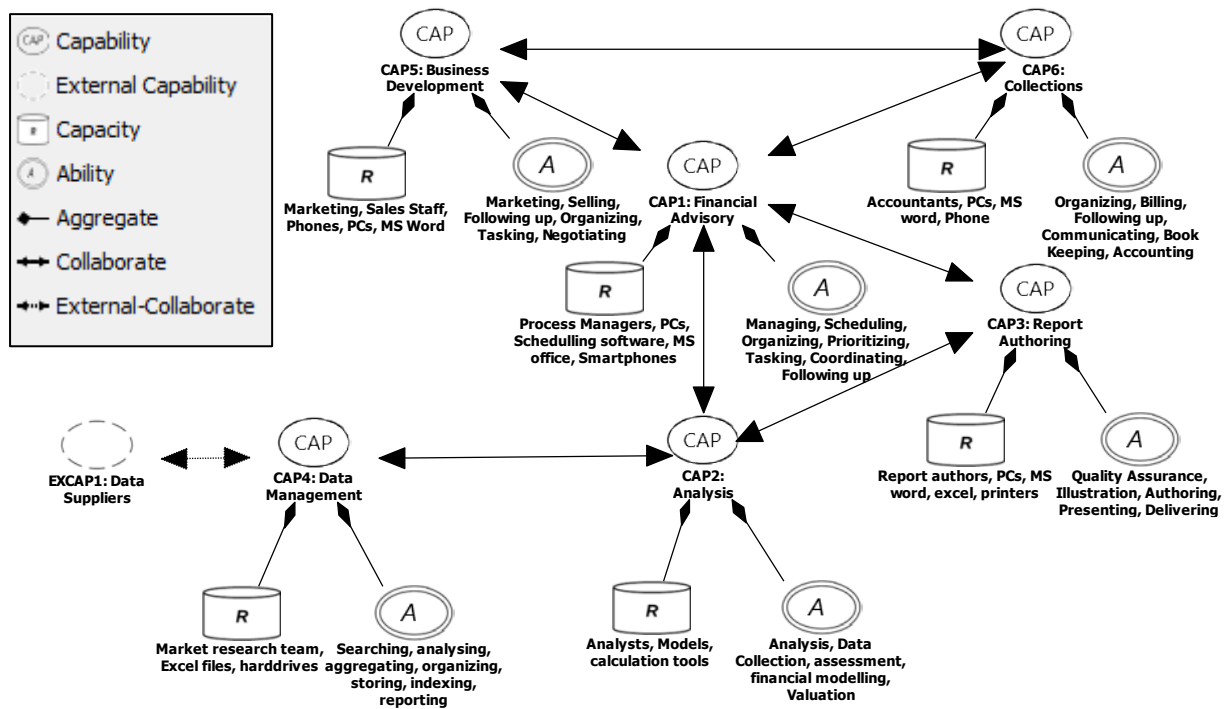


Figure 26: Fincorp current business capabilities

The function of the chosen use application is possible because Fincorp is the owner of capabilities CAP1-CAP6 and the collaboration between these capabilities. For example, *Financial Advisory*, which is deployed daily, collaborates with four other capabilities to make sure tasks are fulfilled and proper procedures are followed to push the workflow of the consulting process forward.

Capabilities CAP1-CAP6 are considered internal capabilities, i.e. they are wholly owned by Fincorp and therefore can review and update their configuration of capabilities. In the Fincorp use case, such re-configuration will need to occur for Fincorp to utilise “smart” capabilities.

In addition to these internal capabilities, there is one external capability, EXCAP1, owned by enterprises with which Fincorp collaborates but whose capabilities are not owned, controlled, or subject to any influence by Fincorp. External capabilities are included in the capability model to externalise these relationships, which may be very significant if, in the TO-BE situation, there may be opportunities for a closer collaboration of Fincorp with external



entities, such as suppliers of data and data companies perhaps making use of IoT functionalities.

Similar to the previous use-case (GAT), the model of Figure 26 provides the scoping for the Fincorp application. It acts as an anchor point for the rest of the models, which will use this model for defining: “why does the enterprise need these capabilities?” (answered by the goal model), “what socio-technical actors are involved and how do they co-operate in order to meet these enterprise goals?” (answered by the actor dependency model), and “what kind of information is used in this co-operation?” (answered by the informational object model).

Therefore, this capability model represents a high level of abstraction in identifying the key levers of the current operation in this specific application of Fincorp. If Fincorp needs to meet some other new goals (which will be detailed in the change goals model), one would need to answer the questions of “which one of these ‘levers’ need to change?” the answer to which will lead to a new TO-BE situation.

### 4.2.2.2 Fincorp Goal Model

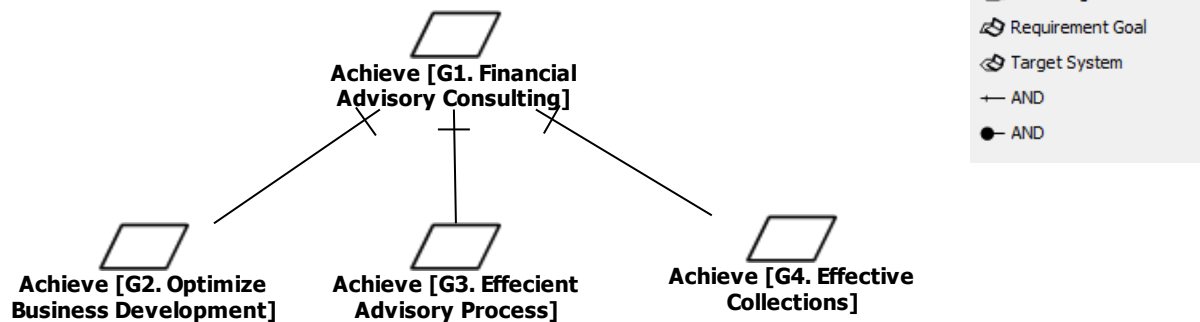
The Fincorp business goal model development was based on the information gathered from the users and executives at Fincorp via interviews and iterative feedback. The initial model was verified, corrected and expanded through repeated face to face workshops and online meetings with Fincorp stakeholders.

In this Chapter, we present the goal model stepwise for reasons of readability and understandability, following their causality decomposition.

Similar to how we conducted the previous use case, in this use case, initially stated goals were often rephrased to avoid ambiguous goals or identify synonymous goals and relationships between goals. The same clarification exercise was followed to distinguish operational goals from business goals, avoid ‘goal tangling’, and resolve the ambiguity between ‘hard’ and ‘soft’ goals.



Early in this process, it became evident that Fincorp use cases share the same strategic objective; G1: to have the data and capability for financial advisory consulting. This was refined in three sub-goals, namely, G2: To optimise business development, G3: To efficiently manage the advisory process, and G4: To manage collections effectively, respectively, leading to the goal model depicted in Figure 27, which provides a top-level view of the current Fincorp business goals.

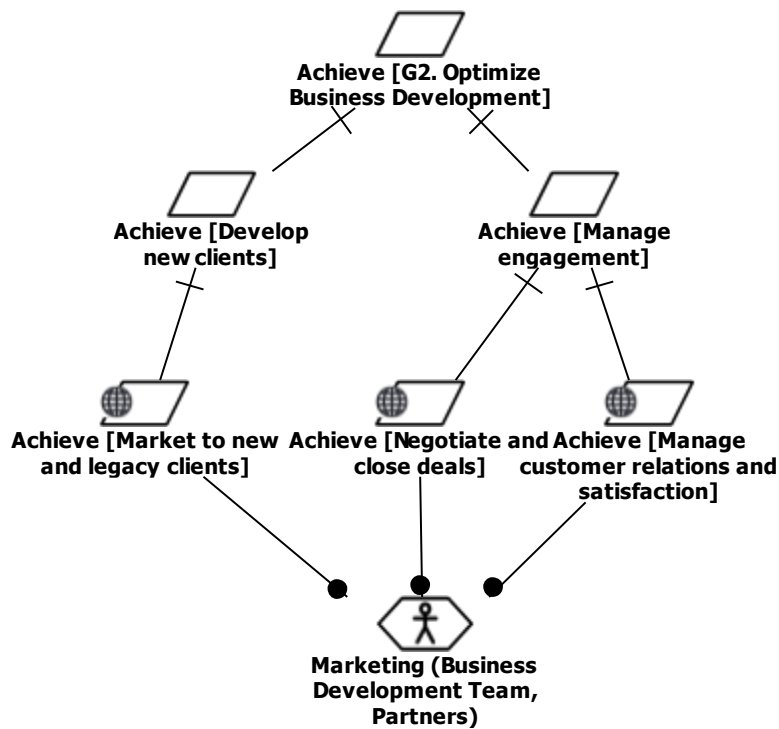


**Figure 27: Top-level Fincorp business goals**

Note that the high-level business goals for Fincorp are very similar to the high-level business goal of the GAT use case (see Chapter 4.1), whereby the only difference is the G3 reflecting the context difference and the core service of that firm. Similar to the previous use case, the AND relationship between the top-level goal and the three sub-goals means that the achievement of the three sub-goals is sufficient to ensure the satisfaction of the strategic Fincorp objective. However, these sub-goals are still too general, providing little information about how these are operationalised. Goal operationalisation encompasses its 'causal transformation' into more concrete sub-goals that achieve desired ends. Each step can result in identifying new sub-goals (more focused and often smaller in scope) linked to the original one through causal relations, thus forming a hierarchy of goals. The operationalisation aims to reach a level of detail whereby specific enterprise actors can realise each leaf goal.

The goal hierarchy depicted in Figure 28 illustrates the operationalisation of goal G2: To optimise business development work. Figure 29, G3: To manage the Advisory process efficiently, and Figure 30 goal G4: To effectively manage collections.

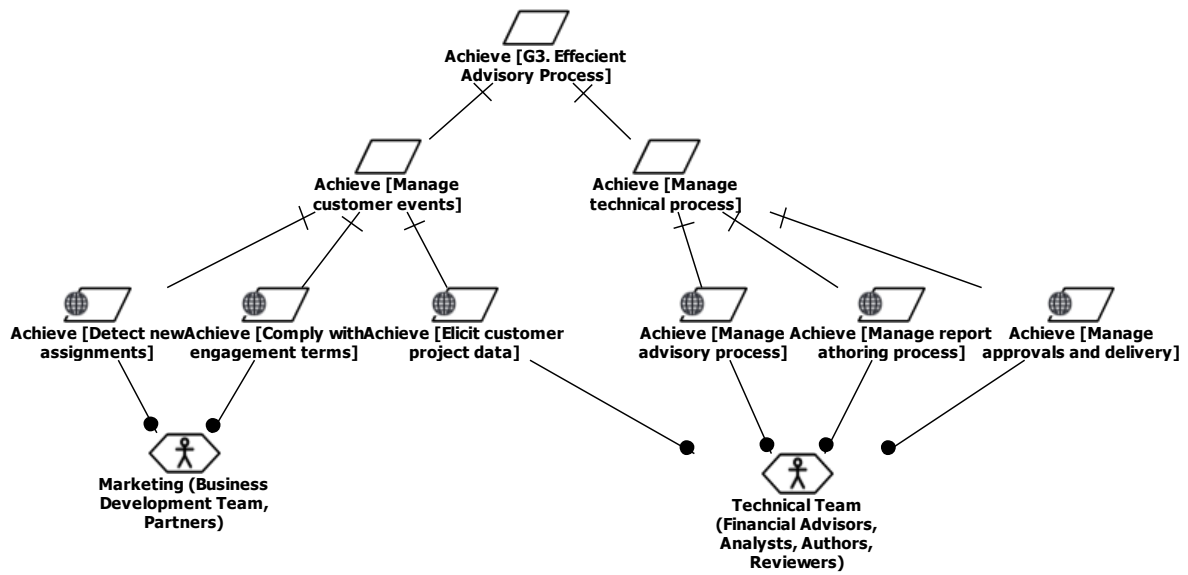




**Figure 28: G2: To optimize business development work**

To achieve goal G2: To optimize business development work, two sub-goals are identified: To develop new clients and To manage engagement. Three new operational goals are created, to Market to new and legacy clients, To Negotiate and close deals, and to Manage customer relations and satisfaction. All those goals are handled by the business development role, which could be one person or a group of people and is represented by the Human-Agent: Marketing. The role of Marketing is to achieve those goals within that organization. At this level of abstraction, it is apparent that the goals are nearly identical to the previous use case.

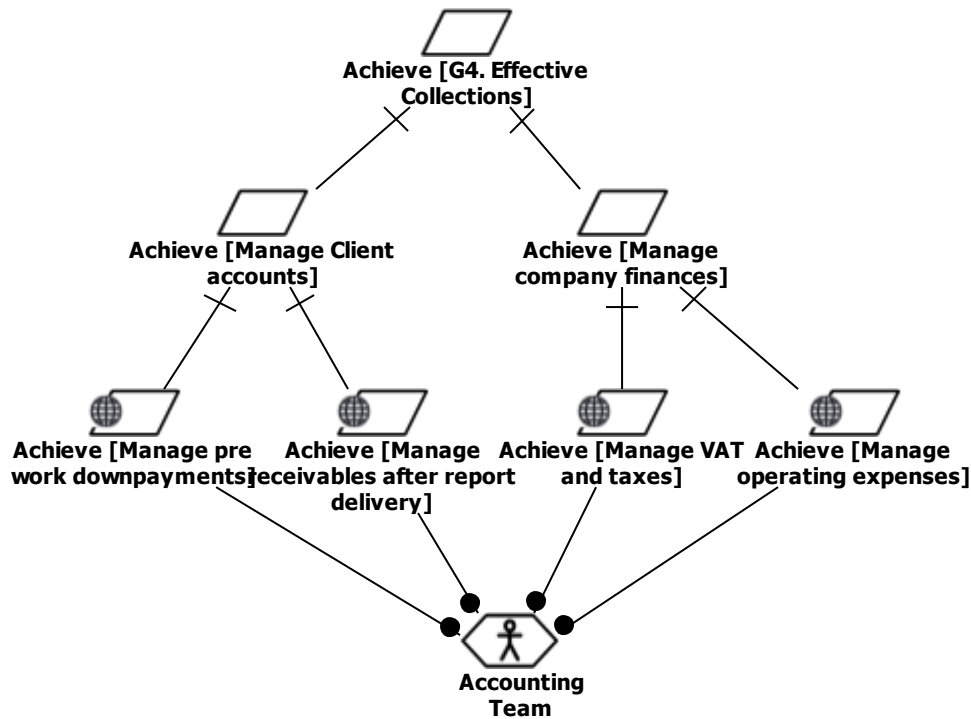




**Figure 29: G3: To manage the Advisory process efficiently**

To achieve G3: To achieve efficient advisory process, two subgoals were identified: To Manage customer events and to Manage the technical process. Both of those goals are at the core of the consulting work and are divided into six operational goals. The first goal relates to dealing directly with the customer, and it is divided into three operational sub-goals as follows: To Detect new assignments, To Comply with engagement terms, and to Elicit customer project data. Meanwhile, the second goal related to dealing with internal teams and is divided into three operational sub-goals as follows: To manage advisory process, To Manage report authoring process, and finally, To Manage approvals and delivery process. Those operational sub-goals are derived and verified through iterating the model via Use Case 1 (See Table 14 Table 12: Overview of the GAT use cases, which is operationally detailed in Appendix 2.2 Fincorp Use Cases). The first two operational goals are under the responsibility of the Business Development team, which is represented in the model as a human-agent named *Marketing*, and the last five operational goals are under the responsibility of the technical office, which includes several actors such as an assigned financial advisor, analyst, authors and reviewers. In the model, the technical team is grouped into one human-agent abstraction named *Technical Team*.





**Figure 30: G4: to effectively manage collections**

To achieve G4: To effectively manage collections, two sub-goals were identified: To Manage Client accounts and to Manage company finances, which are further divided into four operational goals as follows: To Manage pre-work down-payments, To Manage receivables after report delivery, To Manage VAT and taxes and finally To Manage operating expenses. All of those operational goals are under the responsibility of an accounting team. This team is represented in the model as human-agent by the name Accounting Team. The details are outlined in Use Case 3 (See Table 14 and detailed in Appendix 2.2).

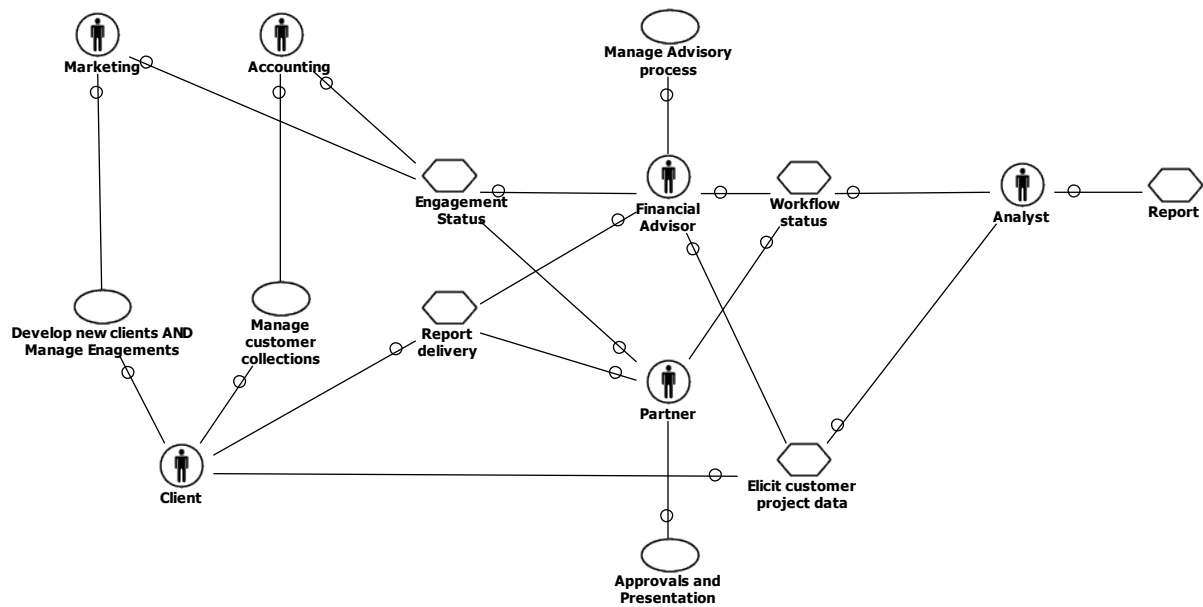
Note that the model could dive into deeper analysis and a lower implementation layer, whereby detailed operational goals for each actor with detailed descriptions could be modelled; however, we will draw the line at this abstraction level for our comparative and pattern analysis with other SCFs.

#### 4.2.2.3 Fincorp Actor-Dependency model

The goal model described in the previous Chapter gives an intentional description of the Fincorp case, and associating business goals to specific actors provides the reasoning for



retaining them as enterprise capacities. Similar to the subsequent use cases study, the socio-technical context of the identified capabilities is represented in constructing the actor-dependency model, a higher-level abstraction that depicts what actors expect from each other. Figure 31 illustrates the AS-IS Actor dependency model.



**Figure 31: Fincorp AS-IS Actor Dependency Model**

As shown in this model, there is a complex network of dependencies between the Fincorp actors. [Agent: Marketing] has a goal-dependency with the [Agent: Client] whereby to achieve their set goals of [Goal: Develop new clients and Manage Engagements], they need to interact with the [Agent: Client] while also managing the [Task: Engagement Status] with the [Agent: Financial Advisor]. The [Agent: Financial Advisor] as shown is a central role, whereby many central tasks and goals depend on him/her, such as [Goal: Manage Advisory process] by managing [Task: Engagement Status], [Task: Elicit customer project data], [Task: Workflow Status] and [Task: Report delivery], each dealing with different actors as shown in the model. In turn, the technical team [Agent: Analyst] have a dependency with the [Agent: Financial Advisor] for the [Task: Workflow status] and dependency among themselves with [Task: Report]. Finally, the [Agent: Accounting] is dependent on the [Goal: Manage customer collections] concerning the

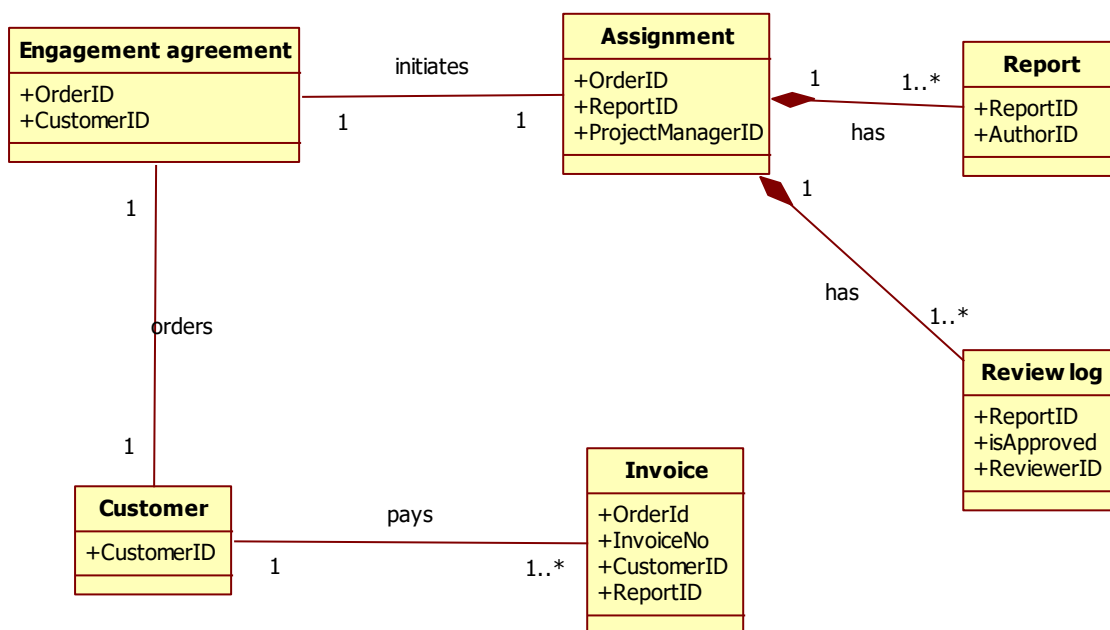


[Agent: Client] and is in sync with the [Agent: Financial Advisor] via the dependency on the [Task: Engagement status].

### 4.2.2.4 Fincorp Informational Objects model

The Fincorp informational object model deals with the essential elements used to utilise the necessary data required so that its various operations can be coordinated through information transmission channels. Following the same process to identify the information objects as the previous case study, looking at the goals, capabilities, and actor-dependency helped identify the informational components. Looking at the information object objectively helped revise and refine the other three models to ensure cohesiveness and consistency.

The Fincorp informational model depicted in Figure 32 contains all informational objects used in the Fincorp capabilities.



**Figure 32: Fincorp AS-IS Informational Object Model**

As shown in this model, the informational objects represent artefacts or encapsulate knowledge-critical content. For instance, an [Engagement agreement] represents all the information, statuses, IDs and documents, both physical and soft, that describe the relationship between the [Agent: Client] and the SCF. Similarly, the [Assignment] is an instance that represents the initiation of the job, which encapsulates (by composition) the



Information objects `[Report]` and `[Review log]`, which in turn are each Task-Dependent on the responsible Agent as represented in the previous Actor-Dependency model. An `[Invoice]` describes the instantiation of an instance that encapsulates the artefacts, statues, and information related to the task-dependency between the `[Agent: accounting]` and `[Agent: Client]`.

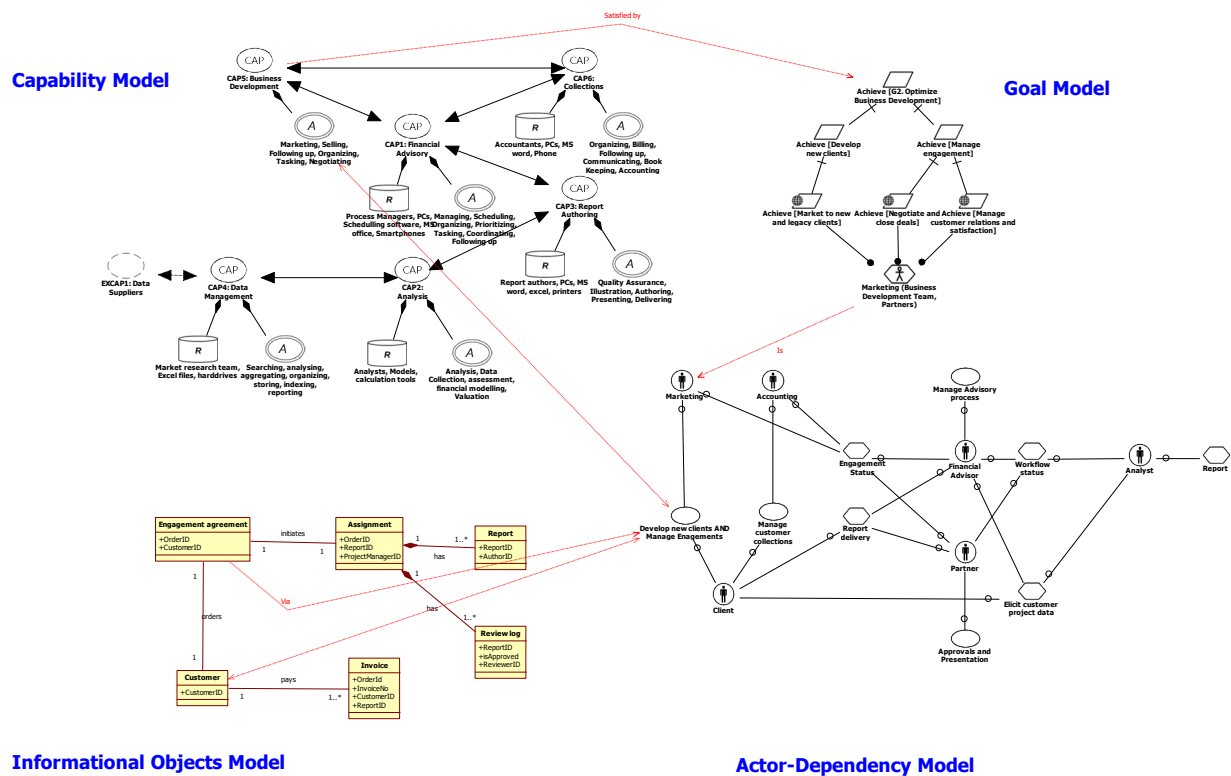
### 4.2.3 Validating the Fincorp AS-IS models for completeness

In Chapter 3.2.2, we introduced the idea of inter-model relationships.

In the process of developing the models presented in Chapter 4.2.2, this inter-model consideration proved to be profoundly vital since it acted as a way of engaging the stakeholders in answering increasingly detailed questions and at each stage of the lifecycle of “information gathering-conceptual modelling-stakeholder reviewing” (see Chapter 3.6.1.4) to ensure that the modelled concepts were necessary and sufficient.

This concept of inter-model relationships is demonstrated in Figure 33, which shows a small fragment of these relationships in the context of `[Business Development]`. In practice, these relationships were discovered using correlation relationships utilizing the power of the eCORE Tools in connecting the different components of the model during construction, which were updated during each reviewing cycle until all stakeholders were confident that the models represented were agreed upon and validated for the production application for the Fincorp use cases.





**Figure 33: Fincorp AS-IS Intermodel relationship**

For instance, the Capability [CAP6: Business Development] with Resource [Marketing and Sales Staff] achieves the Goal [G2: Optimise Business Development] and its sub-goals, via the Human-agent [Marketing], which in terms is the Actor [Business Development] using the Information Objects [Engagement Agreement] and [Customer]. More details on the correlation matrices are outlined in Appendix 2.3 and programmed in the eCORE program files.

### 4.2.4 Modelling Fincorp requirements for change

#### 4.2.4.1 The Fincorp goals for change

Like the previous case study, change goals express Fincorp's needs and wishes and perceived opportunities concerning digital transformation technologies. A similar process was followed in eliciting those change goals via suitable formulation by deliberating and agreeing with Fincorp's stakeholders during face-to-face and online workshops and offline revisions of the models.



The baseline for identifying and refining change goals has been the current business goals model (see Chapter 4.2.2.2). In particular, the hierarchy of change goals was constructed top-down, step by step, by generating the change goals either as improvements of the current goals or by introducing new goals. The same process as the previous case study was followed, which iterated on three main activities:

1. Determine the impact of perceived ‘smart’ on current business goals, by
  - a. Identifying new goals as adaptations (improvements) of the current goals: *improve*
  - b. Identifying new goals as newly introduced goals: *introduce*
2. Modify the current goal hierarchy to reflect these changes.
3. Re-assign operational goals to existing or foreseen actors (“smart” components).

Like before, the change goals identified by Fincorp stakeholders were very narrow, limited by their perceptions of the capabilities of the digitally transformed system and its components. However, by juxtaposing them to the current goals hierarchy, it was possible to refine and re-express initial goals focusing on the organisations’ objectives rather than perceived transformed system functionality. The outcome was almost identical to the previous use case's desired transformation, with the apparent difference being the context and the subject domain.

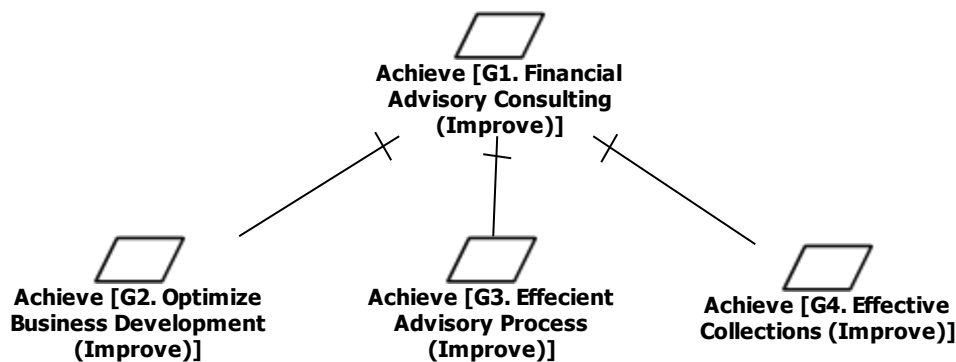


Figure 34: FinCorp TO-BE high-level business goals

Figure 34

Figure 20 illustrates the high-level change goal hierarchy corresponding to Goal 1: *Advisory Consulting (improve)*. As shown in this model, the initial requirements



## Chapter 4: Modelling the use-cases

gradually transformed into several operational goals that represent system goals; as shown in Figure 35. These system goals are related to future system components.

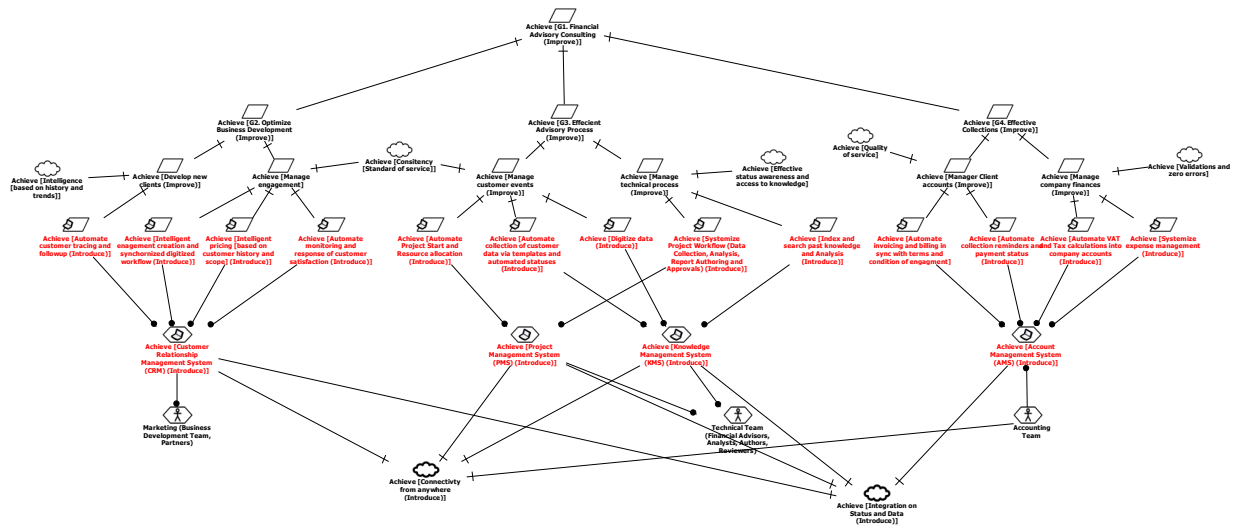


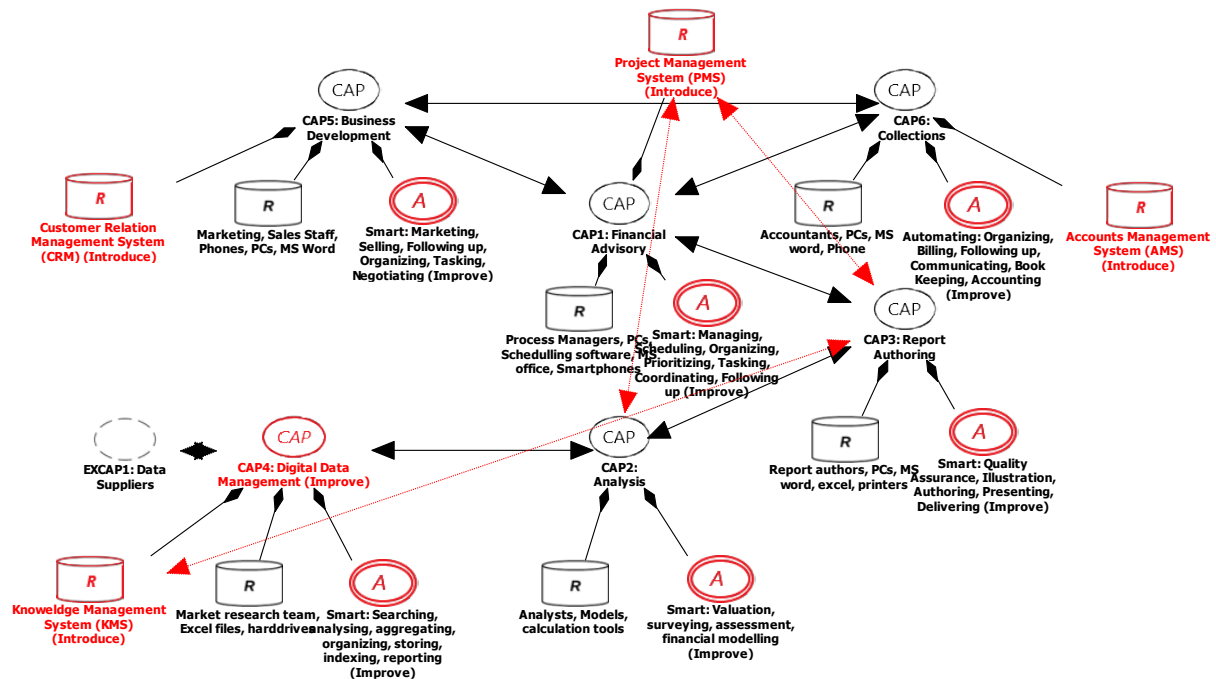
Figure 35: Fincrop TO-BE business goals

This analysis made it possible to provide a clear causality between Fincorp requirements and expected system functionality. This causality works in both directions. It is possible to justify a new system to track high-level business goals to system components. Alternatively, it is possible to trace the reasoning from desired system components to business goals. Again, similar to the previous case study, special attention was given to identifying associated soft goals, as these will be used to determine the (possibly) new performance indicators against which any new development will be measured. In the change goals model of Figure 35, each business goal for change has at least one soft goal associated with it.

### 4.2.4.2 From change goals to desired FinCorp capabilities

As described in Chapter 4.2.4.1 above, the initial Fincorp requirements are gradually operationalised by introducing several new goals, ultimately assigned to new system modules. These modules will represent a new set of assets and, therefore, capabilities. These new capabilities will give Fincorp use case a competitive advantage and deal with current difficulties in solving problems mentioned in Chapter 4.2.1 above.





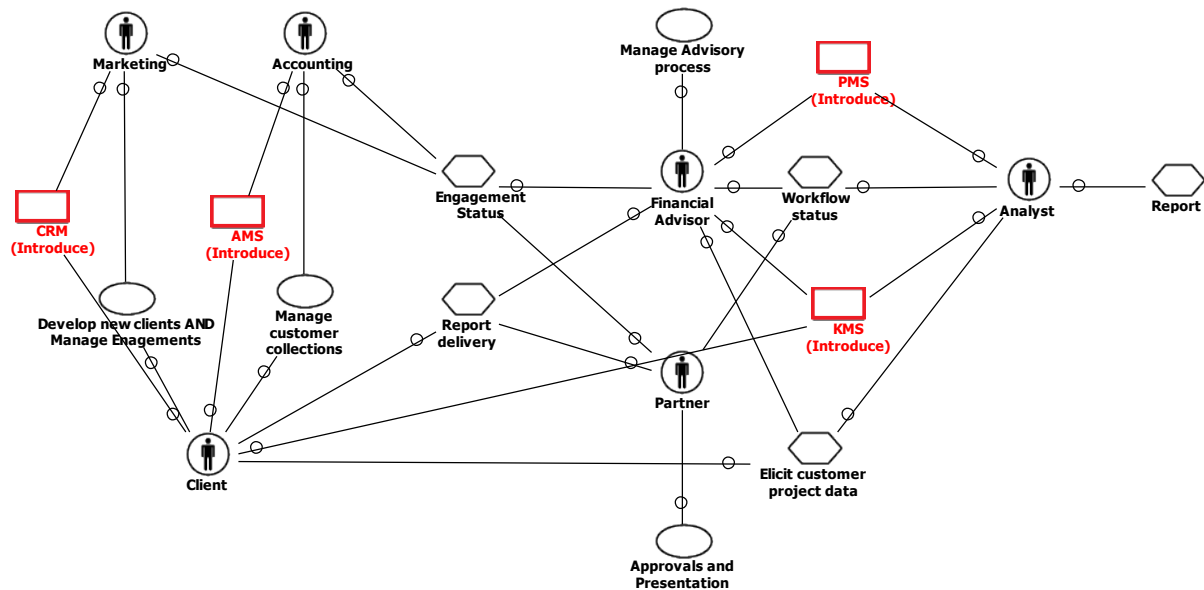
### Figure 36: Fincorp TO-BE Capability Model

Some of these system goals replace existing current goals previously assigned to specific human actors. For example, improve Goal 2 to optimise business development by improved sub-goal Develop new clients is assigned to new system requirements to automate and add intelligence to the process, which then is linked to a new Target System Customer Relationship Management System (CRM) instead of being directly followed up manually by a Human Agent Marketing (Business development team). Thus, it becomes evident that the improvement sought by Fincorp transformation will affect the dependencies between current actors and associated capabilities.

#### 4.2.4.3 From change goals and change capabilities to desired improved Actor-Dependency

Similar to the development process of the TO-BE model of the previous case study, the new set of capabilities gives rise to new collaborations between capabilities and involved actors. The identification of these relationships is significant because it enables us to define the way that actors coordinate between themselves in order to make capabilities realisable.



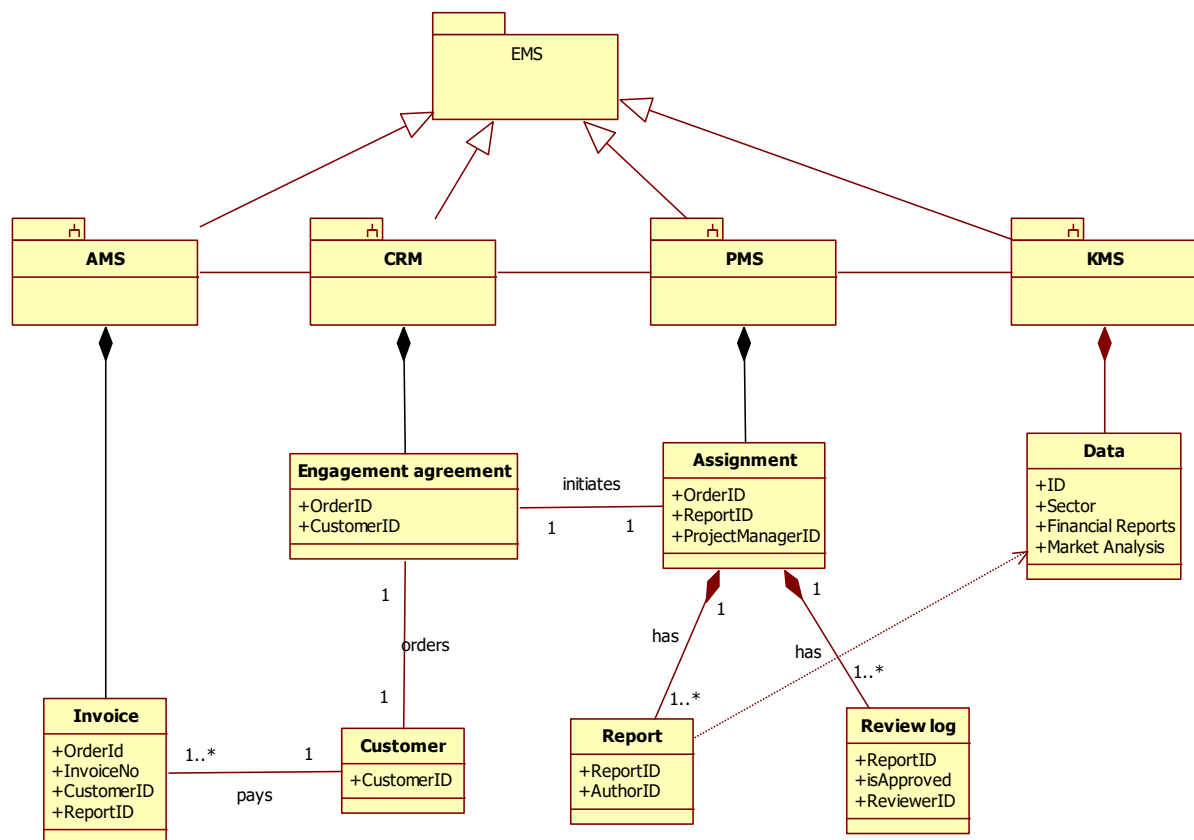


**Figure 37: Fincorp TO-BE Actor-dependency model**

Those new capabilities and goals give rise to new dependencies, as shown in Figure 37. For instance, the new dependency on the newly introduced Knowledge Management System (KMS) fulfils the newly added goal of Achieve Digitization of data elements, which is met with a matching introduction of Digital Data Management Capability capability. Similarly, by expanding this analysis across all newly added goals and capabilities, we will find that the dependency between Accounting and the Client will benefit from introducing a new Accounting Management System (AMS) that auto-tracks billing and integrates with the remaining business processes. Other systems include a Project Management System (PMS) and a Customer Relation Management system (CRM) that create new dependencies between different actors in the model.



### 4.2.4.4 From changed goals, capabilities and actor-dependencies to updated Fincorp information objects model.



**Figure 38: Fincorp TO-BE Information Object model**

Thus, starting from change requirements, new capabilities are modelled, and these, in turn, give rise to details in a new actor model, which essentially defines operational requirements. This is even more explicit in the information model, where the relationship between the pre-transformation information objects get arranged in the newly transformed information structure. Figure 38 outlines the new information object model where the new Enterprise Management System (EMS) is introduced with a suite of sub-systems: Account Management System (AMS), which handles the invoicing, the Customer Relationship Management system (CRM), which manages the engagement with the customer, the Project Management System (PMS) which manages the core tasks of the consulting work, and finally the Knowledge Management System (KMS) which owns the new added information



**Object:** `Data`, that holds all the data from previous work and market data that could be mined and analyzed to produce new outcomes for the consulting job on hand. The Information Object model organizes the storage of the data and updates the statuses throughout the process workflow. At the same time, the “smart” functions lie in the automation of standardized process workflow, status awareness, harnessing existing knowledge, and enhanced connectivity across teams and functions.

#### 4.2.5 The output: Fincorp Digital Transformation requirements

**Table 15: Fincorp High-level Digital Transformation Business Requirements**

#	Title	Explanation
<b>Technology component (TC)</b>		
<b>TR.1</b>	Switch to Cloud-Based Enterprise Management Systems (EMS):  Install Customer-Relationship-Management-System (CRM), Account Management System (AMS), Project Management Systems (PMS), and a Knowledge Management System (KMS).	Enterprise Management Systems (EMS) need to go online to address Omni-presence and connectivity. The PMS will enhance Use case 1, the CRM and the AMS will enhance use case 2 and 3.
<b>TR.2</b>	Integrate the different EMS components with status awareness (“smart” element)	The consultants and employees should be able to track the status and content of an “assignment” or “task” across its multiple “forms” (in the engagement process, project management process, collections process)
<b>Process Component (PR)</b>		
<b>PR.1</b>	Integrate workflow across ERP systems	The steps to conduct each of the three main uses cases can be represented in a workflow in each of



		the ERP systems. Whereby data, statuses, assignments, responsibilities, checklists, and reminders are tracked and recorded.
<b>PR.2</b>	Program “smart” features across process workflows	With the new digitally transformed tools, program smart capabilities such as automated workflow transitions, smart reminders, validity checkers, automated traceability and alarms.
<b>People Component (PP)</b>		
<b>PP.1</b>	Training of employees on the systems	There is an element of transition from the old ways of doing business to the transformed way. This will require a period of training and possibly co-existence with old technologies.
<b>PP.2</b>	Connectivity of people	People need to get accustomed to enabling connective technology such as Systems on smartphones, laptops, and smart meeting rooms to boost productivity and capabilities.

Note how it is almost identical to the previous case study except for differences in domain context.

#### 4.2.6 Feedback and conclusions from Fincorp case study

Similar to the previous case study, a total of four sessions were conducted with Fincorp stakeholders; three pre-transformation and one post-transformation (see Appendix 2.6). The pre-transformation sessions were conducted a few weeks after the pre-transformation sessions of GATs, and although it was the first time for the Fincorp stakeholders to go through the modelling exercise, it was the second time for the researcher. The sessions’ primary focus was similar to the previous case study’s primary focus: 1) Understand the main use-cases of the SCF, 2) Understand how to breakdown the SCF into its different *People*, *Process*, and *Technology (PP&T)* sub-components, and 3) Use the eCORE Tool to build the four viewpoints reflecting the use-cases and the PP&T aspects. However, the primary



research focus was to detect any common themes with the previous case study and to evolve the SC-COST framework to fit both narratives, both for the theory (ontological concepts and abstractions) and practice (enhancements to the eCORE Tools and patterns).

The pre-transformation sessions resulted in discovering three core functions that parallel the GAT's central functions: a) Marketing, b) Central Financial Advisory services (the core project management functions), and c) the post-advisory accounting and collections. A structure and process commonality has already started emerging in how the organization compartmentalizes its core functions. Although the implementation details are different, the SCF structure is paralleled to GAT. A striking difference was also the culture, whereby GAT was strict with process and results; Fincorp was relaxed and allowed for many personal styles of their advisors. Standardization was always a goal for the partners in Fincorp, but they never had the tools to enforce it. Therefore, management overstressed the desire to achieve standardization and controls during the transformation design. Therefore, soft goals were infused in the models accordingly.

The post-transformation sessions revealed similar feedback to that of GAT. The biggest hurdles were difficulties in digitizing the backlog and dealing with resistance to change. However, the specifics of the resistance to change differed in that people resisted standardization and not the improved digitally-enabled workflow. Employees welcomed the enabling technologies as they improved their work tremendously. However, management mentioned that they ran several workshops and group brainstorm sessions to achieve a consensus among all the advisors on standardization of the service delivery, including report templates, data collection process, and review checklists.

Another apparent distinction is the level of digitization when contrasted with GAT. GAT was already digital to some extent pre-transformation, whereby most of the artefacts and processes were using digital technologies and only required a combined digital transformation strategy to cope with a new advanced and 'smart' competitive business environment. Fincorp, on the other hand, lagged on all digital fronts and required more resources and efforts to fulfil its digital transformation goals. The technologies used were elementary, with the majority of the data collections still reliant on physical documents and scans and knowledge



gathering (data collection, analysis, etc.) via verbal or face-to-face meetings. The transformation modelling benefited enormously from the lessons gained from the GAT case study. Fincorp executives liked the ideas and contributions suggested from “replicating” the GAT Digital Transformation model, which suggests that a Digital Transformation “best practice” pattern could be developed from the collective lessons of many SCFs.



### 4.3 Use Case 3: IncomeMarketing (IM)

IncomeMarketing is a Small-Consulting-Firm (SCF) specialized in a wide range of marketing and financial consultancy services, including market research, economic feasibility studies, assessment of investment opportunities, and relevant specialized and customized training programs. The firm is registered in Egypt and Saudi Arabia, has a Joint-venture agreement with a sister consulting network in the Netherlands, and operates in 13 countries.

Typical customers include Corporations, Private Equity Funds, Financial portfolio managers, Public and Private Companies, Governments, and Courts. A few individuals also use IM's services for personal use.

Market Research consulting services rely heavily on resourcefulness in collecting data, comprehensiveness of the reports, and capitalising on institutional knowledge and history for recycling data. The nature of this business is that it is heavily data centred and human skill-based, and the key competitive advantage one firm can gain over the other is the ability to obtain quality data at a reduced cost by reducing effort, time and mistakes. This can be achieved by utilising digital technologies to source data, automate error-prone processes and give a higher quality of analysis, which can be achieved by utilising efficient analysis tools and practical knowledge management systems.

#### 4.3.1 Information gathering

Similar to the previous use case, interviews were conducted with key decision-makers and influencers within the firm. While conducting this case study, insights and experience gained from the previous two case studies were used. A pattern started to emerge when the same process was followed as with the previous case studies, and the use cases were identified in Table 16 (see Appendix 3) for details. Note that this uses case is noticeably similar to the previous use case except for a few key differences that reflect the current stage of digitalization of the firm and the firm's size, adding more complications to the procedures followed. Those differences do not appear extensively when modelling the case study at a high abstraction level. However, it is demonstrated much more profoundly when we materialize



the Digital Transformation at a lower abstraction level, as seen in the Technology related DT requirements list in Appendix 3.5.1.

**Table 16: Overview of IncomeMarketing use cases**

Use Case 1	
Market Research Advisory	
<b>Context</b>	Core business operation/service
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Report Authoring and Calculations</li> <li>2- Data Collection and Management</li> <li>3- Time and Resource management*</li> <li>4- Project Management and standardized workflow*</li> </ul>
<b>Business vision</b>	<p>Improvements in:</p> <ul style="list-style-type: none"> <li>1- Standardization*</li> <li>2- Knowledge capitalization and reuse*</li> <li>3- Status awareness</li> <li>4- Collaboration</li> </ul>
Use Case 2	
Engaging a new client	
<b>Context</b>	Sales & Marketing
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Client service and satisfaction.</li> <li>2- Client selection*</li> <li>3- Engagement follow-up and measurement.</li> </ul>
<b>Business vision</b>	<p>Improvements in:</p> <ul style="list-style-type: none"> <li>1- Quality of customer experience.</li> <li>2- Selection of contracts and assignments*</li> <li>3- Followup and tracking.</li> </ul>
Use Case 3	
Collections	
<b>Context</b>	Account management



<b>Needs for change</b>	<p>The current activities that need change:</p> <ol style="list-style-type: none"> <li>1- Invoicing and collections.</li> <li>2- Followup.</li> <li>3- Status awareness and workflow.</li> </ol>
<b>Business vision</b>	<p>Improvements in:</p> <ol style="list-style-type: none"> <li>1- Collection rates.</li> <li>2- Workflow integrations.</li> </ol>
<p><b>* To highlight the new differentiation in the <i>use case</i> from <i>the previous ones</i>.</b></p>	

#### 4.3.2 Modelling IncomeMarketing AS-IS models

##### 4.3.2.1 IncomeMarketing Current capability modelling

Following the same process conducted in the past use cases, the analysis of the information gathered from the use cases and the physical and virtual meetings with the user personnel resulted in the agreed capability model, shown in Figure 39.

The AS-IS capability model defines seven main capabilities denoted in the model as Consulting, Research and Analysis, Report Authoring, Data Management, Business Development, and Collections, in addition to one external capability: Data suppliers.

These capabilities exist because of certain capacities (in the form of resources) that the consultant firm possesses and the ability (in the form of means or skills inherent in the resources) to be of functional use. For example, *Data Management* is a capability of IM (Table 16) that deploys resources such as Market research team (that include market surveyors), having the knowledge and expertise to gather and organise data from first-hand surveys, third party market research data, including demographical data, the market performance of competitors, demographics, economic drivers and more. In the model of Figure 39, capacities and abilities are indicated for each capability.



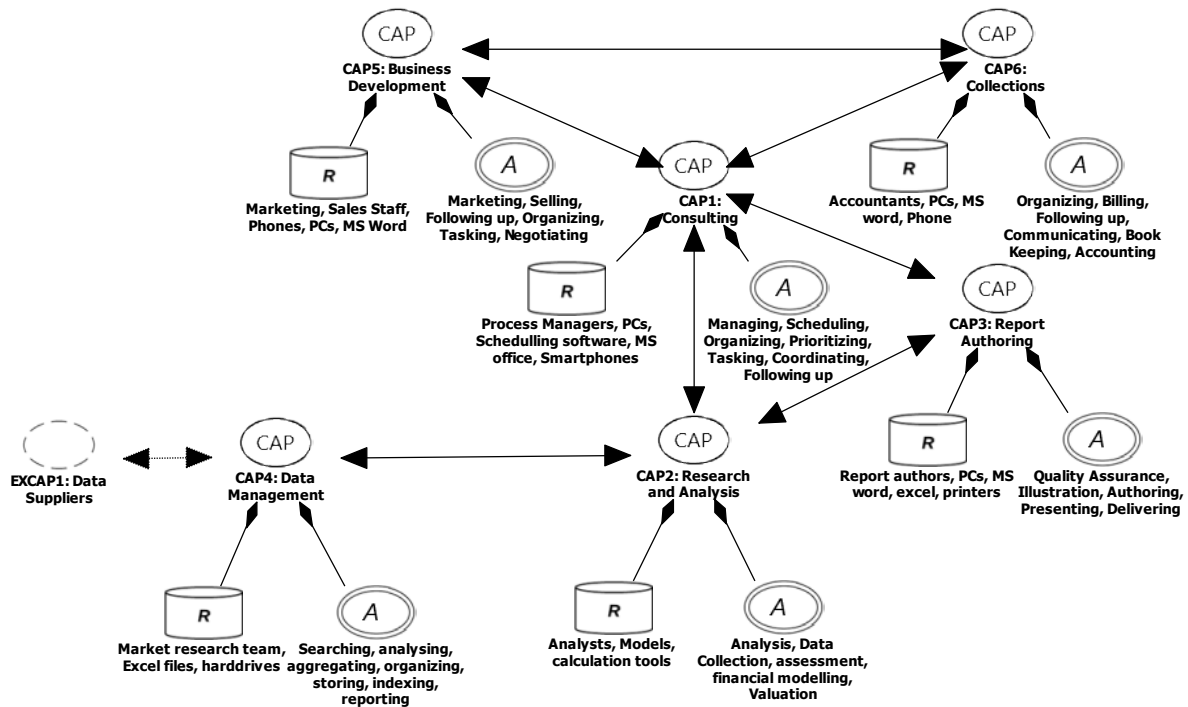


Figure 39: IM As-Is Capability Model

The function of the chosen use application is possible because IncomeMarketing is the owner of capabilities CAP1-CAP6 and the collaboration between these capabilities. For example, *Consulting*, which is deployed daily, collaborates with four other capabilities to make sure tasks are fulfilled and proper procedures are followed to push the workflow of the consulting process forward.

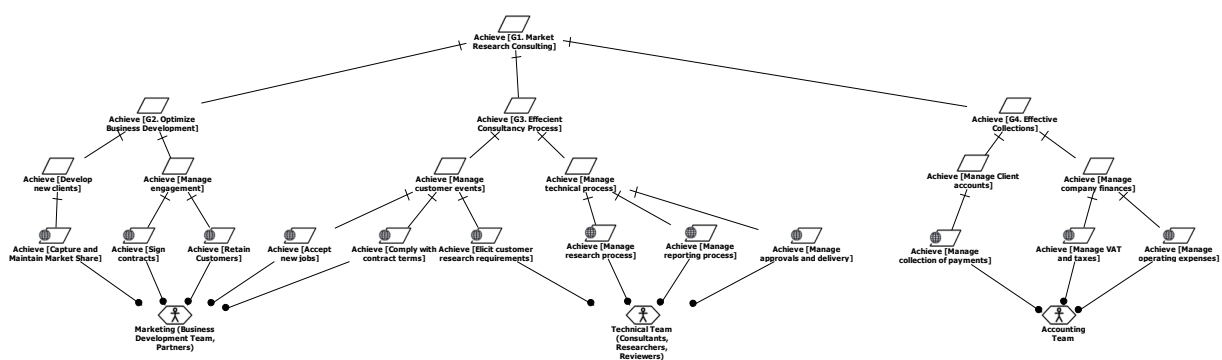
Capabilities CAP1-CAP6 are considered internal capabilities, i.e. they are wholly owned by IncomeMarketing and therefore can review and update their configuration of capabilities. In the IncomeMarketing use case, such re-configuration will need to occur for IncomeMarketing to utilise “smart” capabilities.

In addition to these internal capabilities, there is one external capability, EXCAP1, owned by enterprises with which IncomeMarketing collaborates but whose capabilities are not owned, controlled, or subject to any influence by IncomeMarketing. External capabilities are included in the capability model to externalise these relationships.



### 4.3.2.2 IncomeMarketing Goal Model

Similar to how we conducted the previous use case, in this use case, initially stated goals were often rephrased to avoid ambiguous goals or identify synonymous goals and relationships between goals. Then more rigour was carried out to distinguish operational goals from business goals and clear up any ambiguities. Knowledge and experience from conducting the goal model of the previous two use cases were leveraged in efficiently guiding the discussions with special care to not influence it. However, it became evident that IncomeMarketing use cases share the same strategic objective, with the difference being the context; G1: to have the data and capability for Market Research consulting. This was refined in three sub-goals, namely, G2: To optimise business development, G3: To efficiently manage the consulting process and G4: To manage collections effectively, respectively, leading to the top two layers in the goal model shown in Figure 40.



**Figure 40: IM As-Is Goal Model**

To achieve goal G2: To optimize business development work, two sub-goals are identified: To develop new clients and To manage engagement. Three new operational goals are created, to Capture and maintain market share, to Sign contracts, and to Retain Customers. All those goals are handled by the business development role, which could be one person or a group of people and is represented by the Human-Agent: Marketing. The role of Marketing is to achieve those goals within that organization. At this level of abstraction, it is apparent that the goals are nearly parallel to the previous use cases in meaning.



## Chapter 4: Modelling the use-cases

To achieve G3: To achieve an efficient consultancy process, two subgoals were identified: To Manage customer events and to Manage the technical process. Both of those goals are at the core of the consulting work and are divided into six operational goals. The first goal relates to dealing directly with the customer, and it is divided into three operational sub-goals as follows: To Accept new jobs, To Comply with contract terms, and to Elicit customer research requirements. Meanwhile, the second goal related to dealing with internal teams and is divided into three operational sub-goals as follows: To manage research process, To Manage reporting process, and finally, To Manage approvals and delivery process. Those operational sub-goals are derived and verified through iterating the model via Use Case 1 (See Table 16Table 12: Overview of the GAT use cases, which is operationally detailed in Appendix 3.2). The first two operational goals are under the responsibility of the Business Development team, which is represented in the model as a human-agent named Marketing, and the last four operational goals are under the responsibility of the technical team, which includes several actors such as an assigned Consultant, Researchers, Analysts, and reviewers. In the model, the technical team is grouped into one human-agent abstraction named Technical Team.

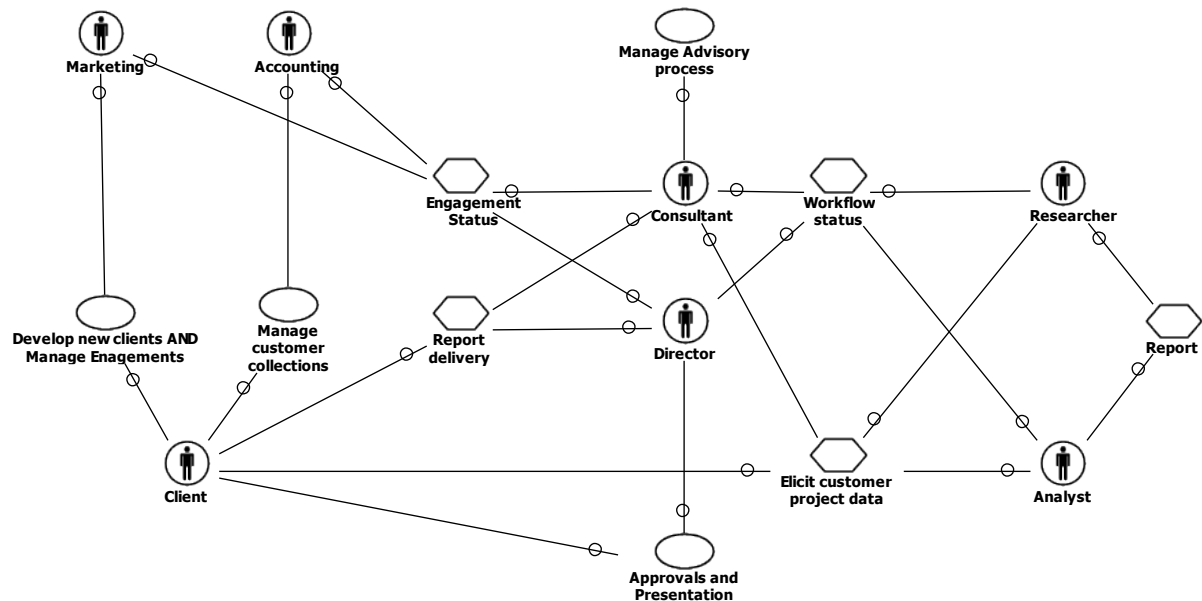
Finally, to achieve G4: To effectively manage collections, two sub-goals were identified: To Manage Client accounts and to Manage company finances, which are further divided into three operational goals as follows: To Manage collection payments, To Manage VAT and taxes and finally To Manage operating expenses. All of those operational goals are under the responsibility of an accounting team. This team is represented in the model as human-agent by the name Accounting Team, the details of which are outlined in Use Case 3 (See Table 16 and detailed in Appendix 3).

To remain consistent at a common high-level abstraction layer as the previous case studies, the model does not dive into deeper analysis and a lower implementation layer, avoiding detailed operational goals for each actor with detailed implementation details. Instead, we will draw the line at this abstraction level for our comparative and pattern analysis with other SCFs.



### 4.3.2.3 IncomeMarketing Actor-Dependency model

The goal model described in the previous Chapter gives an intentional description of the IncomeMarketing case study. Similar to the previous use cases study, the socio-technical context of the identified capabilities is represented in constructing the actor-dependency model, a higher-level abstraction that depicts what actors expect from each other. Figure 41 illustrates the AS-IS Actor dependency model.



**Figure 41: IM As-Is Actor-Dependency Model**

As shown in this model, there is a complex network of dependencies between the IncomeMarketing actors. [Agent: Marketing] has a goal-dependency with the [Agent: Client] whereby to achieve their set goals of [Goal: Develop new clients and Manage Engagements], they need to interact with the [Agent: Client] while also managing the [Task: Engagement Status] with the [Agent: Consultant]. The [Agent: Consultant] as shown is a central role, whereby many central tasks and goals depend on him/her, such as [Goal: Manage Advisory process] by managing [Task: Engagement Status], [Task: Elicit customer project data], [Task: Workflow Status] and [Task: Report delivery], each dealing with different actors as shown in the model. In turn, the technical team [Agent: Analyst] and [Agent: Researcher] have a dependency with the [Agent: Consultant] for the [Task: Workflow



status] and dependency among themselves with [Task: Report]. Similar to the Consultant, the [Agent: Director] is involved in a dependency with all the direct subordinates in a supervisory role. Finally, the [Agent: Accounting] is dependent on the [Goal: Manage customer collections] concerning the [Agent: Client] and is in sync with the [Agent: Consultant] and sometimes the [Agent: Director] via the dependency on the [Task: Engagement status].

### 4.3.2.4 IncomeMarketing Informational Objects model

The IncomeMarketing informational object model deals with the essential elements used for the company to utilise the necessary data required to coordinate various operations through information transmission channels. Following the same process of identifying the information objects as the previous case studies, looking at the goals, capabilities, and actor-dependency helped identify the informational components. The information object objectively helped revise and refine the other three models to ensure cohesiveness and consistency. The IncomeMarketing informational model depicted in Figure 42 contains all informational objects used as part of the IncomeMarketing capabilities.

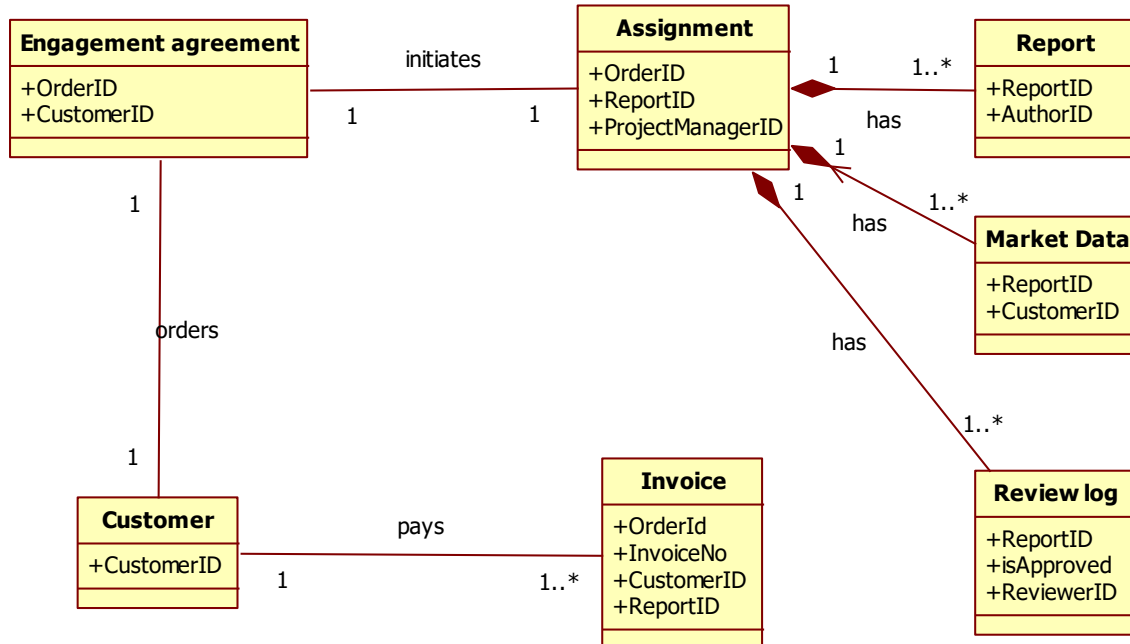
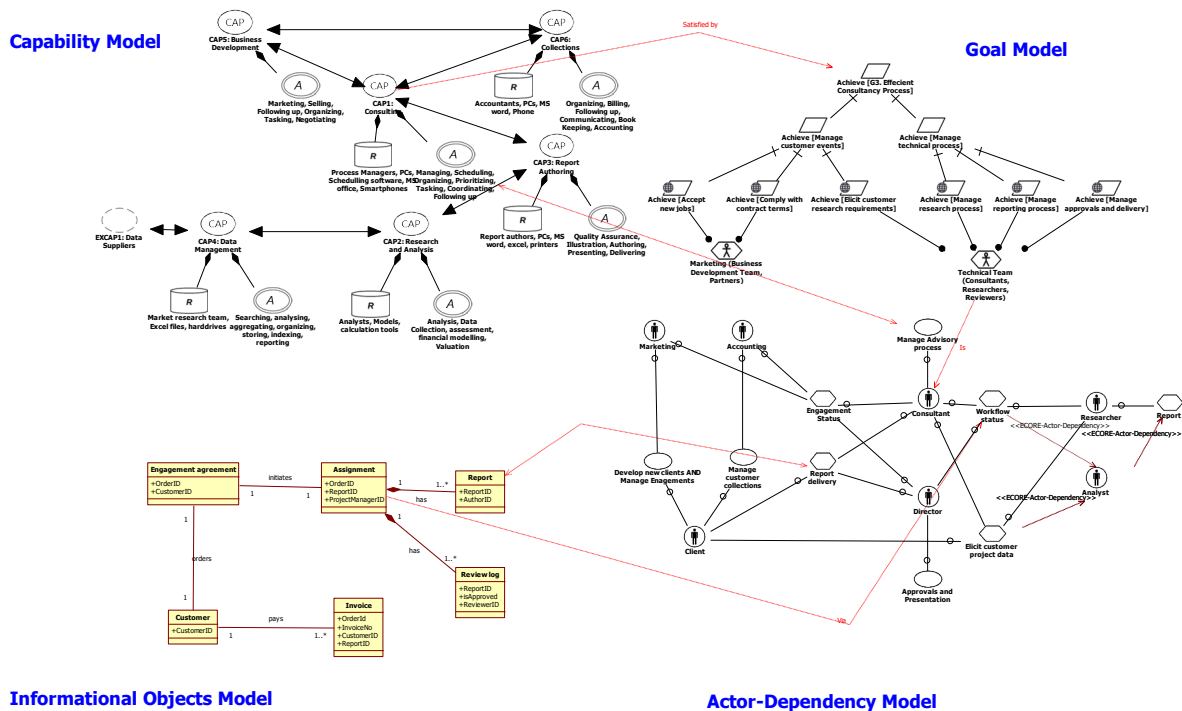


Figure 42: IM As-is Information objects



### 4.3.3 Validating the IncomeMarketing AS-IS models for completeness

This concept of inter-model relationships is demonstrated in Figure 43, which shows a small fragment of these relationships in the context of [Consultancy]. In practice, these relationships were discovered using correlation relationships utilizing the power of the eCORE Tools in connecting the different components of the model during construction, which were updated during each reviewing cycle until all stakeholders were confident that the models represented were agreed upon and validated for the production application for the IncomeMarketing use cases.



**Figure 43: Income Inter-model Relationship**

For instance, the Capability [CAP1: Consultancy] with Resource [Process Management, Scheduling software, MS Office, and Technical Staff] achieves the Goal [G3: Efficient Consultancy process] and its sub-goals, via the Human-agent [Technical Team], which in terms is the Actors [Consultant] [Researcher] and [Analyst] using the Information Objects [Assignment] and [Report]. More details on the correlation matrices are outlined in Appendix 3.3, and programmed in the eCORE program files.



## Chapter 4: Modelling the use-cases

### 4.3.4 Modelling IncomeMarketing requirements for change

#### 4.3.4.1 The IncomeMarketing goals for change

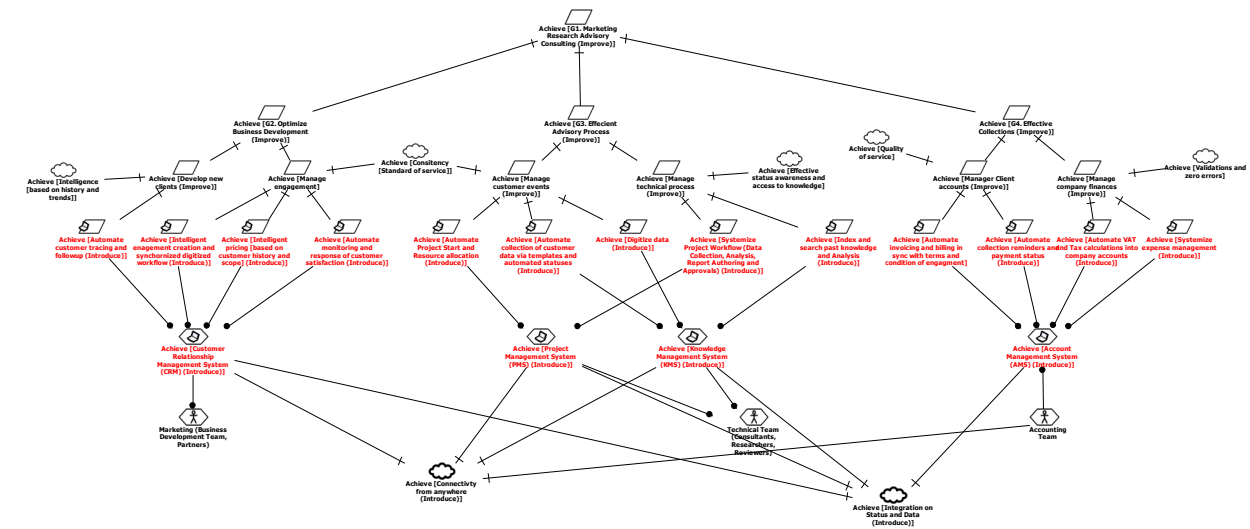
Similar to the previous case study, change goals express IncomeMarketing's needs and wishes and perceived opportunities concerning digital transformation technologies. A similar process was followed in eliciting those change goals via suitable formulation by deliberating and agreeing with IncomeMarketing's stakeholders during face-to-face and online workshops and offline revisions of the models.

The baseline for identifying and refining change goals has been the current business goals model (see Chapter 4.2.2.2). In particular, the hierarchy of change goals was constructed top-down, step by step, by generating the change goals either as improvements of the current goals or by introducing new goals. The same process as the previous case studies was followed, which iterated on three main activities:

1. Determine the impact of perceived 'smart' on current business goals, by
  - a. Identifying new goals as adaptations (improvements) of the current goals: *improve*
  - b. Identifying new goals as newly introduced goals: *introduce*
2. Modify the current goal hierarchy to reflect these changes.
3. Re-assign operational goals to existing or foreseen actors ("smart" components).

Similar to before, the change goals identified by IncomeMarketing stakeholders were very narrow, limited by their perceptions of the digitally transformed system's capabilities and components. However, by juxtaposing them to the current goals hierarchy, it was possible to refine and re-express initial goals focusing on the organisations' objectives rather than perceived transformed system functionality. The outcome was almost identical to the previous use case's desired transformation, with the apparent difference being the context and the subject domain.





**Figure 44: IM To-Be Goal Model**

Figure 44 illustrates the goal model, starting with Goal 1: Market Research Advisory Consulting (improve). This model shows that the initial requirements gradually transformed into several operational goals representing system goals.

This analysis made it possible to provide a clear causality between IncomeMarketing requirements and expected system functionality. This causality works in both directions. It is possible to justify a new system to track high-level business goals to system components. Alternatively, it is possible to trace the reasoning from desired system components to business goals. Again, similar to the previous case study, special attention was given to identifying associated soft goals, as these will be used to determine the (possibly) new performance indicators against which any new development will be measured. The change goals model of Figure 44 shows how each business goal for change has at least one soft goal associated with it.

### 4.3.4.2 From change goals to desired IncomeMarketing capabilities

As described in Chapter 4.2.4.1 above, the initial IncomeMarketing requirements are gradually operationalised by introducing several new goals, ultimately assigned to new system modules. These modules will represent a new set of assets and, therefore, capabilities. These new capabilities will give IncomeMarketing use case a competitive advantage and deal with current difficulties in solving problems mentioned in Chapter 4.3.1 above.



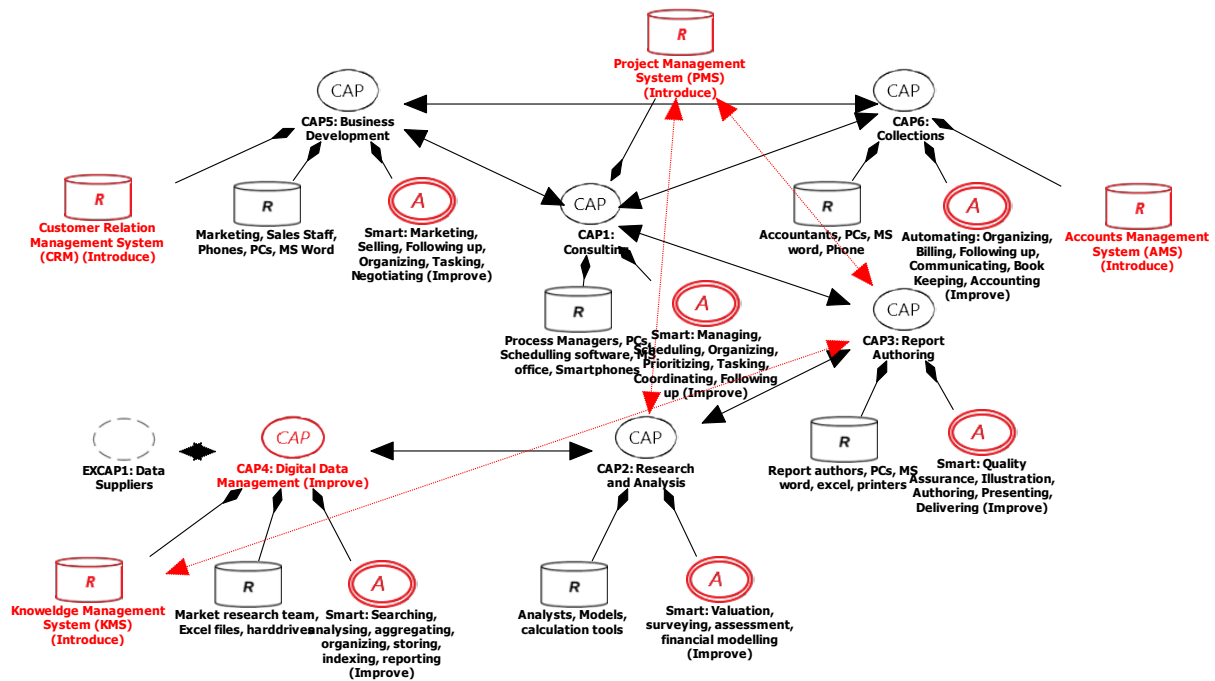


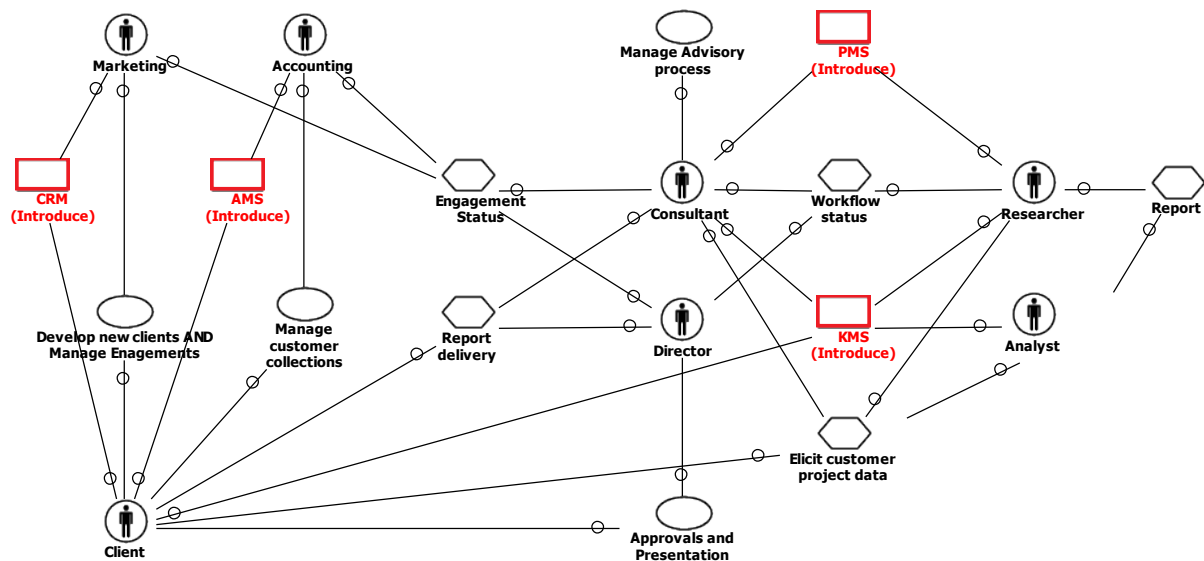
Figure 45: IM To-be Capability Model

Some of these system goals replace existing current goals previously assigned to specific human actors. For example, improve Goal 3 to achieve efficient advisory process by improved sub-goal Manage customer events [improve], it is assigned to new system requirements to automate and add intelligence to the process. This new system and process design involve linking it to a new Target System Project Management System (PMS) integrated with the Customer Relationship Management System (CRM), which will automate the creation and solicitation of data collection forms created from a template bank, which the customer generates desired market research needs. This new “smart” digitally transformed process replaces the old direct and manual process carried out by the Human-Agent Consultant and Researcher. Thus, it becomes evident that the improvement sought by the IncomeMarketing transformation will affect the dependencies between current actors and associated capabilities.



### 4.3.4.3 From change goals and change capabilities to desired improved Actor-Dependency

Similar to the development process of the TO-BE model of the previous case studies, the new set of capabilities gives rise to new collaborations between capabilities and involved actors. The identification of these relationships is significant because it enables us to define the way that actors coordinate between themselves in order to make capabilities realisable.



**Figure 46: IM To-Be Actor-dependency Model**

Those new capabilities and goals give rise to new dependencies, as shown in Figure 46. For instance, the new dependency on the newly introduced Accounting Management System (AMS) fulfils the newly added goal of Automate collection reminders and payment status, which is met with a matching introduction of Automating Accounts Management System (AMS) processes. Similarly, by expanding this analysis across all newly added goals and capabilities, we will find that the dependency between Analyst, Consultant and Researcher will benefit from introducing a new Knowledge Management System (KMS). Other systems include a Project Management System (PMS) and a Customer Relation Management system (CRM) that create new dependencies between different actors in the model.



4.3.4.4 From changed goals, capabilities and actor-dependencies to updated IncomeMarketing information objects model.

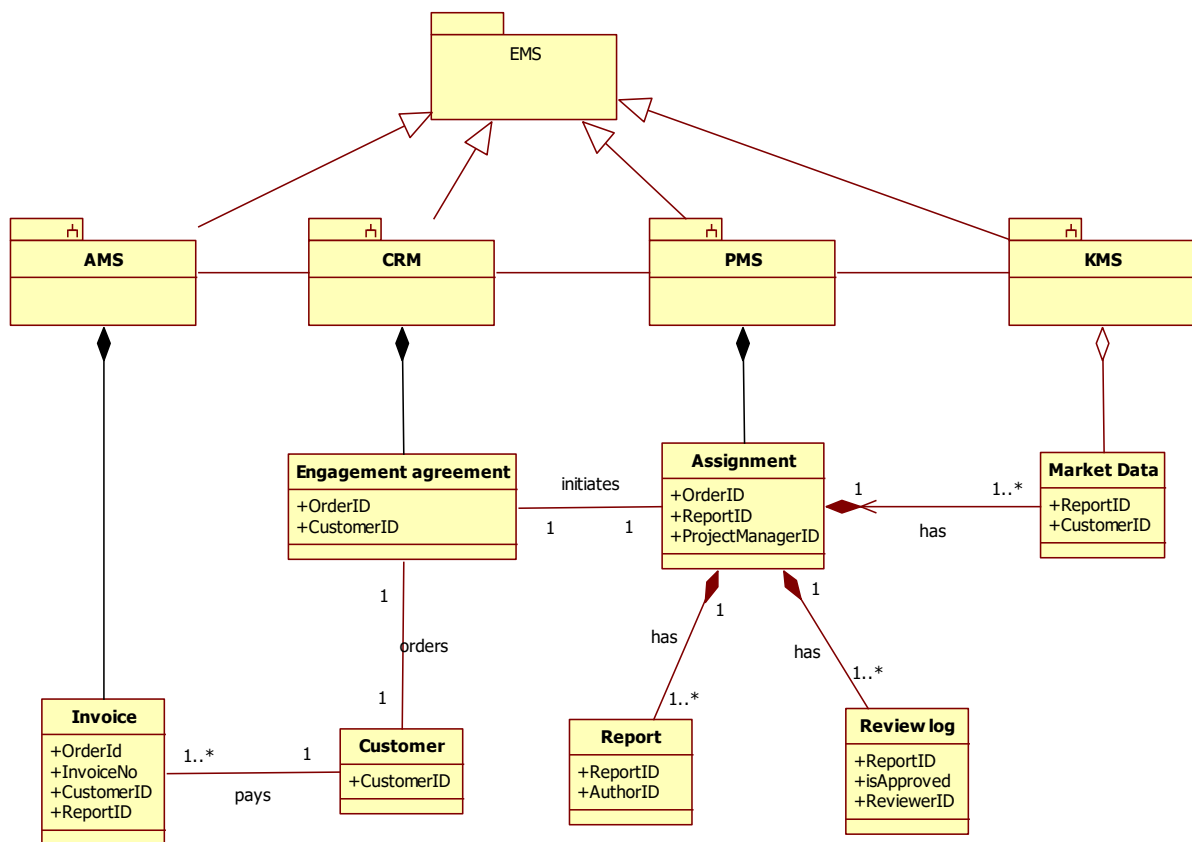


Figure 47: IM To-be Information Object

Similar to all previous case studies, starting from change requirements, new capabilities are modelled, and these, in turn, give rise to details in a new actor model, which essentially defines operational requirements. This is even more explicit in the information model, where the relationship between the pre-transformation information objects gets arranged in the newly transformed information structure. Figure 47 outlines the new information object model where the new Enterprise Management System (EMS) is introduced with a suite of sub-systems: Account Management System (AMS), which handles the invoicing, the Customer Relationship Management system (CRM), which manages the engagement with the customer, the Project Management System (PMS) which manages the core tasks of the consulting work, and finally the Knowledge Management System (KMS) which owns the new



added information Object: *Data*, that holds all the data from previous work and market data that could be mined and analyzed to produce new outcomes for the consulting job on hand. The Information Object model organizes the storage of the data and the updating of the statuses throughout the process workflow. At the same time, the “smart” functions lie in the automation of standardized process workflow, status awareness, harnessing existing knowledge, and enhanced connectivity across teams and functions.

#### 4.3.5 The output: IncomeMarketing Digital Transformation requirements

**Table 17: IncomeMarketing High-level Digital Transformation Business Requirements**

#	Title	Explanation
<b>Technology component (TC)</b>		
<b>TR.1</b>	Switch to Cloud-Based Enterprise Management Systems (EMS):  Install Customer-Relationship-Management-System (CRM), Account Management System (AMS), Project Management Systems (PMS), and a Knowledge Management System (KMS).	Enterprise Management Systems (EMS) need to go online to address Omni-presence and connectivity. The PMS and CRM will enhance Use case 1, the CRM and the AMS will enhance use case 2 and 3.
<b>TR.2</b>	Integrate the different EMS components with status awareness (“smart” element)	The consultants and employees should be able to track the status and content of an “assignment” or “task” across its multiple “forms” (in the engagement process, project management process, collections process)
<b>Process Component (PR)</b>		
<b>PR.1</b>	Integrate workflow across ERP systems	The steps to conduct each of the three main uses cases can be represented in a workflow in each of



		the ERP systems. Whereby data, statuses, assignments, responsibilities, checklists, and reminders are tracked and recorded.
<b>PR.2</b>	Program “smart” features across process workflows	With the new digitally transformed tools, program smart capabilities such as automated workflow transitions, smart reminders, validity checkers, automated traceability and alarms.
<b>People Component (PP)</b>		
<b>PP.1</b>	Training of employees on the systems	There is an element of transition from the old ways of doing business to the transformed way. This will require a period of training and possibly co-existence with old technologies.
<b>PP.2</b>	Connectivity of people	People need to get accustomed to enabling connective technology such as Systems on smartphones, laptops, and smart meeting rooms to boost productivity and capabilities.

Note how it is almost identical to the previous case study except for differences in domain context.

#### 4.3.6 Feedback and conclusions from the IncomeMarketing case study

Similar to the previous case studies, a total of five sessions were conducted with IncomMarketing stakeholders; two pre-transformation and three post-transformation (see Appendix 3.6). The pre-transformation sessions were conducted during the same period as the previous two case studies. Like the Fincorp case study, although it was the first time for the stakeholders to go through the modelling exercise, it was now a repeated exercise for the research. The sessions were focused on achieving the same objectives for the modelling exercise in order to compare and generalize: 1) Understand the main use-cases of the SCF, 2) Understand how to breakdown the SCF into its different *People*, *Process*, and *Technology* (*PP&T*) sub-components, and 3) Use the eCORE Tool to build the four viewpoints reflecting



the use-cases and the PP&T aspects. Additionally, the primary research focus was to detect any common themes with the previous case studies and to evolve the SC-COST framework to fit the three narratives, both for the theory (ontological concepts and abstractions) and practice (enhancements to the eCORE Tools and patterns).

The pre-transform sessions were quicker as lessons from the other two use cases were presented as a blueprint for the modelling exercise. It was the first case study to experiment with the concept of “templates” and test their effectiveness in a pre-transform setup. Applying the principles of the DSRM, a template based on an early understanding of a “pattern” was developed and tested in the eCORE tool. Stakeholders were observed dealing with the template and inquiring about its utility for their transformation needs. The outcome was beneficial as the template was altered to create their models, and the alteration process resulted in more insights that further enhanced the templates.

The pre-transform models also resulted in parallel central functions: a) Marketing, b) Central Market research services (the product), and c) post-consulting accounting and collections. It is becoming clear that the similarities between those eCORE model structures for the past three use cases suggest a general commonality across multiple practices in the SCF business model at the higher abstract layers. Thus, a pattern has emerged that could be explored and generalized. A detailed description of those patterns is discussed in Chapter 5.

Unfortunately, during the post-transformation feedback sessions, we discovered that the firm did not follow through with the plan due to a tragedy where the top partner and leading champion of this transformation project passed away during COVID-19. The firm was focused on recovering and restructuring, and the project was swept aside. A few initial efforts were implemented for the Marketing function only, with partial transformation deemed successful; however, the entire organization is yet to be transformed. The research was about to exclude the case study from the research; however, the new executive decided that the firm wanted to reopen the project and start over, in which case the three post-transform sessions were used to re-run the pre-transform models from three years prior, which served as an excellent feedback opportunity for the research to test the validity of the framework in a post-COVID-19 era and during a different period. The added benefit was



that, at this point, the templates and tools had been improved upon from the six use case studies, and the firm benefited from the collective experiences of all the other use cases.

The outcome was consistent with the findings in that the patterns were still valid and consistent with the structure and process of the AS-IS state of the firm and that the TO-BE desired digital transformation models were found valuable and met the desired transformation requirements. There was no post-transform feedback conducted on this use case beyond this point, as the firm was in the implementation process during the writing of this thesis.

Firms like GAT, Fincorp and Income Marketing work in an advisory capacity, where the project typically ends with delivering an artefact, typically a report or advice. It became apparent that exploring more SCFs of the exact nature would yield diminishing returns for the advancement of the SC-COST framework. Therefore, the selection of case studies was modified to exclude similar SCFs that operated in an advisory capacity and select firms like GAV, YAMM and ITEGY that work in a servicing capacity, where typically the project is serviced until complete. In the spirit of the DSRM iterative process, it would challenge the findings from the first type of SCFs in a different setup and gain more insights into the generalizability of the framework.



### 4.4 Use Case 4: GAV

GAV is a Small-Consulting-Firm (SCF) specialized in consulting for liquidation and selling of distressed assets via direct sale or auction. They hold a license from the Ministry of Supply and Internal Trade (MSIT) in Egypt, which gives them the authority to help set up, organize, supervise and approve public sales and auctions of public and private property.

Typical customers include Corporations, Private Equity Funds, Financial portfolio managers, Public and Private Companies, Governments, and Courts. In addition, a few individuals also use GAV's services for personal use.

Auctioning consulting services rely heavily on organizational skills as the consulting effort is more operational than advisory. In addition, the nature of this business is that it is heavily reliant on retaining customer relations as both the procurer of the service (Seller) and the beneficiaries (Buyers) are two different sets of customers of which demand high standards of service. In this situation, the auction consulting firm's role is to comply with public and private auctions' laws, regulations, and standards while maintaining a competitive advantage in the market by securing a balance of high quality with the cheapest cost. As a result, a successful Auction consulting firm typically enjoys a robust customer database, a strong handle on processes and procedures that protect both the buyer and seller and an organized and efficient strong project management team. It is vital to distinguish that auction consulting firms are not themselves brokers (or sale agents); instead, they are expert consulting firms that clients (sellers) hire to advise, plan, supervise and manage their auction/sale needs and may be delegated to procure the services of additional vendors such as brokers, agents, lawyers, valuers, appraisers and more.

#### 4.4.1 Information gathering

Similar to the previous use case, interviews were conducted with key decision-makers and influencers within the firm. While conducting this case study, insights and experience gained from the previous case studies were used. The emerged patterns, discussed in Chapter 5, helped speed up requirement elicitation and modelling, and the use cases were identified as followed in Table 18 (see Appendix 4 for more details). This uses case differs slightly from



the three previous use cases in its operational context. Those differences do not appear extensively when modelling the case study at a high abstraction level. However, it is demonstrated much more profoundly when we materialize the Digital Transformation at a lower abstraction level, as seen in the Technology related DT requirements list in Appendix 4.5.

**Table 18: Overview of GAV use cases**

<b>Use Case 1      Auction Advisory</b>	
<b>Context</b>	Core business operation/service
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Project Management and standardised workflow</li> <li>2- Client management both buyers and sellers*</li> <li>3- Contract templating and compliance management*</li> <li>4- Time and Resource management</li> </ul>
<b>Business vision</b>	<p>Improvements in:</p> <ul style="list-style-type: none"> <li>1- Standardization</li> <li>2- Client Database capitalization and reuse*</li> <li>3- Status awareness</li> <li>4- Collaboration</li> </ul>
<b>Use Case 2      Engaging a new client</b>	
<b>Context</b>	Sales & Marketing
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Client service and satisfaction.</li> <li>2- Client selection</li> <li>3- Engagement follow-up and measurement.</li> </ul>
<b>Business vision</b>	<p>Improvements in:</p> <ul style="list-style-type: none"> <li>1- Quality of customer experience.</li> <li>2- Speed and compliance of procedural paperwork*</li> <li>3- Followup and tracking.</li> </ul>



Use Case 3	Collections
<b>Context</b>	Account management
<b>Needs for change</b>	<p>The current activities that need change:</p> <ol style="list-style-type: none"> <li>1- Invoicing and collections.</li> <li>2- Account reconciliation between buyers, sellers and vendors.*</li> <li>3- Followup.</li> <li>4- Status awareness and workflow.</li> </ol>
<b>Business vision</b>	<p>Improvements in:</p> <ol style="list-style-type: none"> <li>1- Collection rates.</li> <li>2- Faster procedural red-tape handling.*</li> <li>3- Workflow integrations.</li> </ol>
<p><b>* To highlight the new differentiation in the <i>use case</i> from the <i>previous ones</i>.</b></p>	

#### 4.4.2 Modelling GAV AS-IS models

##### 4.4.2.1 GAV Current capability modelling

Following the same process conducted in the past use cases, the analysis of the information gathered from the use cases and the physical and virtual meetings with the user personnel resulted in the agreed capability model, shown in Figure 48.

The AS-IS capability model defines seven main capabilities denoted in the model as Auctioneering, Inspections, Marketing and Advertising, Session Organizing, Business Development, and Collections, in addition to one external capability that groups all external vendors: Brokers and Ad Agencies. GAV is the owner of capabilities CAP1-CAP6 and the collaboration between these capabilities. For example, *Auctioneering*, which is deployed daily, collaborates with five other capabilities to ensure tasks are fulfilled, and proper procedures are followed to push the workflow of the consulting process forward.



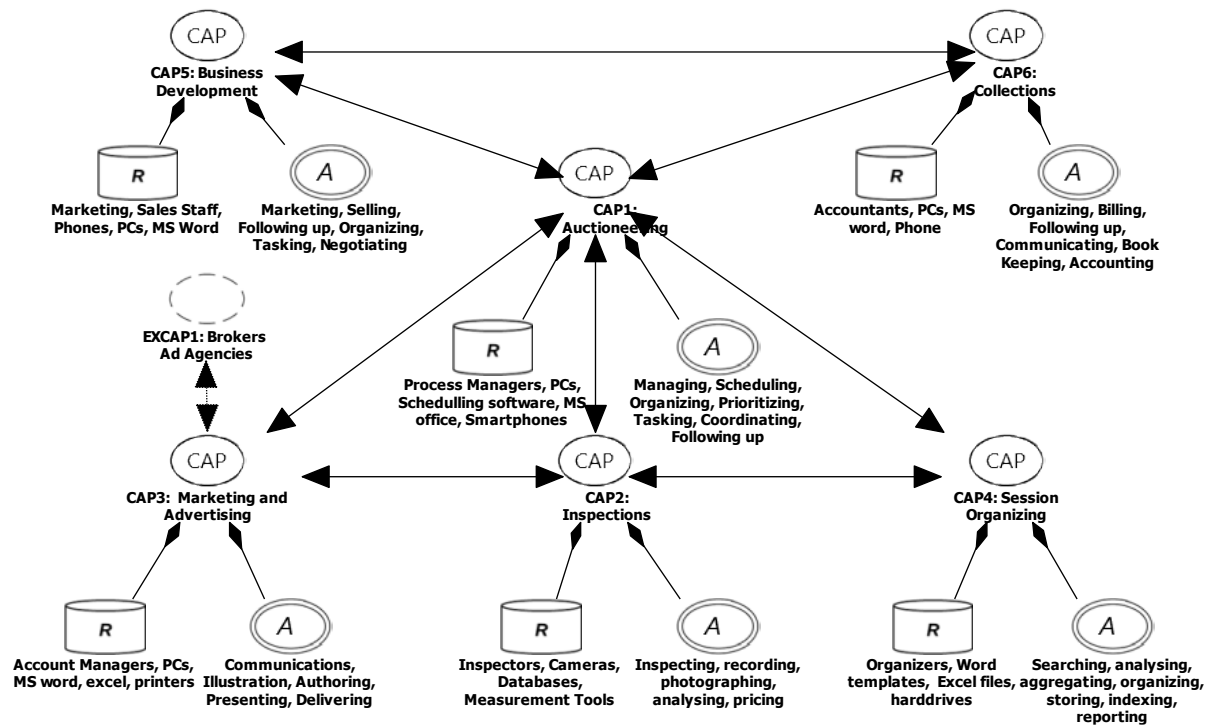


Figure 48: GAV AS-IS Capability Model

Capabilities CAP1-CAP6 are considered internal capabilities and are wholly owned by GAV and therefore can review and update their configuration of capabilities. In the GAV use case, such re-configuration will need to occur for GAV to utilise “smart” capabilities.

In addition to these internal capabilities, there is one external capability, EXCAP1, owned by enterprises with which GAV collaborate but whose capabilities are not owned, controlled or subject to any influence by GAV. Therefore, external capabilities are included in the capability model to externalise these relationships.

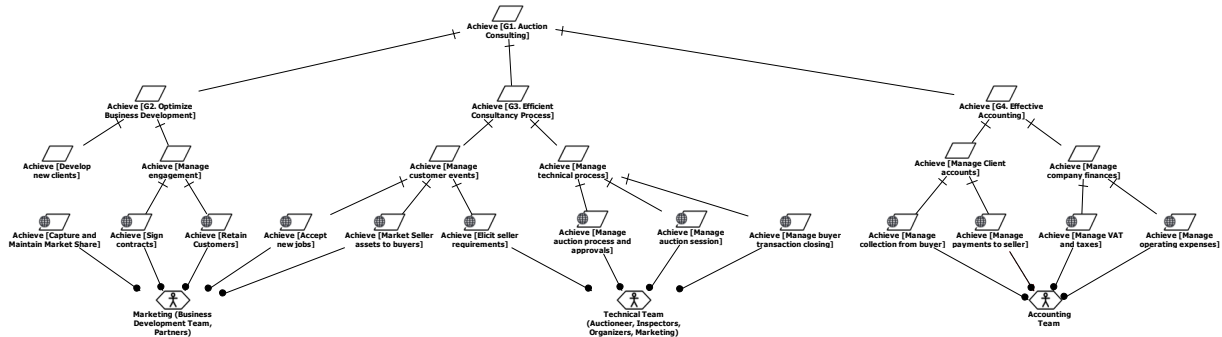
Therefore, similar to the previous modelling use cases, the model shown in Figure 48 reflects the capacities and abilities of GAV, which all work together in the relationship to achieve the business goals described in Figure 49 below.

#### 4.4.2.2 GAV Goal Model

In the process of building the GAV goal model, it became evident that the GAV use case aspires to achieve similar high-level strategic objectives as the previous uses cases, with the difference being the context; G1: Achieve Auction Consulting. This was refined in



three sub-goals, namely, G2: Achieve business development, G3: Achieve efficient consulting process and G4: Achieve effective accounting, respectively, leading to the top two layers in the goal model shown in Figure 49.



**Figure 49: GAV AS-IS Goal Model**

To achieve goal G2: Achieve Optimize business development, two sub-goals are identified: To develop new clients and To manage engagement. Three new operational goals are created, to Capture and maintain market share, to Sign contracts, and to Retain Customers. All those goals are handled by the business development role, which could be one person or a group of people and is represented by the Human-Agent: Marketing. The role of Marketing in this context is to achieve those goals within that organization. At this level of abstraction, it is apparent that the goals are nearly parallel to the previous use cases to some extent. However, the role of Marketing is a lot more involved when achieving other operational goals for the organizations, primarily because of the nature of the consulting service involved. Marketing is also an important actor in achieving G3 below, introducing a new mixed actor not previously seen in previous case studies.

To achieve G3: Achieve efficient consulting process, two subgoals were identified: To Manage customer events and to Manage the technical process. Those goals are at the core of the consulting work and are divided into six operational goals. The first goal relates to dealing directly with the customer, and it is divided into three operational sub-goals: To Accept new jobs, To Market Seller assets to buyers, and to Elicit customer requirements. Meanwhile, the second goal is related to dealing



with internal teams and is divided into three operational sub-goals as follows: To manage auction process and approvals, to manage auction session, and finally, To manage buyer transaction closing. Those operational sub-goals are derived and verified by iterating the model via Use Case 1 (See Table 18, operationally detailed in Appendix 4.2). The first two operational goals are under the responsibility of the Business Development team, which is represented in the model as a human-agent named `Marketing`, and the last four operational goals are under the responsibility of the technical team, which includes several actors such as an assigned Auctioneer, Inspectors, Organizers and Marketing. The technical team is grouped into one human-agent abstraction named `Technical Team` in the model.

Finally, to achieve G4: Achieve effective accounting, two sub-goals were identified: To Manage Client accounts and to Manage company finances, which are further divided into three operational goals as follows: To Manage collection from buyers, To Manage payments to sellers, To Manage VAT and taxes and finally To Manage operating expenses. All of those operational goals are under the responsibility of an accounting team. This team is represented in the model as human-agent by the name `Accounting Team`, the details are outlined in Use Case 3 (See Table 18 and detailed in Appendix 4.2).

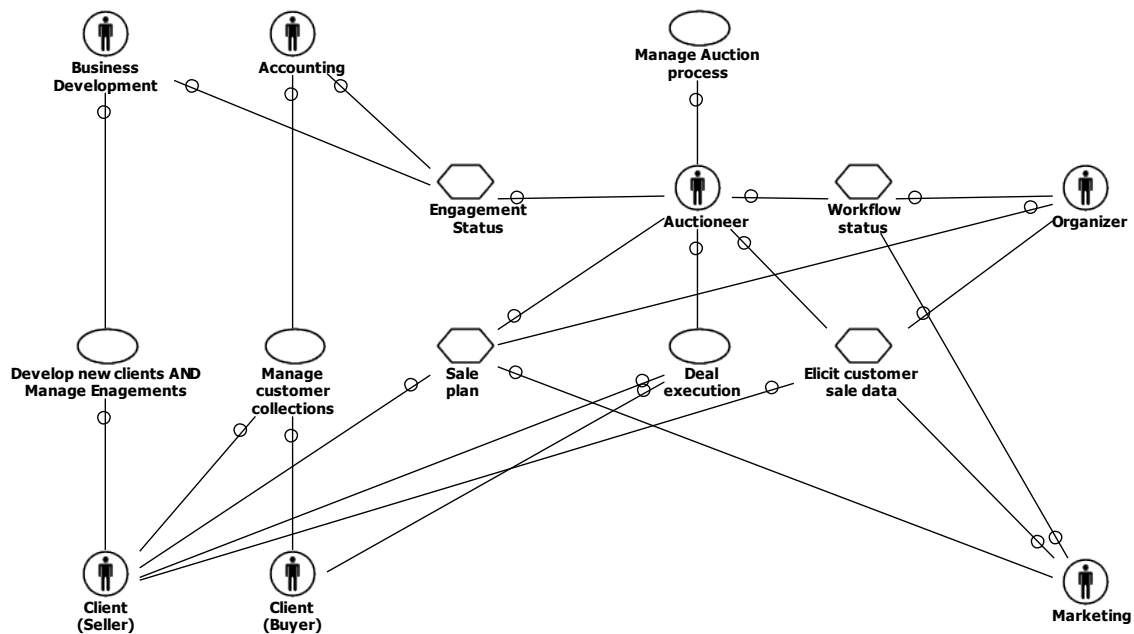
To remain consistent at a common high-level abstraction layer as the previous case studies, the model does not dive into deeper analysis and a lower implementation layer, avoiding detailed operational goals for each actor with detailed implementation details. Instead, we will draw the line at this abstraction level for our comparative and pattern analysis with other SCFs.

### 4.4.2.3 GAV Actor-Dependency model

Figure 50 illustrates the AS-IS Actor dependency model; similar to how the previous models were constructed; the socio-technical context is represented in the actor-dependency model. Note that even if the people are the same, the roles are separated. For example, the Business Development and Marketing roles below are the same team; but in modelling



them, the roles were split into two actors to reflect the scope of responsibilities of the role, rather than the person behind the role.



**Figure 50: GAV AS-IS Actor-Dependency Model**

As shown in this model, there is a complex network of dependencies between the GAV actors. [Agent: Business Development] has a goal-dependency with the [Agent: Client (Seller)] whereby to achieve their set goals of [Goal: Develop new clients and Manage Engagements], they need to interact with the [Agent: Client (Seller)] while also managing the [Task: Engagement Status] with the [Agent: Auctioneer] and [Agent: Accounting]. The [Agent: Auctioneer] as shown is a central role, whereby many central tasks and goals depend on him/her, such as [Goal: Manage Auctioneerig process] by managing [Task: Engagement Status], [Task: Elicit customer sale data], [Task: Workflow Status] and [Task: Workflow status], each dealing with different actors as shown in the model. In turn, the technical team [Agent: Organizer] and [Agent: Marketing] have a dependency with the [Agent: Auctioneer] for the [Task: Elicit customer Sale Data] and dependency among themselves with [Task: Workflow Status]. Similar to the Auctioneer, the [Agent: Marketing] is involved in a dependency with all the [Agent: Client (Seller)] and [Agent: Client (Buyer)] via the [Goal: Deal



## Chapter 4: Modelling the use-cases

Execution]. Finally, the [Agent: Accounting] is dependent on the [Goal: Manage customer collections] concerning the [Agent: Client (Buyer)] and [Agent: Client (Seller)] and is in sync with the [Agent: Auctioneer] and the [Agent: Marketing] via the dependency on the [Task: Deal Execution].

### 4.4.2.4 GAV Informational Objects model

The GAV informational object model deals with the essential elements used for the company to utilise the necessary data required to coordinate various operations through information transmission channels. Following the same process of identifying the information objects as the previous case studies, looking at the goals, capabilities, and actor-dependency helped identify the informational components. The information object objectively helped revise and refine the other three models to ensure cohesiveness and consistency.

The GAV informational model depicted in Figure 51 contains all informational objects used in the GAV capabilities.

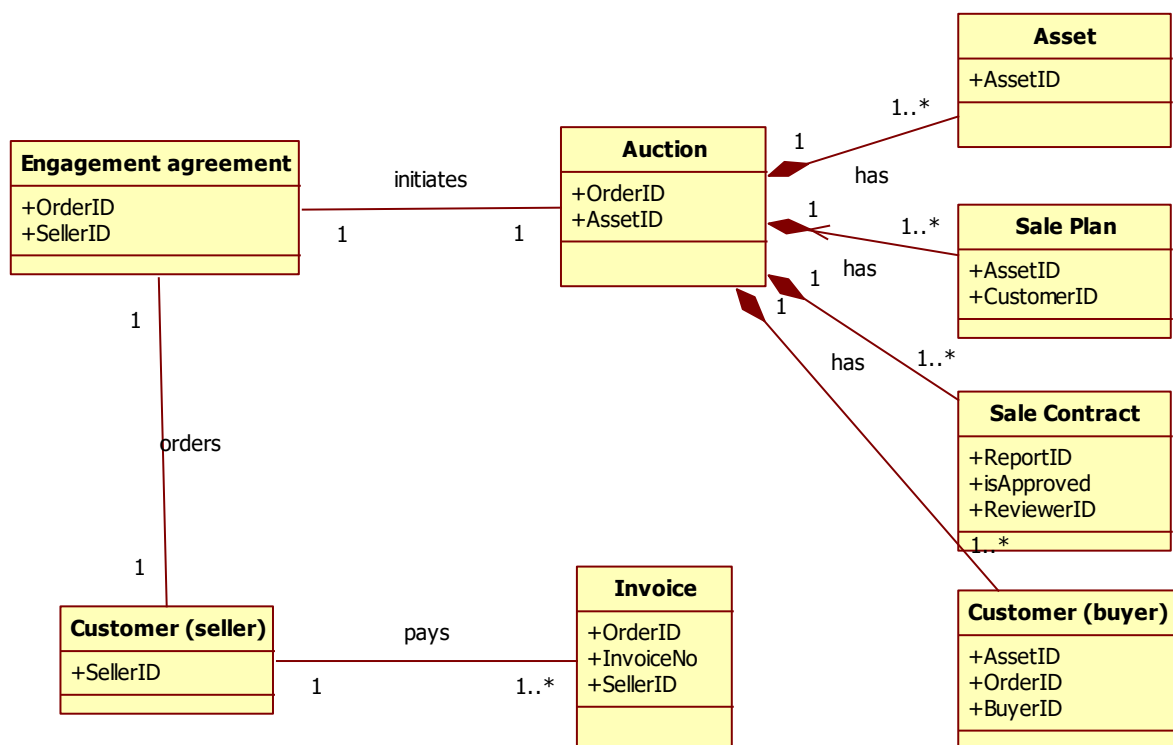


Figure 51: GAV AS-IS Informational Object Model



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### 4.4.3 Validating the GAV AS-IS models for completeness

This concept of inter-model relationships is demonstrated in Figure 52, which shows a small fragment of these relationships in the context of [Auctioneering]. In practice, these relationships were discovered using correlation matrices and the power of the eCORE Tools in connecting the different components of the model during construction, which were updated during each reviewing cycle until all stakeholders were confident that the models represented were agreed upon and validated for the production application for the GAV use cases.

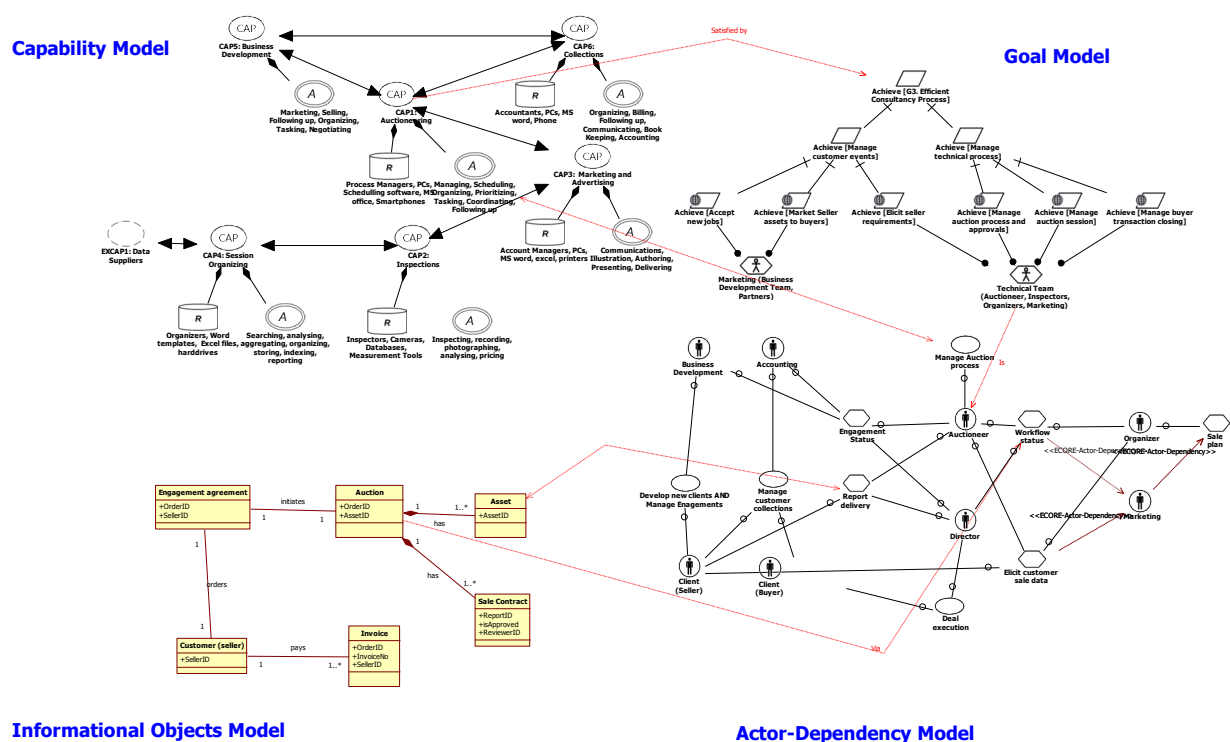


Figure 52: GAV AS-IS Inter-model relationship

For instance, the Capability [CAP1: Auctioneering] with Resource [Process Management, Scheduling software, MS Office, and Technical Staff] achieves the Goal [G3: Efficient consulting process] and its sub-goals, via the Human-agent [Technical Team], which in terms is the Actors [Auctioneer], [Organizer] and [Marketing] using the Information Objects [Asset] and [Auction]. More



details on the correlation matrices are outlined in Appendix 4.3, and programmed in the eCORE program files.

### 4.4.4 Modelling GAV requirements for change

#### 4.4.4.1 The GAV goals for change

Similar to the previous case study, change goals express GAV's needs and wishes and perceived opportunities concerning digital transformation technologies. A similar process was followed in eliciting those change goals via suitable formulation by deliberating and agreeing with GAV's stakeholders during face-to-face and online workshops and offline revisions of the models. Experience from the past use cases was used as similarities in desired digital transformation requirements were initially observed.

The baseline for identifying and refining change goals has been the current business goals model (see Chapter 4.4.2.1). In particular, the hierarchy of change goals was constructed top-down, step by step, by generating the change goals either as improvements of the current goals or by introducing new goals. The same process as the previous case studies was followed, which iterated on three main activities:

39. Determine the impact of perceived 'smart' on current business goals, by

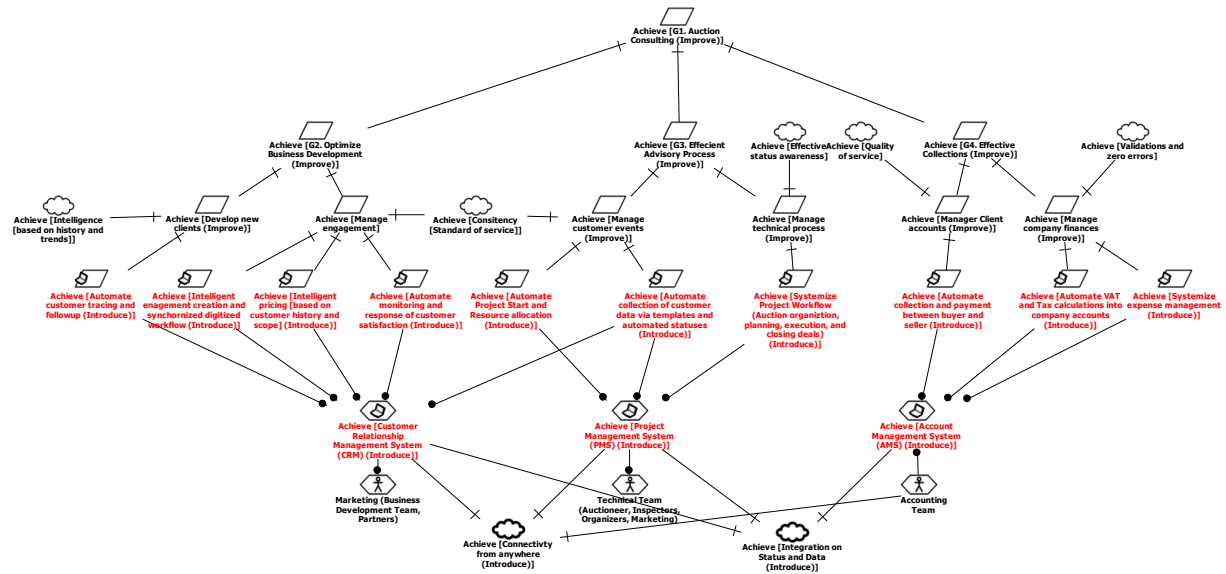
- a. Identifying new goals as adaptations (improvements) of the current goals: `improve`
- b. Identifying new goals as newly introduced goals: `introduce`

40. Modify the current goal hierarchy to reflect these changes.

41. Re-assign operational goals to existing or foreseen actors ("smart" components).

Similar to before, the change goals identified by GAV's stakeholders were very narrow, limited by their perceptions of the digitally transformed system's capabilities and its components. However, by juxtaposing them to the current goals hierarchy, it was possible to refine and re-express initial goals focusing on the organisations' objectives rather than perceived transformed system functionality. The outcome was close to the previous use case's desired transformation, with the apparent difference being the context and the subject domain.





**Figure 53: GAV TO-BE Goal Model**

Figure 53 illustrates the TO-BE goal model, starting with Goal 1: Auction Consulting (improve) . This model shows that the initial requirements gradually transformed into several operational goals representing system goals.

This analysis made it possible to provide a clear causality between GAV’s requirements and expected system functionality. This causality works in both directions. It is possible to justify a new system to track high-level business goals to system components. Alternatively, it is possible to trace the reasoning from desired system components to business goals. Again, similar to the previous case study, special attention was given to identifying associated soft goals, as these will be used to determine the (possibly) new performance indicators against which any new development will be measured. The change goals model of Figure 54 shows how each business goal for change has at least one soft goal associated with it.

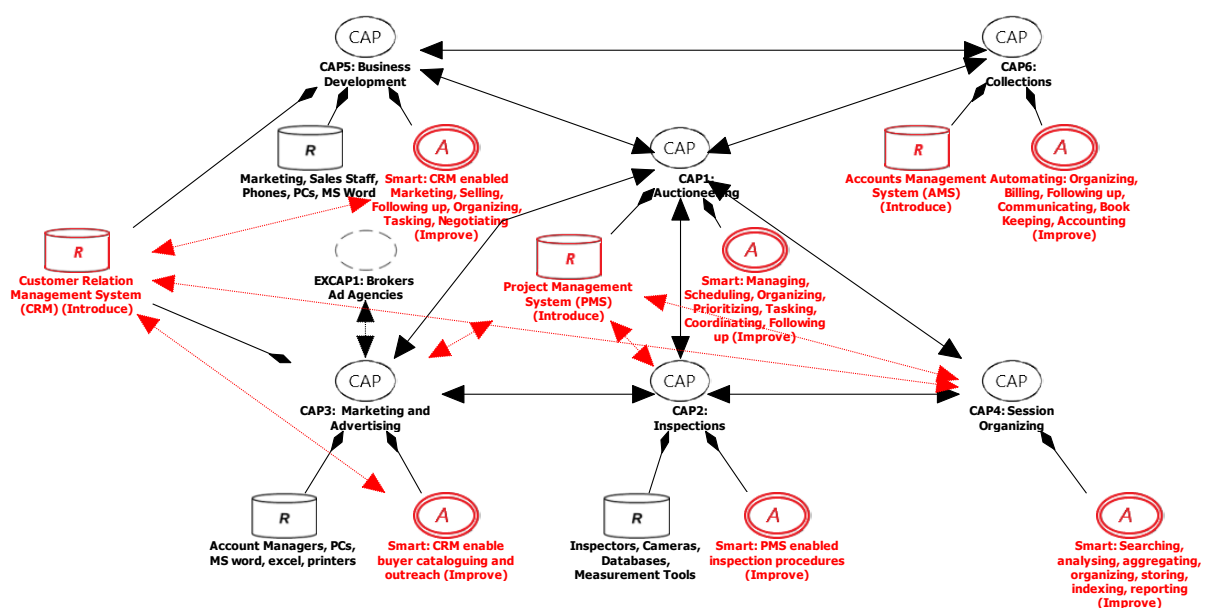
One significant contrasting difference between this use case and the previous uses cases appears at the Requirement Goal of using the Customer Relationship Manager (CRM) to achieve both the Business Development Goals and the Operational Core consulting goals because the CRM is used as the “smart” solution to handling both types of Clients, the buyer and the seller for two different goals. The value of using a singular system with advanced contexts and workflows naturalizes integration between different capabilities and roles, as



will be described in the TO-BE Capability Model and the TO-BE Actor-Dependency models below.

### 4.4.4.2 From change goals to desired GAV capabilities

As described in Chapter 4.4.2.2 above, the initial GAV requirements are gradually operationalised by introducing several new goals, ultimately assigned to new system modules. These modules will represent a new set of assets and, therefore, capabilities. These new capabilities will give GAVs use case a competitive advantage and deal with current difficulties in solving problems mentioned in Chapter 4.1.14.4.1 above.



**Figure 54: GAV TO-BE Capability Model**

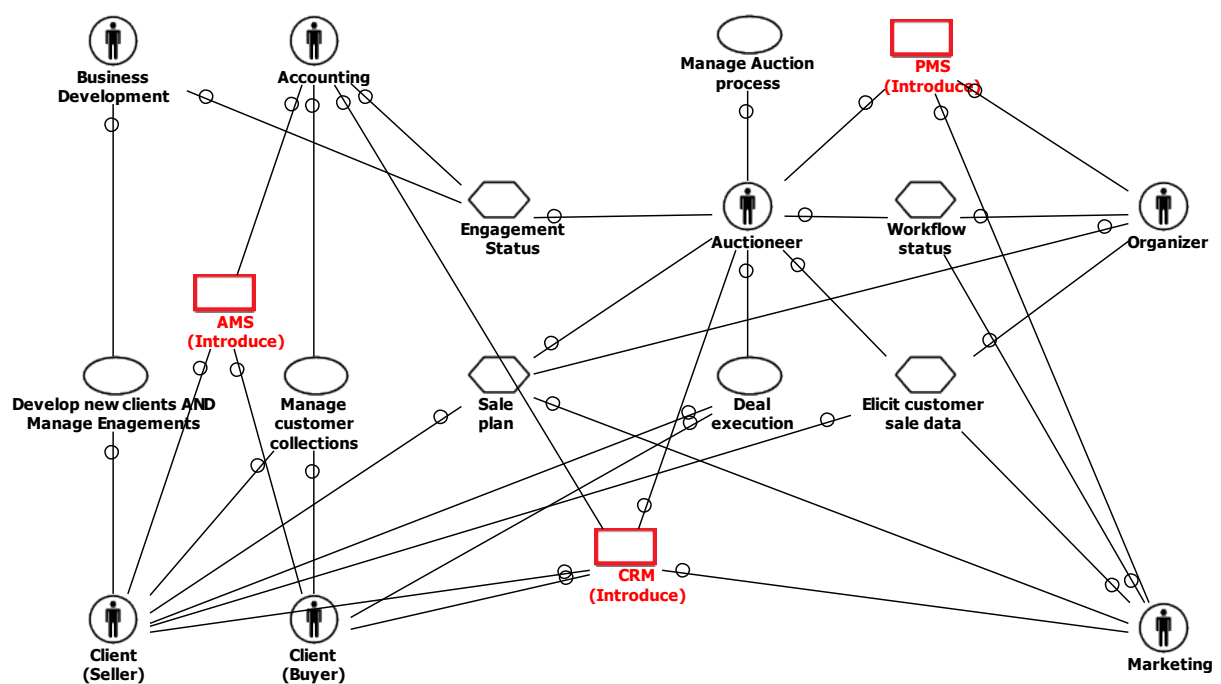
Some of these system goals replace existing current goals previously assigned to specific human actors. For example, improve Goal 3 to achieve efficient Auctioneering process by improved sub-goal Manage Technical process [improve], it is assigned to new system requirements to automate and add intelligence to the process. This new system and process design involve linking it to a new Target System Project Management System (PMS) integrated with the Customer Relationship Management System (CRM) which will automate the creation and solicitation of compliance artefacts, such as conditions handbooks and contracts, created from a template bank, which is



generated by the client auction plan. This new “smart” digitally transformed process replaces the old direct and manual process used to be carried out by the Human-Agent *Auctioneer* and *Marketing*. Thus, it becomes evident that the improvement sought by the GAV transformation will affect the dependencies between current actors and associated capabilities.

### 4.4.4.3 From change goals and change capabilities to desired improved Actor-Dependency

Similar to the development process of the TO-BE model of the previous case studies, the new set of capabilities gives rise to new collaborations between capabilities and involved actors. The identification of these relationships is significant because it enables us to define the way that actors coordinate between themselves in order to make capabilities realisable.



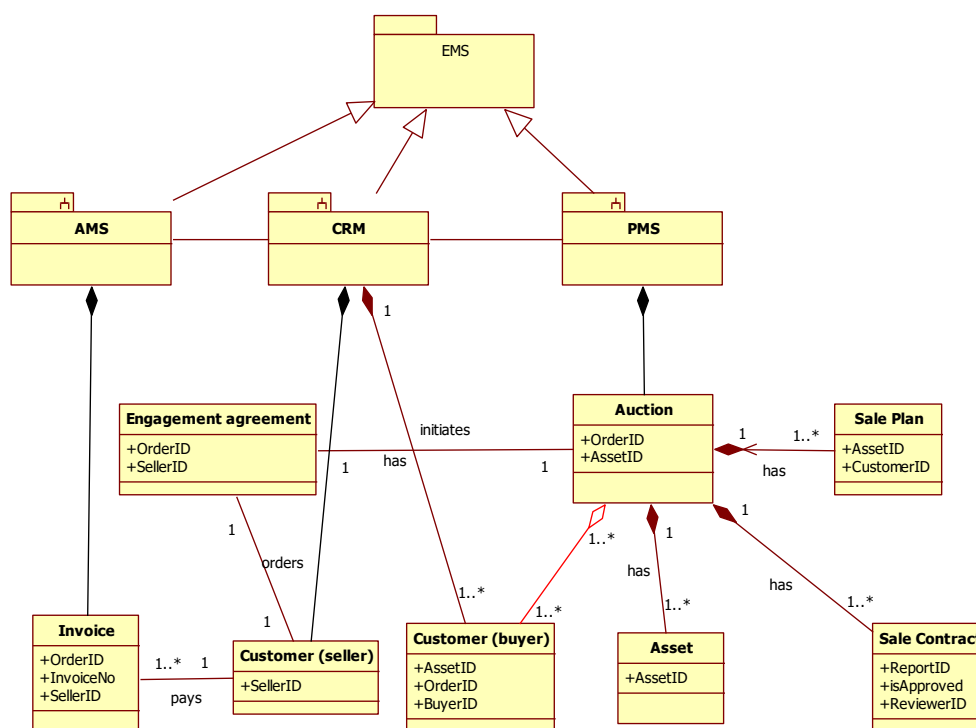
**Figure 55: GAV TO-BE Actor-Dependency Model**

Those new capabilities and goals give rise to new dependencies, as shown in Figure 55. For instance, the new dependency on the newly introduced *Customer Relationship Management (Introduce)* fulfils the newly added goal of *Achieve Automated Collection of customer data via templates and automated status, which is met*



with a matching introduction of Automating Customer Relationship Management (CRM) processes. Similarly, by expanding this analysis across all newly added goals and capabilities, we will find that the dependency between Auctioneers, Organizers and Marketing will benefit from introducing a new Customer Relationship Management (CRM). Other systems include a Project Management System (PMS) and an Account Management System (AMS) that create new dependencies between different actors in the model.

### 4.4.4.4 From changed goals, capabilities and actor-dependencies to updated GAV information objects model.



**Figure 56: GAV TO-BE Information Object Model**

Similar to all previous case studies, starting from change requirements, new capabilities are modelled, and these, in turn, give rise to details in a new actor model, which essentially defines operational requirements. This is even more explicit in the information model, where the relationship between the pre-transformation information objects gets arranged in the newly transformed information structure. Figure 56 outlines the new information object model where the new Enterprise Management System (EMS) is introduced with a suite of



sub-systems: Account Management System (AMS), which handles the payment for both the buyers and sellers as well as company finances, the Customer Relationship Management system (CRM), which manages the engagement with the clients both buyers and sellers, the Project Management System (PMS) which manages the core tasks of the consulting work. The Information Object model organizes the storage of the data and updates the statuses throughout the process workflow. At the same time, the “smart” functions lie in the automation of standardized process workflow, status awareness, harnessing existing knowledge, and enhanced connectivity across teams and functions.

#### 4.4.5 The output: GAV Digital Transformation requirements

**Table 19: GAV High-level Digital Transformation Business Requirements**

#	Title	Explanation
<b>Technology component (TC)</b>		
<b>TR.1</b>	Switch to Cloud-Based Enterprise Management Systems (EMS): Install Customer-Relationship-Management-System (CRM), Account Management System (AMS), and Project Management Systems (PMS).	Enterprise Management Systems (EMS) need to go online to address Omni-presence and connectivity. The PMS and CRM will enhance Use case 1, the CRM and the AMS will enhance use case 2 and 3.
<b>TR.2</b>	Integrate the different EMS components with status awareness (“smart” element)	The consultants and employees should be able to track the status and content of an “assignment” or “task” across its multiple “forms” (in the engagement process, project management process, collections process)
<b>Process Component (PR)</b>		



<b>PR.1</b>	Integrate workflow across ERP systems	The steps to conduct each of the three main uses cases can be represented in a workflow in each of the ERP systems. Whereby data, statuses, assignments, responsibilities, checklists, and reminders are tracked and recorded.
<b>PR.2</b>	Program “smart” features across process workflows	With the new digitally transformed tools, program smart capabilities such as automated workflow transitions, smart reminders, validity checkers, automated traceability and alarms.
<b>People Component (PP)</b>		
<b>PP.1</b>	Training of employees on the systems	There is an element of transition from the old ways of doing business to the transformed way. This will require a period of training and possibly co-existence with old technologies.
<b>PP.2</b>	Connectivity of people	People need to get accustomed to enabling connective technology such as Systems on smartphones, laptops, and smart meeting rooms to boost productivity and capabilities.

Note how it is almost identical to the previous case study except for differences that pertain to domain context.

#### 4.4.6 Feedback and conclusions from the GAV case study

GAV use case introduced a starkly different business model from previous case studies. The previous use cases were all similar in that they provide one-off advisory services, whereby a client asks a “question” or poses a “problem”, seeking “advice” or “recommendation”, and the consulting firm conducts studies and then responds with a resulting outcome. Meanwhile, GAV introduced an element of operational involvement with the client, whereby not only did the firm advise on how to solve a “problem” but also provided a “service” to support the execution.



A total of three sessions were conducted with GAV stakeholders; two pre-transform and one post-transform (see Appendix 4.6). For consistency, the three modelling objectives were focused upon in addition to a fourth new objective: 1) Understand the main use-cases of the SCF, 2) Understand how to breakdown the SCF into its different *People, Process, and Technology (PP&T)* sub-components, 3) Use the eCORE Tool to build the four viewpoints reflecting the use-cases and the PP&T aspects, and 4) Test the templates within the eCORE Tool. Additionally, the research objective was to review the common themes with the previous case studies and test the patterns' validity.

The pre-transform sessions utilized the templates and the lessons learned from modelling the previous case studies but in a new operational setup. Parallel central functions were confirmed: a) Marketing, b) Central Consulting services (the service), and c) post-service accounting and collections. The main distinction was in the capabilities involved in the long-project duration support technologies and processes for the core service and the supporting marketing. That meant tasks did not end for months (and years), and the “knowledge memory” needed to be retained for extended periods. The Digital transformation meant achieving the capabilities for tracking, indexing, recalling and aiding in the “continuous” support functions and achieving the goals of maintaining quality, consistency, compliance and continuity over long periods. Unlike the first three case studies where the project ended and a report or advice was delivered, and the firm could afford to switch teams or quality of delivery between clients, GAV had to sustain services at the agreed-upon quality or risk dissatisfaction with the client.

Even with the change in operational involvement, the modelling of the digital transformation on a high abstraction level did not seem to differ significantly from the previous models, which suggests that the patterns are generalizable not only to different contexts but also to different business models SCFs, this is yet to be further verified by two more case studies

The post-transformation sessions revealed two main hurdles: 1) difficulties in systemizing informal communications and 2) difficulties effectively transforming the organizing of the auction sessions. The formal involves implementation difficulties in capturing all the



information from phone calls, face-to-face meetings, and messages. Although the system has input forms to summarize the minutes of the meetings and update the status, employees find it as additional work on top of their day-to-day jobs and often gets neglected or set aside for later. The failure was digitally transforming the workflow from informal to formal interaction through the system. Although this requirement was modelled in the eCORE models, the implementation failed to achieve those goals. Management is taking steps to reassess the implementation and is adding more implementation level changes to achieve their goal.

Similarly, the transformation of the auction sessions was done on-site and was divorced from the system. The system was treated as an overhead process; employees thought it was only for documenting the progress and steps and not as a planning tool. It did not work well for the auction event planning teams; they needed new technology and processes.

The feedback was looked into and how it would impact the SC-COST framework and the models; however, upon reviewing the Digital Transformation models, the stakeholders attested that they fulfilled the correct goals and desires for the transformation. Thus it was not the requirements for transformation that was the problem but rather their implementation. Reflecting on the previous IncomeMarketing case study, which failed during implementation for different reasons, it is clear that a lack of commitment and improper allocation of resources will continue to cause failure for any transformation.

This use case's value was limiting the research to the digital transformation requirements. Solving implementation challenges that are not related to requirements is outside the scope of this thesis.



### 4.5 Use Case 5: YAMM

YAMM is a Small-Consulting-Firm (SCF) specialising in project and construction management and supervision. They hold a license from the Syndicate for Professional Engineers in Egypt, Saudi Arabia, and UAE, and a Project Management Professional (PMP) certificate from PMI.org gives them the authority to manage and supervise construction projects.

Typical customers include Corporations, Governments, and Individual investors. The firm usually works on a handful of projects at a time.

Project and construction management and supervision services rely heavily on their organizational skills in a more operational capacity than advisory since the nature of this business is to manage projects that run for an extended period, sometimes years. In this situation, the consulting firm's goal is to manage a client project to completion successfully. As a result, a consulting firm wins client contracts and maintains its success and reputation in this field by maintaining a solid specialized project management team that can work on a single project effectively and efficiently for years at a time. Nevertheless, it is vital to distinguish that project and construction management consulting firms are not themselves contractors; instead, they are expert consulting firms that clients hire to advise, plan, supervise and manage their project and construction needs and may be delegated to procure the services of additional vendors such as contractors, lawyers, architects, appraisers and more.

#### 4.5.1 Information gathering

Similar to the previous use case, interviews were conducted with key decision-makers and influencers within the firm. While conducting this case study, insights and experience gained from the previous case studies were used. The emerged patterns, discussed in Chapter 5.3, helped speed up requirement elicitation and modelling, and the use cases were identified as follows (see Appendix 5 for more details). This use case differs slightly from the previous use cases in its operational context, and those differences do not appear extensively when modelling the case study at a high abstraction level. However, it is demonstrated much more profoundly when we materialize the Digital Transformation at a lower abstraction level, as seen in the Technology related DT requirements list in Appendix 5.5.1.



Table 20: Overview of YAMM use cases

Use Case 1	
Project Management Advisory	
<b>Context</b>	Core business operation/service
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Project Management and standardised workflow</li> <li>2- Client construction management workflow*</li> <li>3- Time and Resource management</li> </ul>
<b>Business vision</b>	<p>Improvements in:</p> <ul style="list-style-type: none"> <li>1- Integration*</li> <li>2- Status awareness</li> <li>3- Collaboration</li> </ul>
Use Case 2	
Engaging a new client	
<b>Context</b>	Sales & Marketing
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Client service and satisfaction.</li> <li>2- Engagement follow-up and measurement.</li> </ul>
<b>Business vision</b>	<p>Improvements in:</p> <ul style="list-style-type: none"> <li>1- Quality of customer experience.</li> <li>2- Speed and compliance of procedural paperwork</li> <li>3- Followup and tracking.</li> </ul>
Use Case 3	
Accounting	
<b>Context</b>	Account management
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Invoicing and collections.</li> <li>2- Contractors account management*</li> <li>3- Followup.</li> <li>4- Status awareness and workflow.</li> </ul>



<b>Business vision</b>	Improvements in:  1- Collection rates.  2- Faster procedural red-tape handling.  3- Workflow integrations.
<i>* To highlight the new differentiation in the use case from the previous ones.</i>	

### 4.5.2 Modelling YAMM AS-IS models

#### 4.5.2.1 YAMM Current capability modelling

Following the same process conducted in the past use cases, the analysis of the information gathered from the use cases and the physical and virtual meetings with the user personnel resulted in the agreed capability model, shown in Figure 57.

The AS-IS capability model defines seven main capabilities denoted in the model as Project Management, Construction Management, Site Engineers Inspections, Document Control, Business Development and Accounting, in addition to one external capability that groups all external vendors. YAMM is the owner of capabilities CAP1-CAP6 and the collaboration between these capabilities. For example, *Project Management*, which is deployed daily, collaborates with five other capabilities to make sure tasks are fulfilled and proper procedures are followed to push the workflow of the consulting process forward.



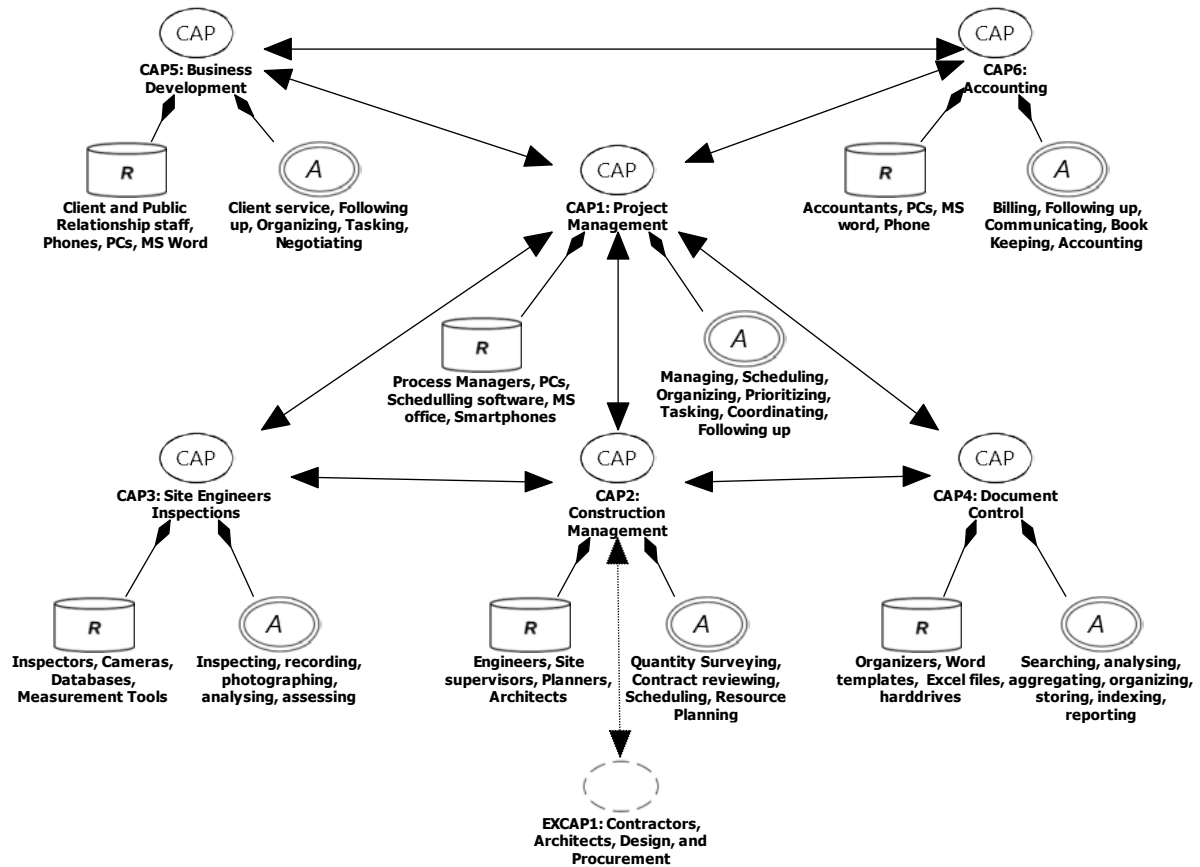


Figure 57: YAMM AS-IS Capability Model

Capabilities CAP1-CAP6 are considered internal capabilities and are wholly owned by YAMM and therefore can review and update their configuration of capabilities. In the YAMM use case, such re-configuration will need to occur for YAMM to utilise “smart” capabilities.

In addition to these internal capabilities, there is one external capability, EXCAP1, that is owned by enterprises with which YAMM collaborate but whose capabilities are not owned, controlled or subject to any influence by YAMM. Therefore, external capabilities are included in the capability model to externalise these relationships.

Therefore, similar to the previous modelling use cases, the model shown in Figure 57 reflects the capacities and abilities of YAMM, which all work together in the relationship to achieve the business goals described in Figure 58 below.



### 4.5.2.2 YAMM Goal Model

In building the YAMM goal model, it became evident that the YAMM use case aspires to achieve similar high-level strategic objectives as the previous uses cases, with the difference being the context; G1: Achieve Project Management Consulting. This was refined in three sub-goals, namely, G2: Achieve business development, G3: Achieve efficient consultancy process and G4: Achieve effective accounting, respectively, leading to the top two layers in the goal model shown in Figure 58.

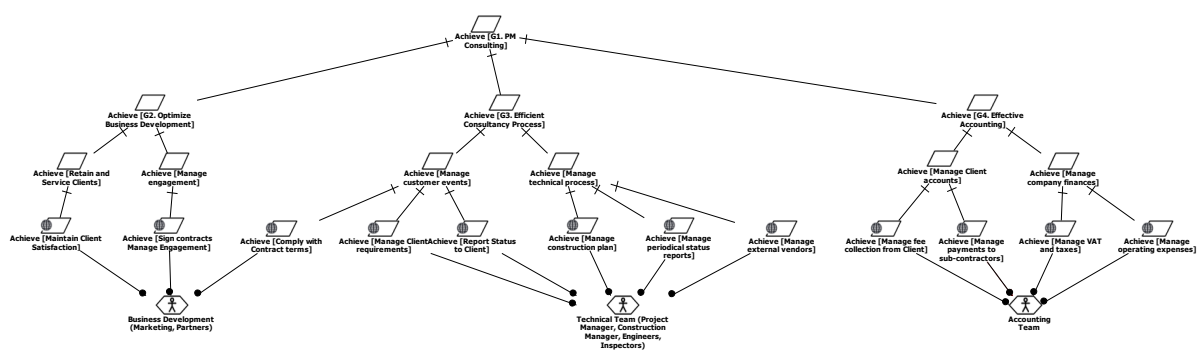


Figure 58: YAMM AS-IS Goal Model

To achieve goal G2: Achieve Optimize business development, two sub-goals are identified: To Retain and Service Clients and To manage engagement. Two operational goals are created to Maintain Client Satisfaction and to Sign contracts and Manage Engagements. All those goals are handled by the business development role, which could be one person or a group of people and is represented by the Human-Agent: Business Development. The role of Business Development in this context is to achieve those goals within that organization. At this level of abstraction, it is apparent that the goals are nearly parallel to the previous use cases to some extent. However, the role of Business Development focuses less on marketing efforts and more on client relationships since the consulting firm typically engages very few clients for long periods, eliminating the need for traditional customer acquisition marketing needs. Therefore, the Business Development role is geared more toward Client Care and a critical factor in achieving



G3 below, resulting in a differently purposed G2 Business Development goal than demonstrated in earlier use cases.

To achieve G3: Achieve efficient consulting process, two subgoals were identified: To Manage customer events and to Manage the technical process. Both of those goals are at the core of the consulting work and are divided into six operational goals. The first goal relates to dealing directly with the customer, and it is divided into three operational sub-goals as follows: To Comply with Contract terms, To Manage Client Requirements and To Report Status to Client. Meanwhile, the second goal is related to dealing with internal teams and is divided into three operational sub-goals as follows: To Manage Construction plan, To Manage periodical status reports, and to Manage external vendors. Those operational sub-goals are derived and verified by iterating the model via Use Case 1 (See Table 16, operationally detailed in Appendix 5.2). The first operational goal is under the responsibility of the Business Development team, which is represented in the model as a human-agent named Business Development, and the last five operational goals are under the responsibility of the technical team, which includes several actors such as an assigned Project Manager, Construction Manager, Engineers and Inspectors. The technical team is grouped into one human-agent abstraction named Technical Team in the model.

Finally, to achieve G4: Achieve effective accounting, two sub-goals were identified: To Manage Client accounts and to Manage company finances, which are further divided into four operational goals as follows: To Manage fee collection from Client, To manage payments to sub-contractors, To Manage VAT and taxes and finally To Manage operating expenses. All of those operational goals are under the responsibility of an accounting team. This team is represented in the model as human-agent by the name Accounting Team, the details are outlined in Use Case 3 (See Table 20 and detailed in Appendix 5.2).

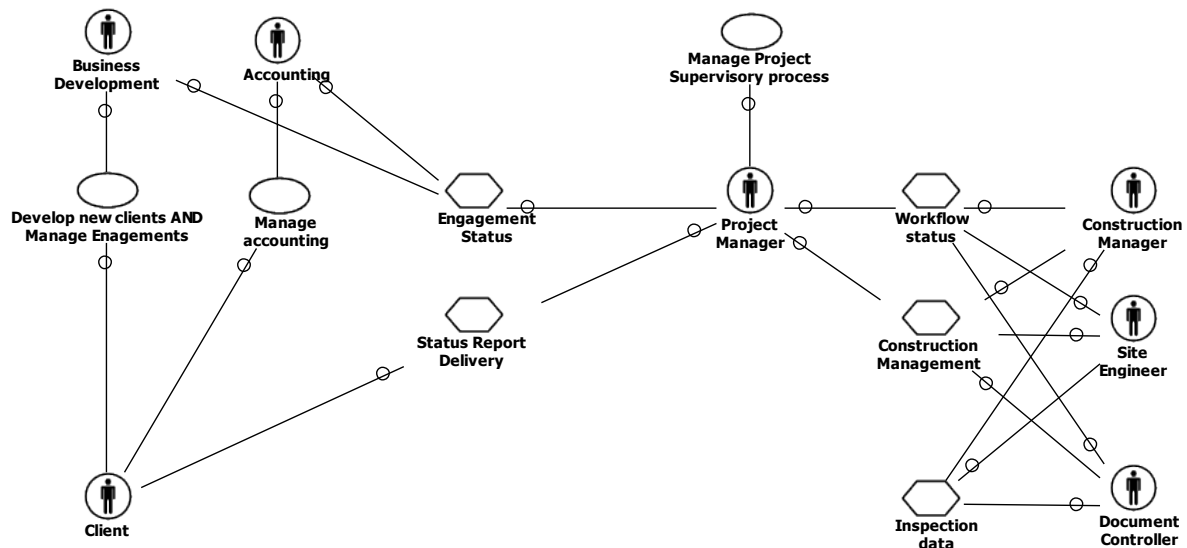
To remain consistent at a common high-level abstraction layer as the previous case studies, the model does not dive into deeper analysis and a lower implementation layer, avoiding detailed operational goals for each actor with detailed implementation details. Instead, we



will draw the line at this abstraction level for our comparative and pattern analysis with other SCFs.

### 4.5.2.3 YAMM Actor-Dependency model

Figure 59 illustrates the AS-IS Actor dependency model; similar to how the previous models were constructed, the socio-technical context is represented in the actor-dependency model.



**Figure 59: YAMM AS-IS Actor-Dependency Model**

As shown in this model, there is a complex network of dependencies between the YAMM actors. [Agent: Business Development] has a goal-dependency with the [Agent: Client] whereby to achieve their set goals of [Goal: Develop new clients and Manage Engagements], they need to interact with the [Agent: Client] while also managing the [Task: Engagement Status] with the [Agent: Project Manager] and [Agent: Accounting]. The [Agent: Project Manager] as shown is a central role, whereby many central tasks and goals depend on him/her, such as [Goal: Manage Project Supervisory process] by managing [Task: Engagement Status], [Task: Construction Management], [Task: Workflow Status] and [Task: Status Report Delivery], each dealing with different actors as shown in the model. In turn, the technical team [Agent: Construction Manager], [Agent: Site Engineer] and [Agent: Document Controller] have dependencies among each other via



the [Task: Workflow Status], [Task: Construction Management] and [Task: Inspection Data]. Finally, the [Agent: Accounting] is dependent on the [Goal: Manage Accounting] concerning the [Agent: Client] and is in sync with the [Agent: Business Development] and the [Agent: Project Manager] via the dependency on the [Task: Engagement status].

### 4.5.2.4 YAMM Informational Objects model

The YAMM informational object model deals with the essential elements used for the company to utilise the necessary data required to coordinate various operations through information transmission channels. Following the same process of identifying the information objects as the previous case studies, looking at the goals, capabilities, and actor-dependency helped identify the informational components. The information object objectively helped revise and refine the other three models to ensure cohesiveness and consistency.

The YAMM informational model depicted in Figure 60 contains all informational objects used in the YAMM capabilities.

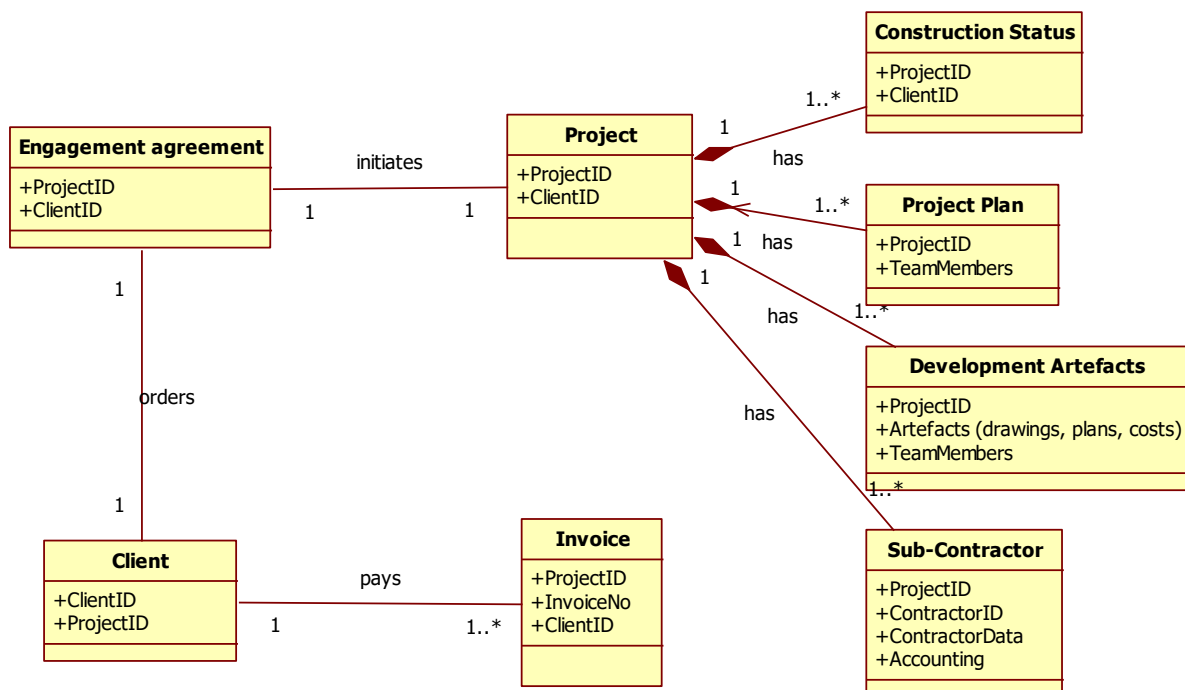


Figure 60: YAMM AS-IS Informational Object Model



## Chapter 4: Modelling the use-cases

### 4.5.3 Validating the YAMM AS-IS models for completeness

This concept of inter-model relationships is demonstrated in Figure 61, which shows a small fragment of these relationships in the context of [Project Management]. In practice, these relationships were discovered using correlation relationships utilizing the power of the eCORE Tools in connecting the different components of the model during construction, which were updated during each reviewing cycle until all stakeholders were confident that the models represented were agreed upon and validated for the production application for the YAMM use cases.

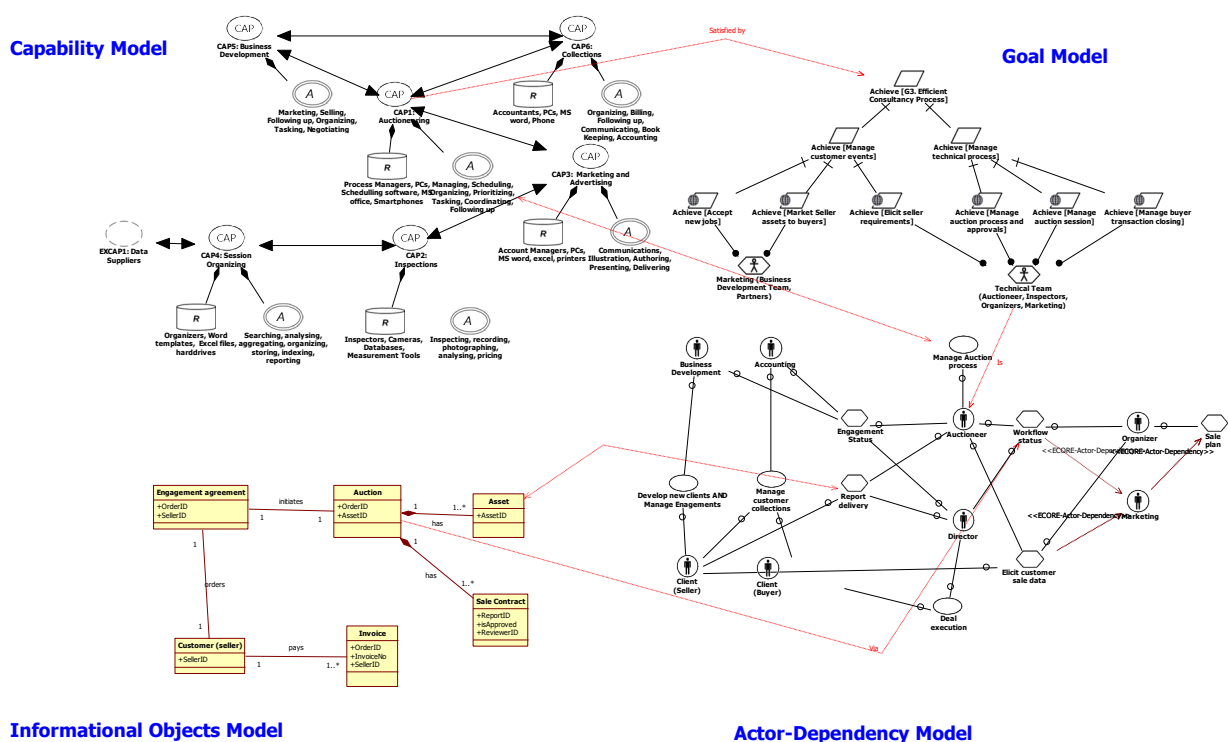


Figure 61: YAMM AS-IS Inter-model relationship

For instance, the Capability [CAP1: Project Management] with Resource [Process Management, Scheduling Software, MS Office, and Technical Staff] achieves the Goal [G3: Efficient consultancy process] and its sub-goals, via the Human-agent [Technical Team], which in terms is the Actors [Technical Team] using the Information Objects [Project]. More details on the correlation matrices are outlined in Appendix 5.3 and programmed in the eCORE program files.



## Chapter 4: Modelling the use-cases

### 4.5.4 Modelling YAMM requirements for change

#### 4.5.4.1 The YAMM goals for change

Like the previous case study, change goals express YAMM's needs, wishes, and perceived opportunities concerning digital transformation technologies. A similar process was followed in eliciting those change goals via suitable formulation by deliberating and agreeing with YAMM's stakeholders during face-to-face and online workshops and offline revisions of the models. Experience from the past use cases was used as similarities in desired digital transformation requirements were initially observed.

The baseline for identifying and refining change goals has been the current business goals model (see Chapter 4.5.4). In particular, the hierarchy of change goals was constructed top-down, step by step, by generating the change goals either as improvements of the current goals or by introducing new goals. The same process as the previous case studies was followed, which iterated on three main activities:

1. Determine the impact of perceived 'smart' on current business goals, by
  - a. Identifying new goals as adaptations (improvements) of the current goals: *improve*
  - b. Identifying new goals as newly introduced goals: *introduce*
2. Modify the current goal hierarchy to reflect these changes.
3. Re-assign operational goals to existing or foreseen actors ("smart" components).

Similar to before, the change goals identified by YAMM's stakeholders were very narrow, limited by their perceptions of the digitally transformed system's capabilities and its components. However, by juxtaposing them to the current goals hierarchy, it was possible to refine and re-express initial goals focusing on the organisations' objectives rather than perceived transformed system functionality. The outcome was close to the previous use case's desired transformation, with the apparent difference being the context and the subject domain.



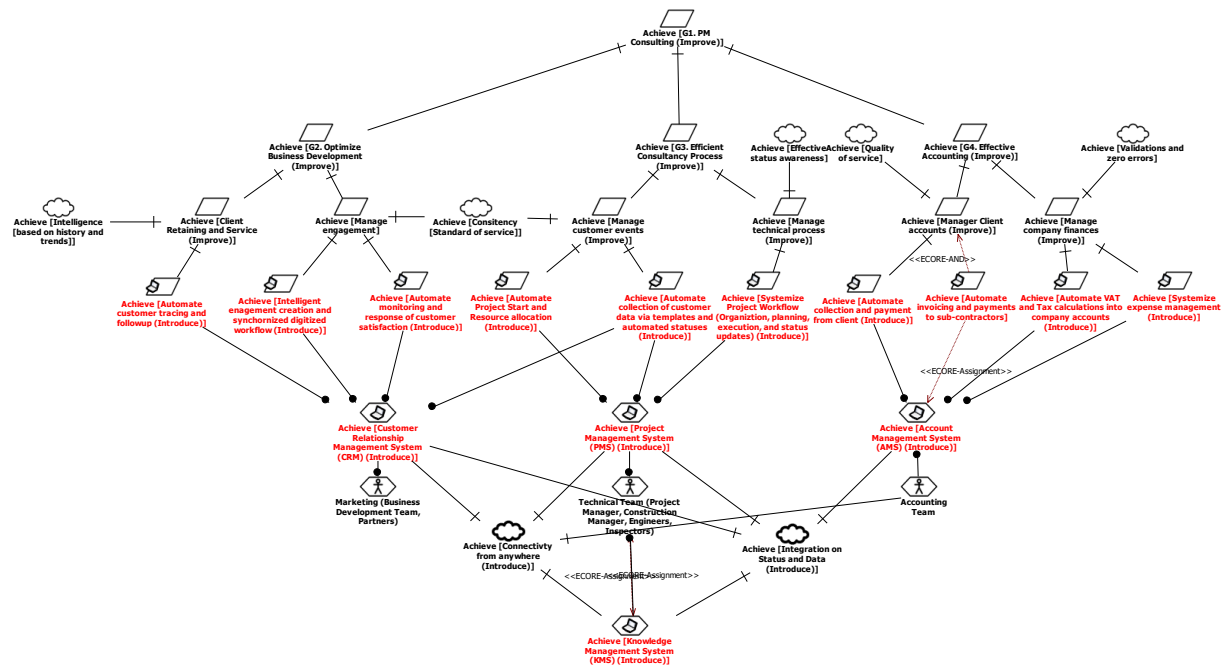


Figure 62: YAMM TO-BE Goal Model

Figure 62 illustrates the TO-BE goal model, starting with Goal 1: Project Management Consulting (improve). This model shows that the initial requirements gradually transformed into several operational goals representing system goals.

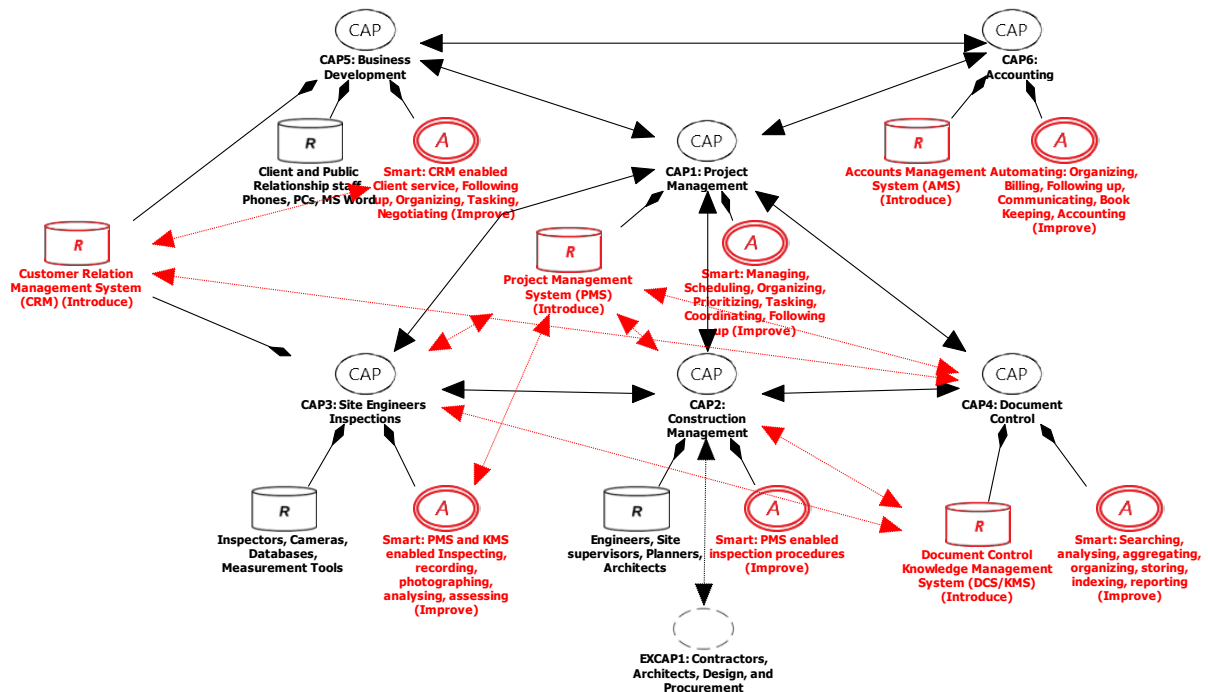
This analysis made it possible to provide a clear causality between YAMM's requirements and expected system functionality. This causality works in both directions. It is possible to justify a new system to track high-level business goals to system components. Alternatively, it is possible to trace the reasoning from desired system components to business goals. Again, similar to the previous case study, special attention was given to identifying associated soft goals, as these will be used to determine the (possibly) new performance indicators against which any new development will be measured. The change goals model of Figure 62 shows how each business goal for change has at least one soft goal associated with it.

#### 4.5.4.2 From change goals to desired YAMM capabilities

As described in Chapter 4.5.4.1 above, the initial YAMM requirements are gradually operationalised by introducing several new goals, ultimately assigned to new system modules.



These modules will represent a new set of assets and, therefore, capabilities. These new capabilities will give YAMMs a competitive advantage and deal with current difficulties in solving problems mentioned in Chapter 4.5.1 above.



**Figure 63: YAMM TO-BE Capability Model**

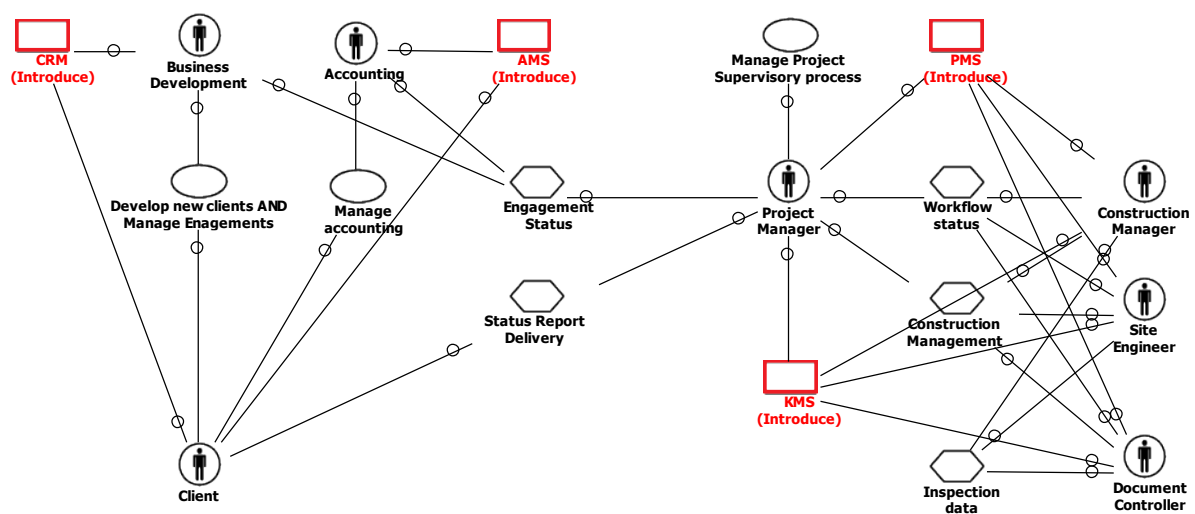
Some of these system goals replace existing current goals previously assigned to specific human actors. For example, improve Goal 3 to achieve efficient Consultancy process by improved sub-goal Manage Technical process [improve], it is assigned to new system requirements to automate and add intelligence to the process. This new system and process design involve linking it to a new Target System Project Management System (PMS) integrated with the Customer Relationship Management System (CRM), which will automate the creation and solicitation of work artefacts, such as project requirements documents, drawings and contracts, created from a template bank, which is generated by the client project development plan. This new “smart” digitally transformed process replaces the old direct and manual process used to be carried out by the Human-Agent Project Management and Marketing. Thus, it becomes



evident that the improvement sought by the YAMM transformation will affect the dependencies between current actors and associated capabilities.

### 4.5.4.3 From change goals and change capabilities to desired improved Actor-Dependency

Similar to the development process of the TO-BE model of the previous case studies, the new set of capabilities gives rise to new collaborations between capabilities and involved actors. The identification of these relationships is significant because it enables us to define the way that actors coordinate between themselves in order to make capabilities realisable.



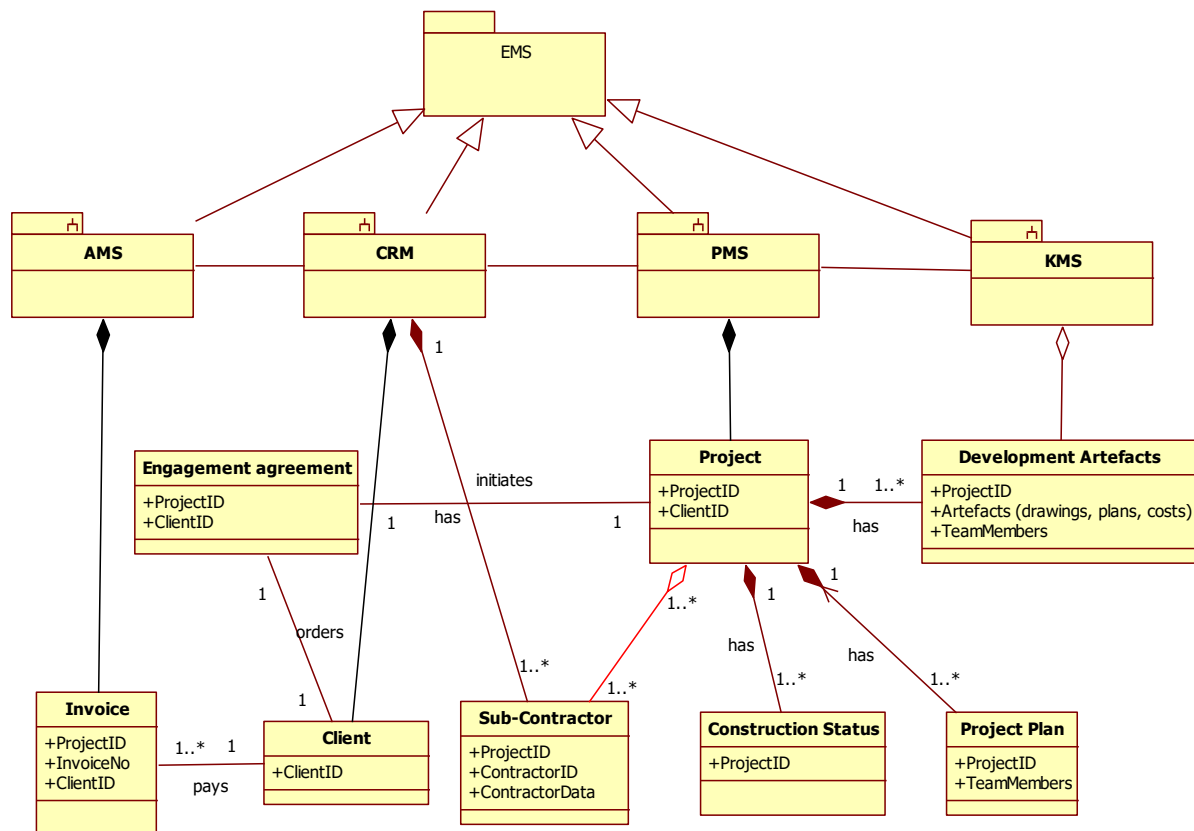
**Figure 64: YAMM TO-BE Actor-Dependency Model**

Those new capabilities and goals give rise to new dependencies, as shown in Figure 64. For instance, the new dependency on the newly introduced `Client Relationship Management (Introduce)` fulfils the newly added goal of `Achieve Automated Collection of customer data via templates and automated status`, which is met with a matching introduction of `Automating Customer Relationship Management (CRM) processes`. Similarly, by expanding this analysis across all newly added goals and capabilities, we will find that the dependency between `Project Managers`, `Construction Managers` and `Business Development` will benefit from introducing a new `Customer Relationship Management (CRM)`. Other systems include a `Project Management`



System (PMS) and an Account Management System (AMS) that create new dependencies between different actors in the model.

4.5.4.4 From changed goals, capabilities and actor-dependencies to updated YAMM information objects model.



**Figure 65: YAMM TO-BE Information Object Model**

Similar to all previous case studies, starting from change requirements, new capabilities are modelled, and these, in turn, give rise to details in a new actor model, which essentially defines operational requirements. This is even more explicit in the information model, where the relationship between the pre-transformation information objects gets arranged in the newly transformed information structure. Figure 65 outlines the new information object model where the new Enterprise Management System (EMS) is introduced with a suite of sub-systems: Account Management System (AMS), which handles the payment for both the Client and sub-contractor as well as company finances, the Customer Relationship



Management system (CRM), which manages the engagement with the external actors either on the client-side or the vendor side, the Project Management System (PMS) which manages the core tasks of the consulting work. Finally, the Knowledge Management System (KMS) provides a “smarter” and more integrative solution for the document control capability. The Information Object model organizes the storage of the data and updates the statuses throughout the process workflow. At the same time, the “smart” functions lie in the automation of standardized process workflow, status awareness, harnessing existing knowledge, and enhanced connectivity across teams and functions.

#### 4.5.5 The output: YAMM Digital Transformation requirements

**Table 21: YAMM High-level Digital Transformation Business Requirements**

#	Title	Explanation
<b>Technology component (TC)</b>		
<b>TR.1</b>	Switch to Cloud-Based Enterprise Management Systems (EMS):  Install Customer-Relationship-Management-System (CRM), Account Management System (AMS), Document Control Knowledge Management System (DC/KMS) and Project Management Systems (PMS).	Enterprise Management Systems (EMS) need to go online to address Omni-presence and connectivity. The PMS, KMS, and CRM will enhance Use case 1, the CRM and the AMS will enhance use case 2 and 3.
<b>TR.2</b>	Integrate the different EMS components with status awareness (“smart” element)	The consultants and employees should be able to track the status and content of an “assignment” or “task” across its multiple “forms” (in the engagement process, project management process, collections process)



<b>Process Component (PR)</b>		
<b>PR.1</b>	Integrate workflow across ERP systems	The steps to conduct each of the three main uses cases can be represented in a workflow in each of the ERP systems. Whereby data, statuses, assignments, responsibilities, checklists, and reminders are tracked and recorded.
<b>PR.2</b>	Program “smart” features across process workflows	With the new digitally transformed tools, program smart capabilities such as automated workflow transitions, smart reminders, validity checkers, automated traceability and alarms.
<b>People Component (PP)</b>		
<b>PP.1</b>	Training of employees on the systems	There is an element of transition from the old ways of doing business to the transformed way. This will require a period of training and possibly co-existence with old technologies.
<b>PP.2</b>	Connectivity of people	People need to get accustomed to enabling connective technology such as Systems on smartphones, laptops, and smart meeting rooms to boost productivity and capabilities.

Note how it is almost identical to the previous case study except for differences in domain context.

#### 4.5.6 Feedback and conclusions from the YAMM case study

YAMM use cases are similar to the GAV use cases in that the business model possesses an element of operational involvement with the client, whereby the firm advises on how to solve a “problem” and provides a “service” to support the execution. YAMM was a much larger SCF with many teams and units, working on larger projects and extending multiple years, thus providing new opportunities to test the SC-COST framework.



A total of five interviews were conducted, three pre-transformation and two post-transformation. With the same objectives in mind for the modelling exercise: : 1) Understand the main use-cases of the SCF, 2) Understand how to breakdown the SCF into its different *People, Process, and Technology (PP&T)* sub-components, 3) Use the eCORE Tool to build the four viewpoints reflecting the use-cases and the PP&T aspects, and 4) Test the templates within the eCORE Tool. The research objective was to review the common themes with the previous case studies and test the patterns' validity.

The pre-transformation sessions used the eCORE tool and the templates in its most up-to-date version. The experience was uniquely different from the previous case studies; The stakeholders were primarily construction engineers with a more technical aptitude for using tools and technology. The eCORE tool's usage exposed many bugs and requested features for improvement, but since it was an experimental tool and not a production software, many of those were worked around after noting them down for future updates. Additionally, the attitude towards digital transformation was mostly technology-oriented and less emphasised on people and processes. It required a few more use-case analysis and scenario simulation rounds to determine the process and people's digital transformation requirements. The eCORE modelling framework proved worth focusing the discussion around the weak areas and defining the requirements that would have otherwise failed to be revealed if left to the engineering teams alone. Parallel central functions were confirmed: a) Marketing, b) Central project management services (the service), and c) post-service accounting and collections.

The post-transformation sessions revealed a very smooth and straightforward digital transformation experience, as the transition was from a desktop-based project management software to a more evolved integrated cloud-based project management version. This was not just a software change but a system transformation that benefitted the firm's capabilities significantly. It allowed stakeholders to connect remotely online, work asynchronously, eliminate erroneous overwriting, add traceability and enhance accountability (because of history logs). The transformation had its roots in technology, but it provided a transformation in the mode of work and the processes followed.



The added features managing the Marketing and Accounting were welcomed as a necessary upgrade to the capabilities and efficiency of the firm, with little to no resistance or challenges. A significant reason why the transition was successful was that the firm was already digitized, and the only remaining component was the “smart” features that come with connectivity, status awareness, knowledge reusability, and asynchronous workflow provided by the new capabilities of the transformed integrated systems.

YAMM case study emphasizes that even with the change in operational involvement, the as-tute technology capabilities of the stakeholders, the high level of existing digitization, and the larger size of the company, the modelling of the digital transformation on a high abstraction level did not seem to differ significantly from all the previous models, which re-emphasizes that the patterns are generalizable not only to different contexts but also to different business models and states of SCFs.



### 4.6 Use Case 6: ITEGY

ITEGY is a Small-Consulting-Firm (SCF) specialising in IT Strategy and Services. They are headquartered in United Arab Emirates and operate in the GCC and North Africa. Typical customers include Corporations, Governments, and Individual investors, and the firm usually works on a handful of projects at a time.

ITEGY's consulting business model depends on three primary revenue streams: Deployment of new IT solutions, onboarding training, and post-deployment maintenance and technical support via a Long Term Support Contract (LTSC). Consulting firms of that nature have to maintain a skilled workforce, an agile mindset, and a rapid response to customer problems, as downtimes for customers significantly affect their reputation and bottom-line.

#### 4.6.1 Information gathering

Similar to the previous use case, interviews were conducted with key decision-makers and influencers within the firm. While conducting this case study, insights and experience gained from the previous case studies were used. The emerged patterns, discussed in Chapter 5.3, helped speed up requirement elicitation and modelling, and the use cases were identified as follows (see Appendix 6 for more details). This use case differs from the previous use cases in its operational context. Those differences do not appear extensively when modelling the case study at a high abstraction level. However, it is demonstrated much more profoundly when we materialize the Digital Transformation at a lower abstraction level, as seen in the Technology related DT requirements list in Appendix 6.5.1.

**Table 22: Overview of ITEGY use cases**

Use Case 1		IT Consulting and Support
Context		Core business operation/service
Needs for change		The current activities that need change:  1- Project Management and standardized workflow for the deployment of new projects  2- Ticketing system for client problems



	<ul style="list-style-type: none"> <li>3- Time and Resource management</li> <li>4- Knowledge management of Training resources</li> </ul>
<b>Business vision</b>	<p>Improvements in:</p> <ul style="list-style-type: none"> <li>1- Integration</li> <li>2- Status awareness</li> <li>3- Collaboration</li> <li>4- Response times</li> <li>5- Consistency of service</li> </ul>
<b>Use Case 2</b>	<b>Engaging a new client</b>
<b>Context</b>	Sales & Marketing
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Client service and satisfaction.</li> <li>2- Engagement follow-up and measurement.</li> <li>3- Client retention and reduction of customer acquisition</li> <li>4- Value added services (increasing revenues)</li> </ul>
<b>Business vision</b>	<p>Improvements in:</p> <ul style="list-style-type: none"> <li>1- Quality of customer experience.</li> <li>2- Speed of response</li> <li>3- Consistency in service</li> <li>4- Followup and tracking.</li> </ul>
<b>Use Case 3</b>	<b>Accounting</b>
<b>Context</b>	Account management
<b>Needs for change</b>	<p>The current activities that need change:</p> <ul style="list-style-type: none"> <li>1- Invoicing and collections.</li> <li>2- Followup.</li> <li>3- Status awareness and workflow.</li> </ul>



<b>Business vision</b>	Improvements in:  1- Collection rates.  2- Workflow integrations.
<i>* To highlight the new differentiation in the use case from the previous ones.</i>	

### 4.6.2 Modelling ITEGY AS-IS models

#### 4.6.2.1 ITEGY Current capability modelling

Following the same process conducted in the past use cases, the analysis of the information gathered from the use cases, and the physical and virtual meetings with the user personnel resulted in the agreed capability model, shown in Figure 66.

The AS-IS capability model defines seven main capabilities denoted in the model as Account Management, IT Consulting, IT Maintenance and Support, Training, Business Development and Accounting, in addition to one external capability that groups all external vendors. ITEGY is the owner of capabilities CAP1-CAP6 and the collaboration between these capabilities. For example, Account Management, which is deployed daily, collaborates with five other capabilities to make sure tasks are fulfilled and proper procedures are followed to push the workflow of the consulting process forward.



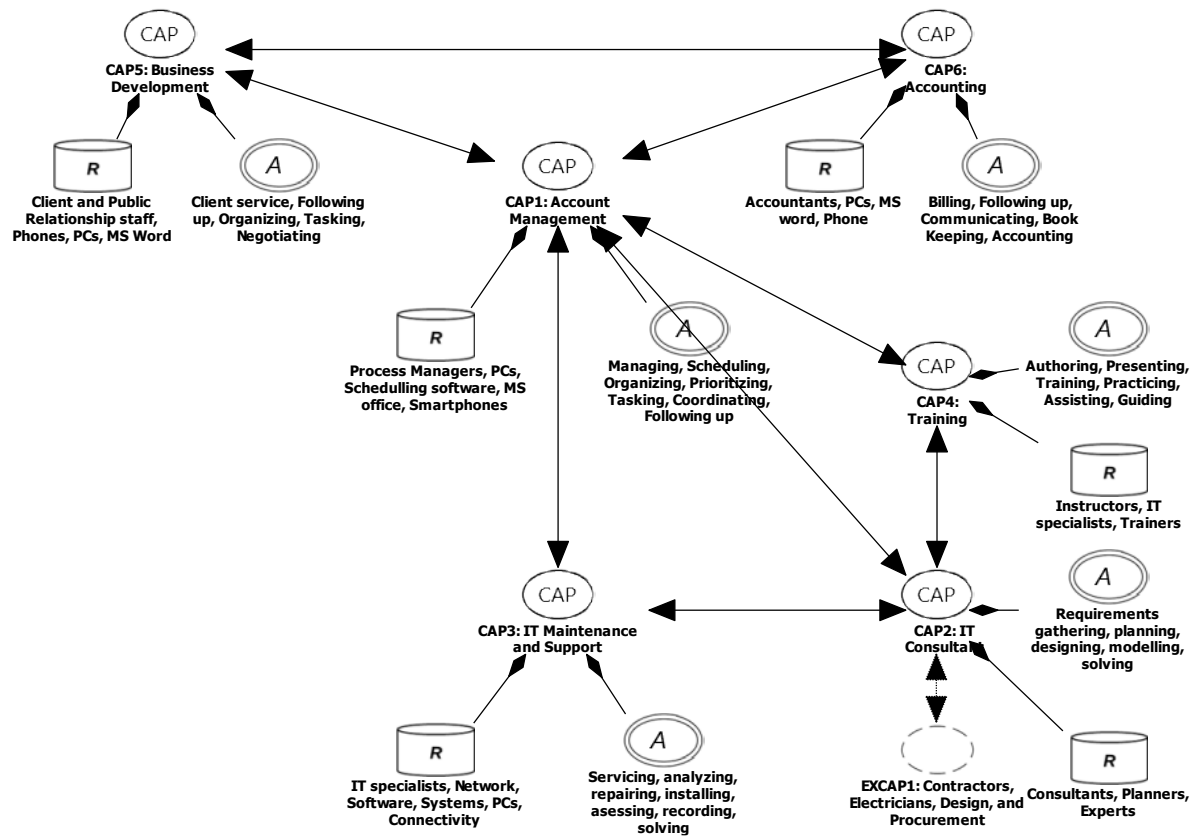


Figure 66: ITEGY AS-IS Capability Model

Capabilities CAP1-CAP6 are considered internal capabilities and are wholly owned by ITEGY and therefore can review and update their configuration of capabilities. In the ITEGY use case, such re-configuration will need to occur for ITEGY to utilise “smart” capabilities.

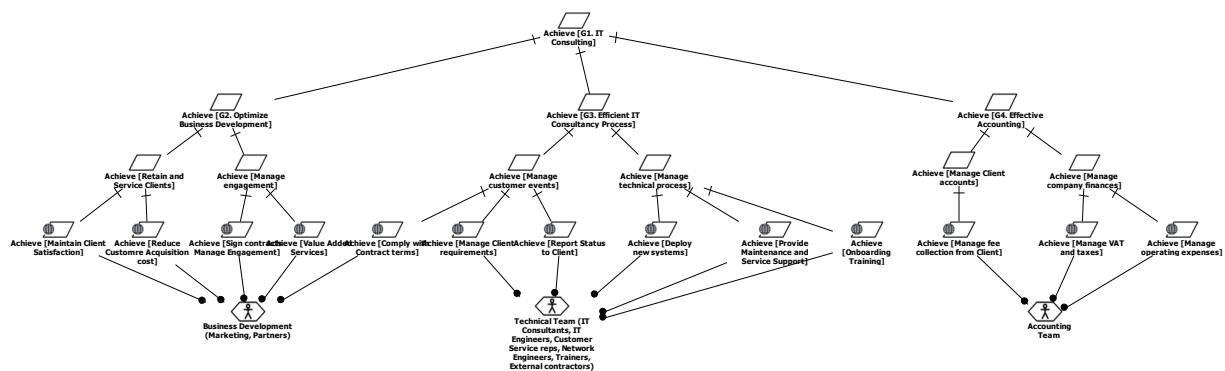
In addition to these internal capabilities, there is one external capability, EXCAP1, owned by enterprises with which ITEGY collaborate but whose capabilities are not owned, controlled or subject to any influence by ITEGY. Therefore, external capabilities are included in the capability model to externalise these relationships.

Therefore, similar to the previous modelling use cases, the model shown in Figure 66 reflects the capacities and abilities of ITEGY, which all work together in the relationship to achieve the business goals described in Figure 67 below.



### 4.6.2.2 ITEGY Goal Model

In the process of building the ITEGY goal model, it became evident that the ITEGY use case aspires to achieve similar high-level strategic objectives as the previous uses cases, with the difference being the context; G1: Achieve IT Consulting. This was refined in three sub-goals, namely, G2: Achieve business development, G3: Achieve efficient IT consultancy process and G4: Achieve effective accounting, respectively, leading to the top two layers in the goal model shown in Figure 67.



**Figure 67: ITEGY AS-IS Goal Model**

To achieve goal G2: Achieve Optimize business development, two sub-goals are identified: To Retain and Service Clients and To manage engagement. Two operational goals are created to Maintain Client Satisfaction and to Sign contracts and Manage Engagements. All those goals are handled by the business development role, which could be one person or a group of people and is represented by the Human-Agent: Business Development. The role of Business Development in this context is to achieve those goals within that organization. At this level of abstraction, it is apparent that the goals are nearly parallel to the previous use cases to some extent. However, the role of Business Development focuses less on marketing efforts and more on client relationships since the consulting firm typically engages very few clients for long periods, eliminating the need for costly customer acquisition marketing needs. Therefore, the Business Development role is geared more toward Client Care and retainment and, therefore, a critical factor in achieving G3 below, resulting in a differently purposed G2 Business Development goal than demonstrated in earlier use cases.



## Chapter 4: Modelling the use-cases

To achieve G3: Achieve efficient consulting process, two subgoals were identified: To Manage customer events and Manage the technical process. Those goals are at the core of the consulting work and are divided into six operational goals. The first goal relates to dealing directly with the customer, and it is divided into three operational sub-goals: To Comply with Contract terms, To Manage Client Requirements and To Report Status to the Client. Meanwhile, the second goal is to deal with internal teams and is divided into three operational sub-goals: To Deploy new systems, provide maintenance and service support, and achieve onboarding training. Those operational sub-goals are derived and verified by iterating the model via Use Case 1 (See Table 16, operationally detailed in Appendix 6.2). The first operational goal is under the responsibility of the Business Development team, which is represented in the model as a human-agent named `Business Development`, and the last five operational goals are under the responsibility of the technical team, which includes several actors such as an assigned Account Manager, IT Consultant, Customer support, and Trainers. In the model, the technical team is grouped into one human-agent abstraction named `Technical Team`.

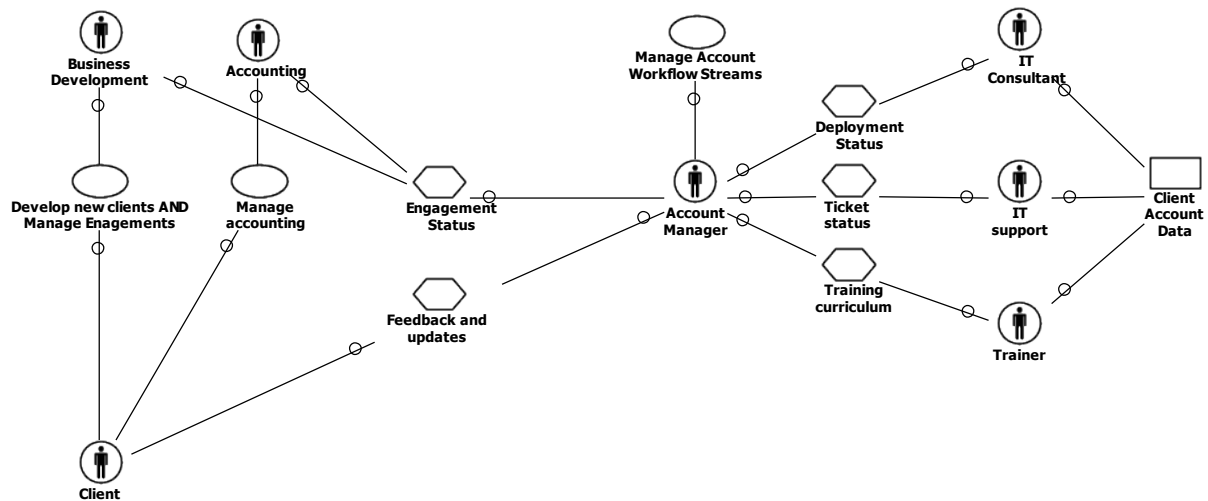
Finally, to achieve G4: Achieve effective accounting, two sub-goals were identified: To Manage Client accounts and to Manage company finances, which are further divided into three operational goals as follows: To Manage fee collection from Client, To Manage VAT and taxes and finally To Manage operating expenses. All of those operational goals are under the responsibility of an accounting team. This team is represented in the model as human-agent by the name `Accounting Team`, the details of which are outlined in Use Case 3 (See Table 22 and detailed in Appendix 6.2).

To remain consistent at a common high-level abstraction layer as the previous case studies, the model does not dive into deeper analysis and a lower implementation layer, avoiding detailed operational goals for each actor with detailed implementation details. Instead, we will draw the line at this abstraction level for our comparative and pattern analysis with other SCFs.



### 4.6.2.3 ITEGY Actor-Dependency model

Figure 68Figure 59 illustrates the AS-IS Actor dependency model; similar to how the previous models were constructed, the socio-technical context is represented in the actor-dependency model.



**Figure 68: ITEGY AS-IS Actor-Dependency Model**

As shown in this model, there is a complex network of dependencies between the ITEGY actors. [Agent: Business Development] has a goal-dependency with the [Agent: Client] whereby to achieve their set goals of [Goal: Develop new clients and Manage Engagements], they need to interact with the [Agent: Client] while also managing the [Task: Engagement Status] with the [Agent: Account Manager] and [Agent: Accounting]. The [Agent: Account Manager] as shown is a central role, whereby many central tasks and goals depend on him/her, such as [Goal: Manage Account workflow streams] by managing [Task: Engagement Status], [Task: Deployment Status], [Task: Ticket Status] and [Task: Training curriculum], each dealing with different actors as shown in the model. In turn, the technical team [Agent: IT Consultant], [Agent: IT Support] and [Agent: Trainer] have



dependencies among each other via the [Resource: Client Account Data]. Finally, the [Agent: Accounting] is dependent on the [Goal: Manage Accounting] concerning the [Agent: Client] and is in sync with the [Agent: Business Development] and the [Agent: Account Manager] via the dependency on the [Task: Engagement status].

### 4.6.2.4 ITEGY Informational Objects model

The ITEGY informational object model deals with the essential elements used for the company to utilise the necessary data required to coordinate various operations through information transmission channels. Following the same process of identifying the information objects as the previous case studies, looking at the goals, capabilities, and actor-dependency helped identify the informational components. The information object objectively helped revise and refine the other three models to ensure cohesiveness and consistency.

The ITEGY informational model depicted in Figure 69 contains all informational objects used as part of the ITEGY capabilities.

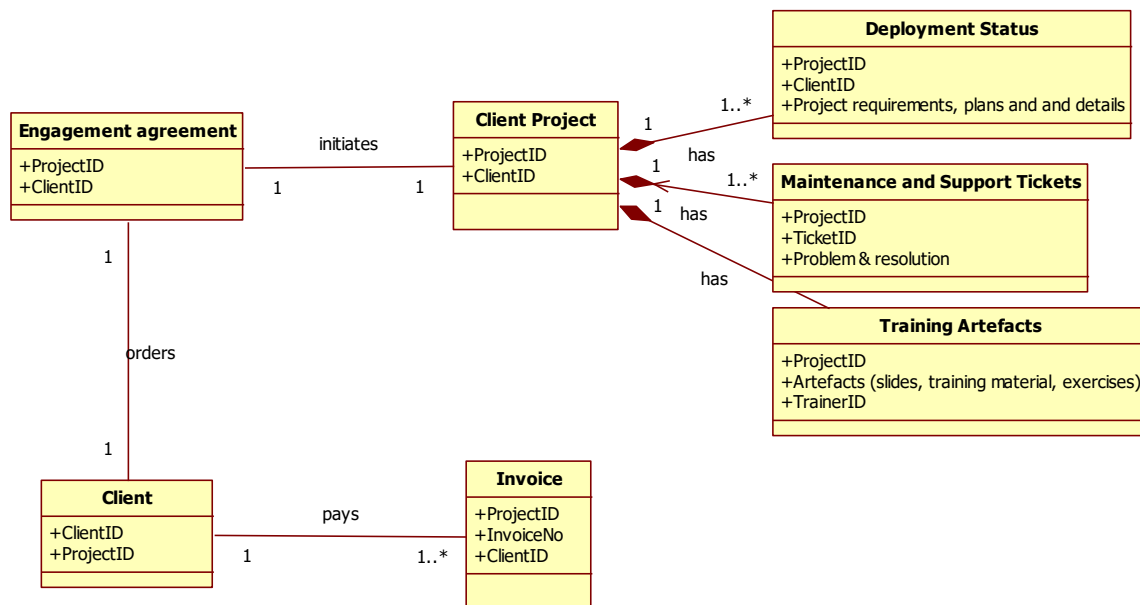


Figure 69: ITEGY AS-IS Informational Object Model



### 4.6.3 Validating the ITEGY AS-IS models for completeness

This concept of inter-model relationships is demonstrated in Figure 70, which shows a small fragment of these relationships in the context of [Account Management]. In practice, these relationships were discovered using correlation relationships utilizing the power of the eCORE Tools in connecting the different components of the model during construction, which were updated during each reviewing cycle until all stakeholders were confident that the models represented were agreed upon and validated for the production application for the ITEGY use cases.

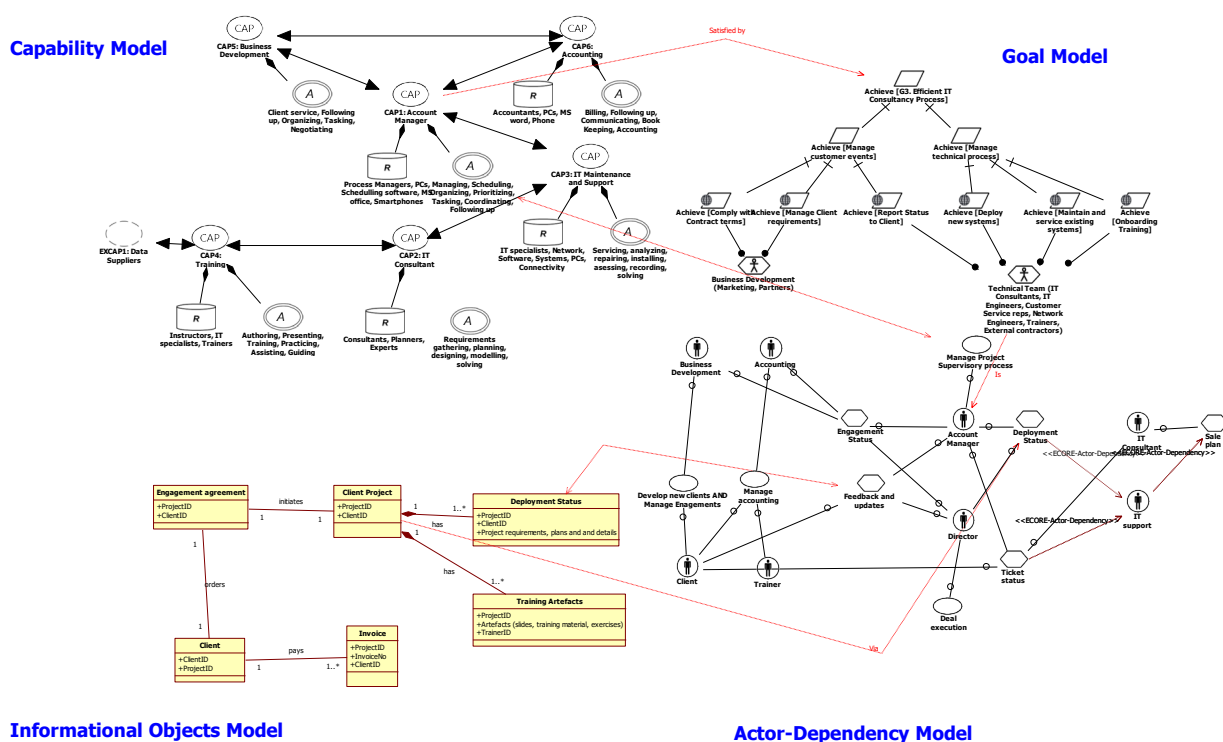


Figure 70: ITEGY AS-IS Inter-model relationship

For instance, the Capability [CAP1: Account Management] with Resource [Process Management, Scheduling software, MS Office, and Technical Staff] achieves the Goal [G3: Efficient IT consultancy process] and its sub-goals, via the Human-agent [Technical Team], which in terms is the Actors [Technical Team] using the Information Objects [Client Project]. More details on the correlation matrices are outlined in Appendix 6.3 and programmed in the eCORE program files.



## Chapter 4: Modelling the use-cases

### 4.6.4 Modelling ITEGY requirements for change

#### 4.6.4.1 The ITEGY goals for change

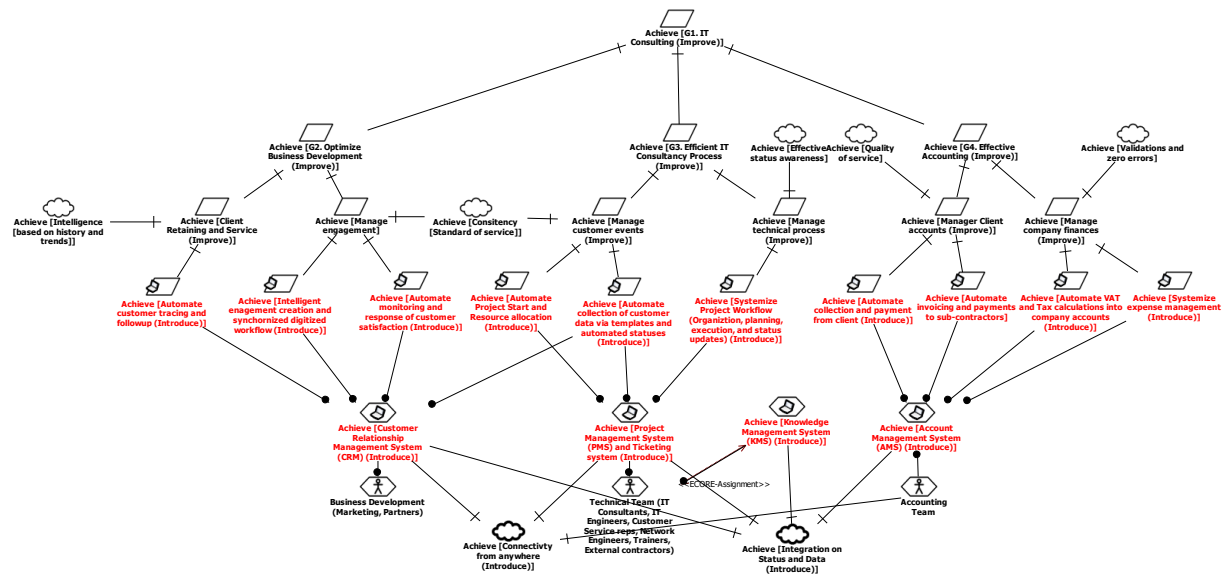
Like the previous case study, change goals express ITEGY's needs, wishes, and perceived opportunities concerning digital transformation technologies. A similar process was followed in eliciting those change goals via suitable formulation by deliberating and agreeing with ITEGY's stakeholders during face-to-face and online workshops and offline revisions of the models. Experience from the past use cases was used as similarities in desired digital transformation requirements were initially observed.

The baseline for identifying and refining change goals has been the current business goals model (see Chapter 4.6.2.2). In particular, the hierarchy of change goals was constructed top-down, step by step, by generating the change goals either as improvements of the current goals or by introducing new goals. The same process as the previous case studies was followed, which iterated on three main activities:

1. Determine the impact of perceived 'smart' on current business goals, by
  - a. Identifying new goals as adaptations (improvements) of the current goals: *improve*
  - b. Identifying new goals as newly introduced goals: *introduce*
2. Modify the current goal hierarchy to reflect these changes.
3. Re-assign operational goals to existing or foreseen actors ("smart" components).

Similar to before, the change goals identified by ITEGY's stakeholders were very narrow, limited by their perceptions of the digitally transformed system's capabilities and its components. However, by juxtaposing them to the current goals hierarchy, it was possible to refine and re-express initial goals focusing on the organisations' objectives rather than perceived transformed system functionality. The outcome was close to the previous use case's desired transformation, with the apparent difference being the context and the subject domain.





**Figure 71: ITEGY TO-BE Goal Model**

Figure 71 illustrates the TO-BE goal model, starting with Goal 1: IT Consulting (improve). This model shows that the initial requirements gradually transformed into several operational goals representing system goals.

This analysis made it possible to provide a clear causality between ITEGY's requirements and expected system functionality. This causality works in both directions. It is possible to justify a new system to track high-level business goals to system components. Alternatively, it is possible to trace the reasoning from desired system components to business goals. Again, similar to the previous case study, special attention was given to identifying associated soft goals, as these will be used to determine the (possibly) new performance indicators against which any new development will be measured. The change goals model of Figure 71 shows how each business goal for change has at least one soft goal associated with it.

### 4.6.4.2 From change goals to desired ITEGY capabilities

As described in Chapter 4.6.4.1 above, the initial ITEGY requirements are gradually operationalised by introducing several new goals, ultimately assigned to new system modules. These modules will represent a new set of assets and, therefore, capabilities. These new capabilities will give ITEGYs use case a competitive advantage and deal with current difficulties in solving problems mentioned in Chapter 4.6.1 above.



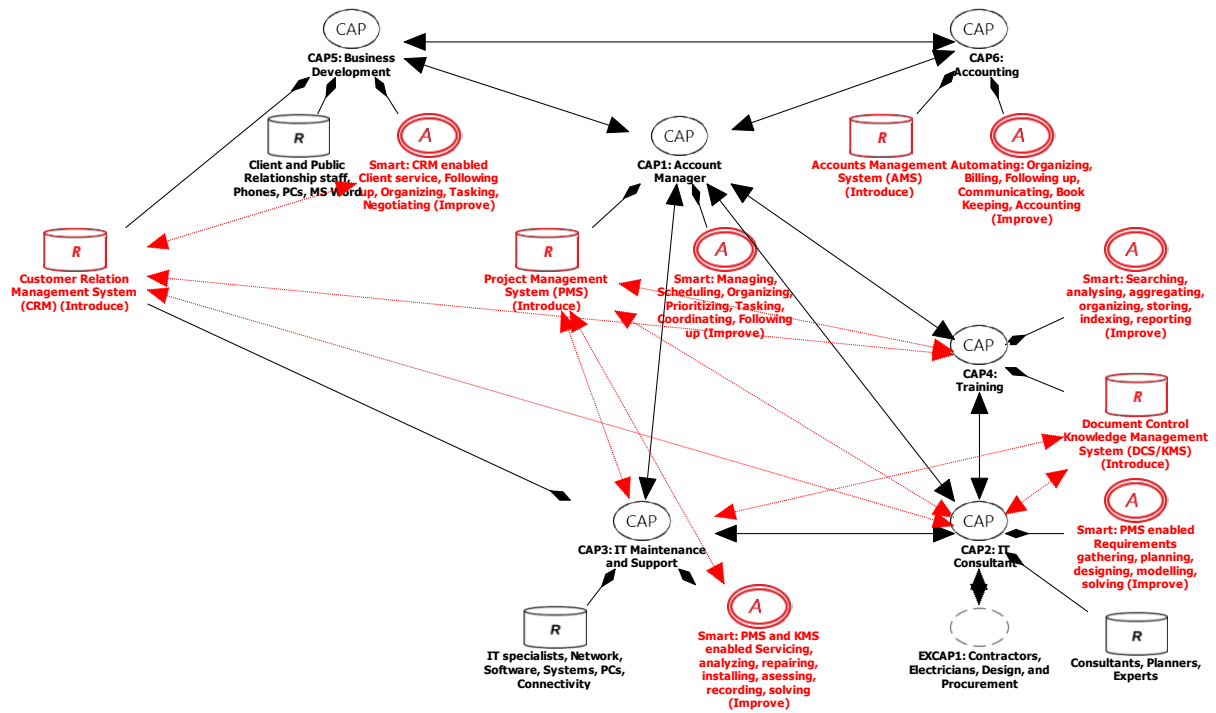


Figure 72: ITEGY TO-BE Capability Model

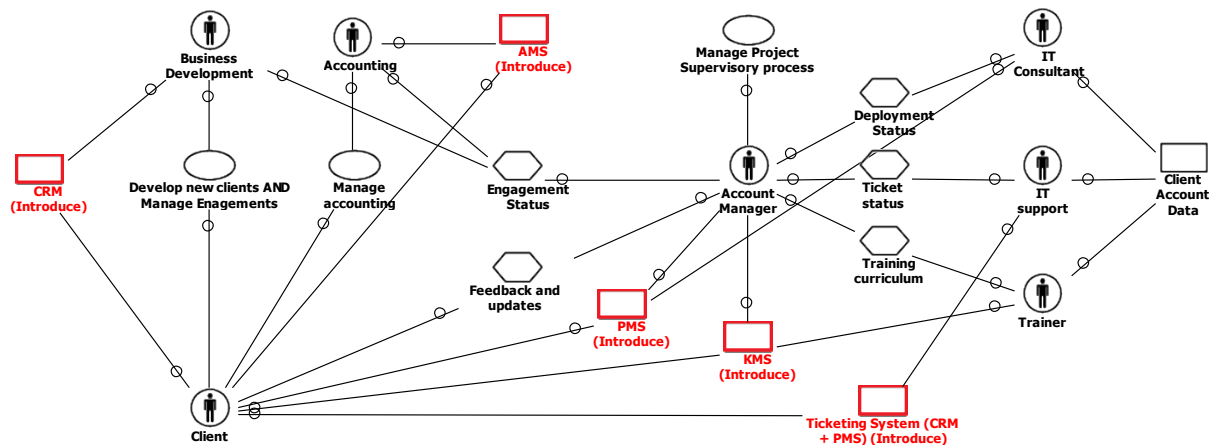
Some of these system goals replace existing current goals previously assigned to specific human actors. For example, improve Goal 3 To achieve efficient IT Consultancy process by improved sub-goal Manage Technical process [improve], it is assigned to new system requirements to automate and add intelligence. This new system and process design involve linking it to a new Target System Project Management System (PMS) integrated with the Customer Relationship Management System (CRM) and the Ticketing System, which will automate the creation and solicitation of work artefacts, such as project requirements documents, deployment plan, Training Solutions, and maintenance and upkeeping schedule and program. This new “smart” digitally transformed process replaces the old direct and manual process used to be carried out by the Human-Agent Account Management and Marketing. Thus, it becomes evident that the improvement sought by the ITEGY transformation will affect the dependencies between current actors and associated capabilities.



## Chapter 4: Modelling the use-cases

### 4.6.4.3 From change goals and change capabilities to desired improved Actor-Dependency

Similar to the development process of the TO-BE model of the previous case studies, the new set of capabilities gives rise to new collaborations between capabilities and involved actors. The identification of these relationships is significant because it enables us to define the way that actors coordinate between themselves in order to make capabilities realisable.

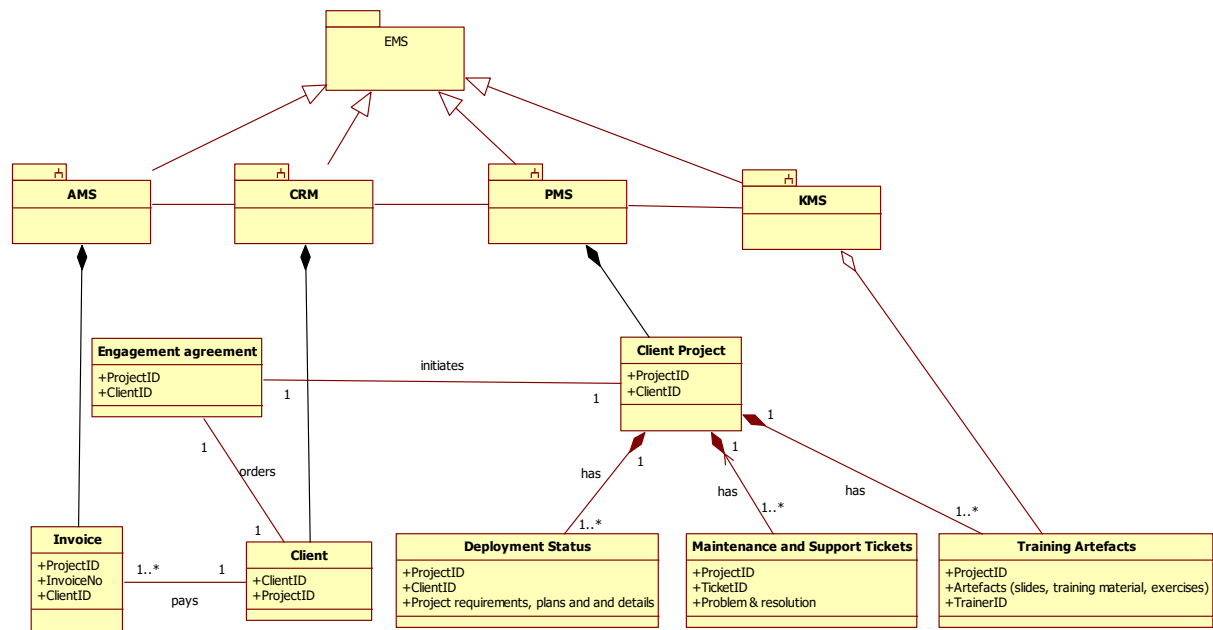


**Figure 73: ITEGY TO-BE Actor-Dependency Model**

Those new capabilities and goals give rise to new dependencies, as shown in Figure 73. For instance, the new dependency on the newly introduced Client Relationship Management (Introduce) fulfils the newly added goal of Achieve Automated Collection of customer data via templates and automated status, which is met with a matching introduction of Automating Customer Relationship Management (CRM) processes. Similarly, by expanding this analysis across all newly added goals and capabilities, we will find that the dependency between Account Managers, IT Consultants and Business Development will benefit from introducing a new Customer Relationship Management (CRM) . Other systems include a Project Management System (PMS, a Knowledge Management System (KMS), a Ticketing System that joins the CRM, PMS and KMS and an Account Management System (AMS) that create new dependencies between different actors in the model.



#### 4.6.4.4 From changed goals, capabilities and actor-dependencies to updated ITEGY information objects model.



**Figure 74: ITEGY TO-BE Information Object Model**

Similar to all previous case studies, starting from change requirements, new capabilities are modelled, and these, in turn, give rise to details in a new actor model, which essentially defines operational requirements. This is even more explicit in the information model, where the relationship between the pre-transformation information objects gets arranged in the newly transformed information structure. Figure 74 outlines the new information object model where the new Enterprise Management System (EMS) is introduced with a suite of sub-systems: Account Management System (AMS), which handles the payment for both the Client and sub-contractor as well as company finances, the Customer Relationship Management system (CRM), which manages the engagement with the external actors either on the client-side or the vendor side, the Project Management System (PMS) which manages the core tasks of the consulting work. Finally, the Knowledge Management System (KMS) provides a “smarter” and more integrative solution for the training resources capability. The Information Object model organizes the data storage and updates the statuses throughout the process workflow. At the same time, the “smart” functions lie in the automation of



standardized process workflow, status awareness, harnessing existing knowledge, and enhanced connectivity across teams and functions.

#### 4.6.5 The output: ITEGY Digital Transformation requirements

**Table 23: ITEGY High-level Digital Transformation Business Requirements**

#	Title	Explanation
<b>Technology component (TC)</b>		
<b>TR.1</b>	Switch to Cloud-Based Enterprise Management Systems (EMS):  Install Customer-Relationship-Management-System (CRM), Account Management System (AMS), Document Control Knowledge Management System (DC/KMS), a Project Management Systems (PMS), and a Ticketing System that integrates the PMS, CRM and KMS in the backend.	Enterprise Management Systems (EMS) need to go online to address Omni-presence and connectivity. The PMS, KMS, Ticketing System, and CRM will enhance Use case 1, the CRM and the AMS will enhance use Case 2 and 3.
<b>TR.2</b>	Integrate the different EMS components with status awareness (“smart” element)	The consultants and employees should be able to track the status and content of an “assignment” or “task” across its multiple “forms” (in the engagement process, project management process, ticketing process and finally, the collections process)
<b>Process Component (PR)</b>		



<b>PR.1</b>	Integrate workflow across ERP systems	The steps to conduct each of the three main uses cases can be represented in a workflow in each ERP system. Whereby data, statuses, assignments, responsibilities, checklists, and reminders are tracked and recorded.
<b>PR.2</b>	Program “smart” features across process workflows	With the new digitally transformed tools, program smart capabilities such as automated workflow transitions, smart reminders, validity checkers, automated traceability and alarms.
<b>People Component (PP)</b>		
<b>PP.1</b>	Training of employees on the systems	There is an element of transition from the old ways of doing business to the transformed way. This will require a period of training and possibly co-existence with old technologies.
<b>PP.2</b>	Connectivity of people	People need to get accustomed to enabling connective technology such as systems on smartphones, laptops, and smart meeting rooms to boost productivity and capabilities.

Note how it is almost identical to the previous case study except for differences in domain context.

#### 4.6.6 Feedback and conclusions from the ITEGY case study

ITEGY use cases are similar to the GAV, and YAMM use cases in that the business model possesses an element of operational involvement with the client, whereby the firm advises on how to solve a “problem” and provides a “service” to support the execution. ITEGY was an IT consulting firm offering IT support; therefore, the choice of the case study was intended to gain more insights into the applicability of the SC-COST for a technologically advanced company.



A total of three interviews were conducted, two pre-transformation and one post-transformation. With the same objectives in mind for the modelling exercise: : 1) Understand the main use-cases of the SCF, 2) Understand how to breakdown the SCF into its different *People, Process, and Technology (PP&T)* sub-components, 3) Use the eCORE Tool to build the four viewpoints reflecting the use-cases and the PP&T aspects, and 4) Test the templates within the eCORE Tool. The research objective was to review the common themes with the previous case studies and test for the validity of the patterns.

The template models were a good start during the pre-transformation sessions, and the feedback loop helped refine and crystallize the overarching goals and resulting relationships. There were few similarities between the client project delivery process during the use case analysis, causing too many fringe scenarios and exceptions. The model had to be tested against many possible past projects and was refined accordingly. However, there was a consensus on the higher abstraction levels (as will be elaborated on in Chapter 5.2), and similar central functions were confirmed: a) Marketing, b) Central IT services, and c) the post-service accounting and collections. Similarly, the patterned transformation goals were confirmed in managing those core functions.

The post-transformation feedback revealed difficulties in the implementation; the main issues revolved around the SCF's many different services. The two main distinctions were consulting and training vs Long-term-support-contracts. They were pragmatically two business models and required two digital transformation plans. The former is similar to GAT, Fincorp and IncomMarketing, whereby the delivery revolved around delivering an artefact (a report or advice), and the latter is similar to GAV and YAMM, which involved sustaining a service. However, since the abstraction layers in the SC-COST patterns did not differentiate between the two models, they were captured in one model. This was meaningful feedback for the modelling exercise and, in hindsight, should have been identified and planned accordingly. The firm worked around it by treating them as two separate firms and ran the models twice, one model for each half, and then synergies were identified and combined, while the unique goals, processes and technologies were separated. The overarching model created by the stakeholders was more comprehensive than the pre-transformation model and had more



elements representing a better understanding of the firm and its transformation. The failure was identified in the original use case analysis and, thus, the modelling, not in the modelling approaches or concepts themselves.

ITEGY case study further confirms that even with a combination of internal business models, the modelling of the digital transformation on a high abstraction level did not seem to differ significantly from all the previous case studies, which re-emphasizes that the patterns are generalizable not only to different contexts but also to different business models of SCFs provided each business model is identified and treated with care.

### 4.7 Summary and reflections

The six case studies were iterated using the DSRM methodology. The progression through the design and testing of the framework revealed how the information gathering of the earlier case studies was mainly formative; then, as the framework evolved, it became more evaluative. As themes became repetitive and patterns emerged, the goal shifted from understanding and modelling how an SCF is structured and worked, to evaluating how effective the framework and tool were in modelling the SCF.

The first case study explored how an SCF functions, including understanding the structure and processes and how the people, process, and technology played a role in the digital transformation requirements as modelled in their eCORE models. The solution's objective was to design and develop the initial part of the artefact, the initial version of the SC-COST framework, including understanding the eCORE model's application. The iteration over the second case study allowed further exploration and refinement of the eCORE model concepts and added the benefit of discovering common themes. Iterating over the third case study made commonalities apparent on a high abstraction level. Apart from the implementation specifics, the digital transformation challenges, general structures and dynamics, and general digital transformation requirements are similar, confirming the proposition and motivation for defining patterns and testing them. The fourth, fifth, and sixth case studies tested the hypothesis over different models, broadly generalised the SC-COST framework's ontology further, refined the patterns and improved the functionality and capabilities of the



## Chapter 4: Modelling the use-cases

eCORE Tools. Reflections from applying the SC-COST framework to the six SCF case studies were extensive and merited their chapter, Chapter 5, to address the solution aspect of **RQ3**.



## 5 Analysis of the case studies and the emergence of patterns

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The exploratory research in Chapter 4 informed the thinking and observation of certain repeated themes across all six case studies. Those themes have led to the emergence and usage of patterns. Those themes can be grouped into three main groupings as follows:

- 1- **Common Digital Transformation challenges:** These are repeated grievances that differ in language from one case study to another but refer to the same concepts.
- 2- **Four Abstraction layers:** During the breakdown of the use cases, those four levels were identified upon which the analysis could be made.
- 3- **Modelling patterns:** Those were modelling patterns that evolved from using the eCORE Tool and helped produce models during later case studies and stakeholder review sessions.

The following Sections elaborate further on the three concepts above.

### 5.1 Common Digital Transformation challenges

#### 5.1.1 Common As-Is People, Process and Technology (PPT) pains

Based on the outcomes from modelling the case studies, the following pains summarise the main sentiments that firms brought to why they demand Digital Transformation.

- 1- **Low connectivity and accessibility:** The most significant concern seems to be the issue of access from everywhere. Employees are constantly moving either at the client site or are expected to work at odd hours from home or hotels. The practice of sending back and forth files in emails or dealing with desktop-based software limits accessibility and introduces plenty of synchronising pains, which leads to many errors and loss of productivity. With the recent COVID-19 pandemic, accessibility has become even more pronounced as working from home has become the new norm. It was no longer sufficient to have the internet on a laptop and access email or company server, but access to entire company systems, which need to be device and location



agnostic, whereby employees can log in and work from any computer or smartphone, tablet or even Smart-TV.

- 2- **Disconnected systems (or low integration) and poor status awareness:** Tracking a customer, task, or resource across multiple workflows is difficult when systems are not well integrated. Often, the customer might still be negotiating the contract with Business Development in the Marketing System while implementation teams have already started arranging for data collection. Another example; is a final work task delivered from the implementation teams without the Accounting getting notified to issue a final invoice. Systems integration pains are among the most significant sources of inefficiency, mistakes, customer dissatisfaction, and lost profits. There is a need to track the workflow with conditions, pre-conditions, automated triggers, and automated reminders that work for a specific department or system and simultaneously across all company systems.
- 3- **Poor Knowledge Management:** Knowledge is one of the most critical assets for the firm. Past work and research are recycled and built upon, then used as input data for newer projects. The build-up of that data and analysis gives the firm experience in the marketplace. The storing, organising, indexing and searching of this knowledge is hugely challenging. Some data exist inside project files and artefacts such as pictures, contracts, deeds, fact sheets, and excel files showing models, financials and calculations. The knowledge accumulated, used and further reused is stored across multiple artefacts, systems, and devices. While it is the firm's practice to collect all the artefacts and store them in archived folders, all that wealth of knowledge is still cumbersome to search and bring together when needed in future assignments or projects. The current knowledge is inaccessible without relying on the consultant's memory and his/her particular preferences in storage and documenting any lessons learned.
- 4- **Cumbersome IT Maintenance:** IT maintenance of PCs, servers, emails, anti-virus, backups, networking, and IT infrastructure is necessary. However, any attempt to replace the desktop applications with Software As A Service (SAAS) applications dramatically reduces in-house IT staff's reliance and human errors. For instance,



maintaining an exchange server for emails often requires monitoring, patches and updates, and continuous backing up and security. Subscribing to a cloud-based email service such as Google G-suite or Outlook 365 reduces the need for in-house IT maintenance of email systems. Similarly, task management software, mapping software, accounting software, and the rest.

### 5.1.2 Common Challenges and Fears with TO-BE Digital Transformation (DT)

The following challenges and fears were cited in the interviews towards DT.

1. **Not knowing what the To-Be state looks like:** Eliciting the requirements and solutions for the problems in itself is an exercise that is often done haphazardly and opportunistically. There is no central strategy or know-how on identifying the goals and how to achieve them.
2. **Too many new technologies:** Confusion on which new technology to adapt. There are many products, and it is unclear how they integrate with existing systems and processes.
3. **Training effort and cost:** It costs money, time and attention away from current projects to train employees and achieve efficiency using those new technologies.
4. **Transition disruption:** The process of onboarding those new technologies often require disruptions to the current workflows, resulting in mistakes and slowdowns.
5. **Limited resources:** Have to weigh the cost and benefit against a budget when selecting one technology or system over another. Often teams have to make do with an inferior technology because another technology ate up all the budget.
6. **Expensive outsourcing:** Hiring an external consulting firm has some significant drawbacks. First, the external consultant had to spend a lot of expensive billable hours understanding the dynamics of the firm to offer sound solutions effectively, and those were outside of the budget of those firms. Second, the changes would be met with more resistance as the stakeholders often have little stake in defining their requirements.

## 5.2 Abstraction Layers

The outcome of the interviews and modelling of the six used cases emerges a distinct repeatable pattern on four levels of abstraction.



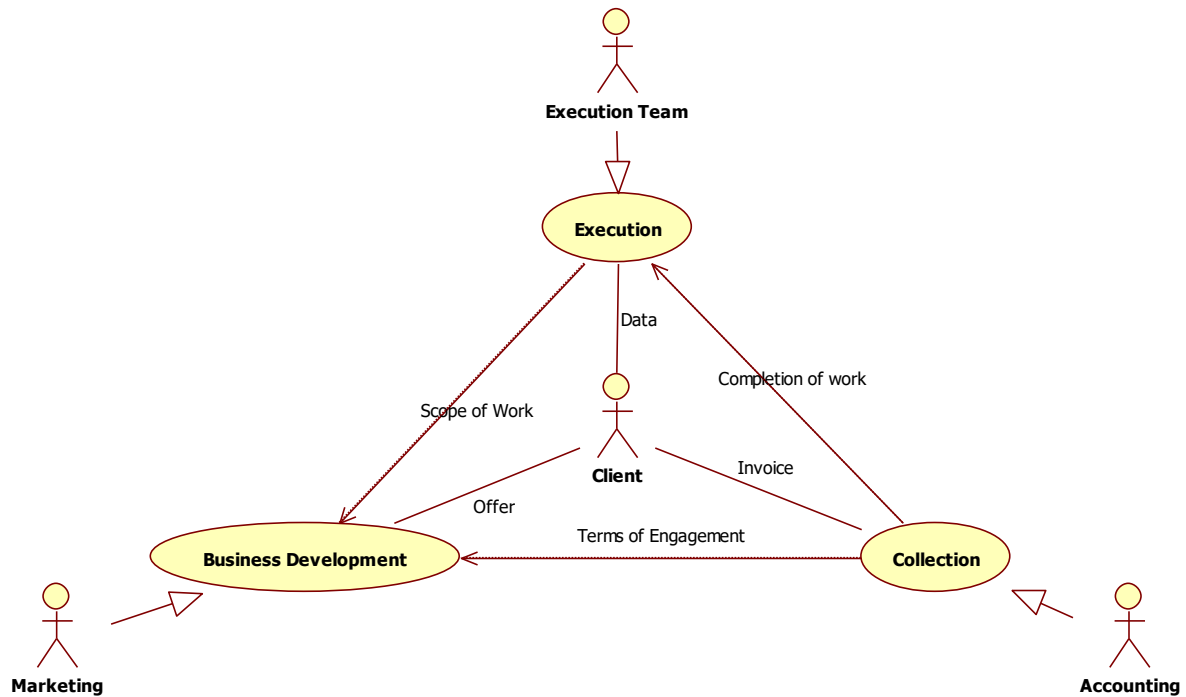
- **Abstraction Layer 1:** Identified generalized business structural commonalities (Chapter 5.2.1)
- **Abstraction Layer 2:** Identified a requirement ontological conceptual commonalities (Chapter 5.2.2).
- **Abstraction Layer 3:** Identified generic patterns of Implementation “Smart” systems (Chapter 5.2.3).
- **Implementation Layer 4:** Implementation is specific to each company (Chapter 5.2.4).

Those conceptual layers translate to structural repeatability in the modelling through eCORE

#### 5.2.1 Abstraction Layer 1: Identified generalized business structural commonalities

On the highest level, we see repeatability of use cases. First, we have two types of consulting firms: Type A) Advisory consulting firm and B) Servicing consulting firms. Those firms like GAT, Fincorp and Income Marketing work in an advisory capacity, where the project typically ends with delivering an artefact, typically a report or advice. While those firms like GAV, YAMM and ITEGY work in a servicing capacity, where typically the project is serviced until complete. The core consultancy solution can be generalised as “execution” in both types.





**Figure 75: Generalise structural pattern of use cases**

In all the use cases, in the centre lies a **Client** of which the consulting service revolves. Figure 75 demonstrates the three primary business operations that revolve around the client: **Business Development**, **Collection** and **Execution**. The key human actors that execute each business operation are **Marketing**, **Accounting**, and an **Execution Team**, respectively. The relationship between the business operations is repeatable across all use cases. For example, the **Business Development** relates to **Collection** via the **Terms of Engagement**, the **Execution** via the **Scope of Work**, and the **Client** via the **Offer**. Similarly, **Collection** relates to **Business Development** via **Terms of Engagement**, the **Execution** via **Completion of work**, and the **Client** via an **Invoice**. Finally, **Execution** relates to the **Client** via **Data** and the other two operations similarly.

The ontology described above in both structure and relationship is continuously reflected across the eCORE models. For example, Figure 76 shows how the structure is reflected in an AS-IS Capability Model for GAT, while Figure 77 shows how the structure is reflected in an AS-IS Goal Model. Similarly, this structure is reflected in the Actor-Dependency Model, as shown in Figure 78.



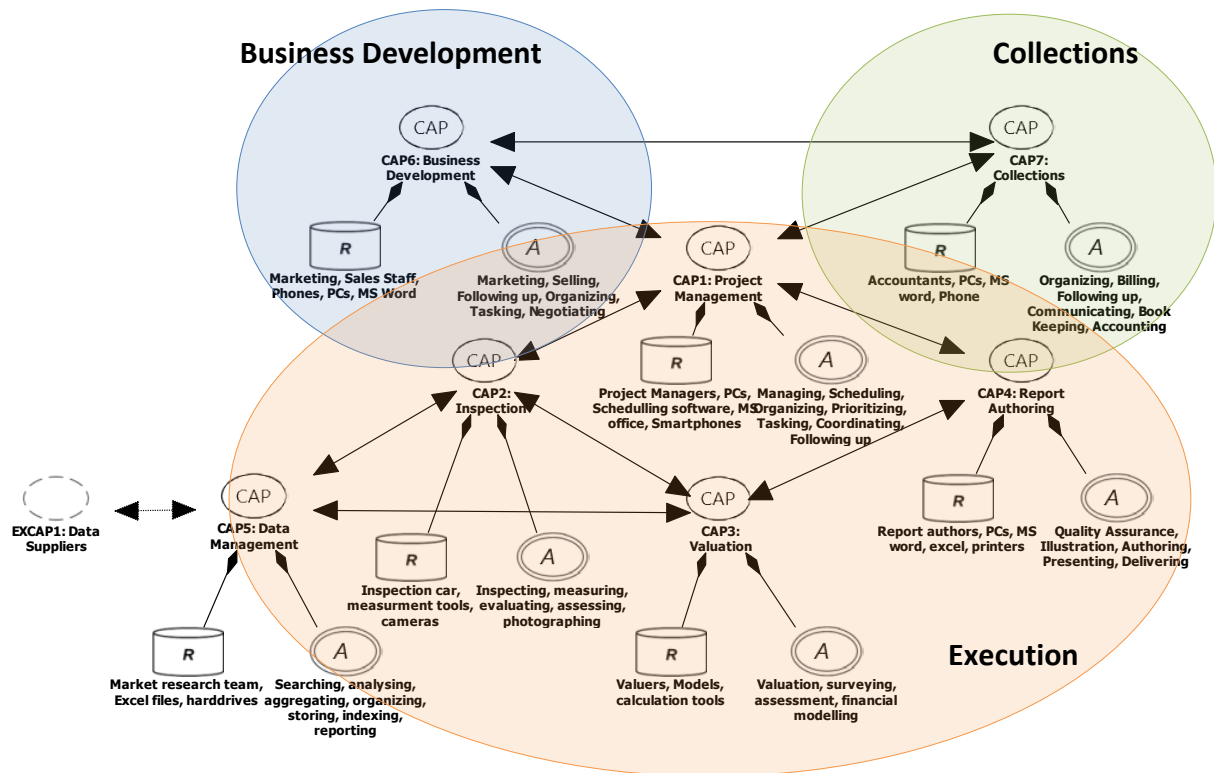
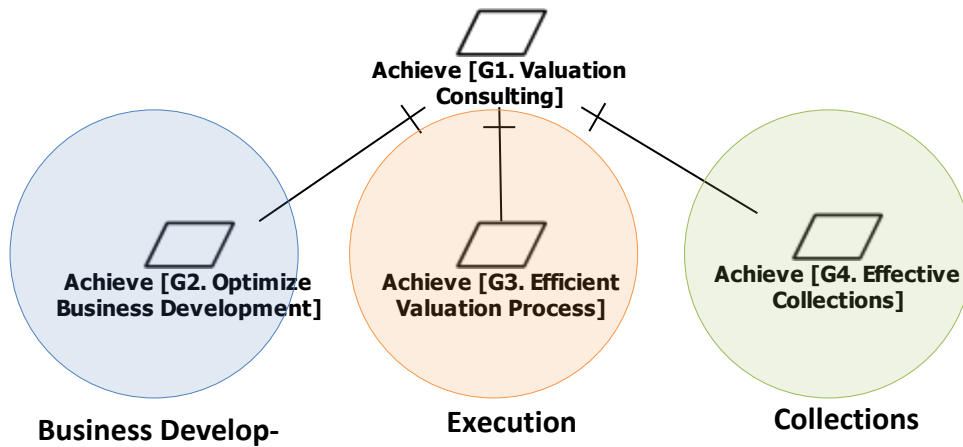


Figure 76: Identifying structural patterns relating to *Business Development*, *Collections* and *Execution* in the Capability Model

In the Capability Model, each sub-structure is reflected as its own set of Capabilities that aggregates their Abilities and Resources, while the relationship with the other two structures is reflected via Collaboration linkages to the respective Capability. For example, the GAT capability model in Figure 76 shows that Business Development substructure is reflected as CAP6: Business Development, and aggregates its Capacities (Marketing, Sales staff, phones, PCs, etc.), and its Abilities in the form of (Marketing, Selling, Followup, etc.). While each business in the case studies may name it differently, this Business Development substructure in the Capability Model is consistently identified in all the other case studies. Similarly, for the Collections and the Execution sub-structures.

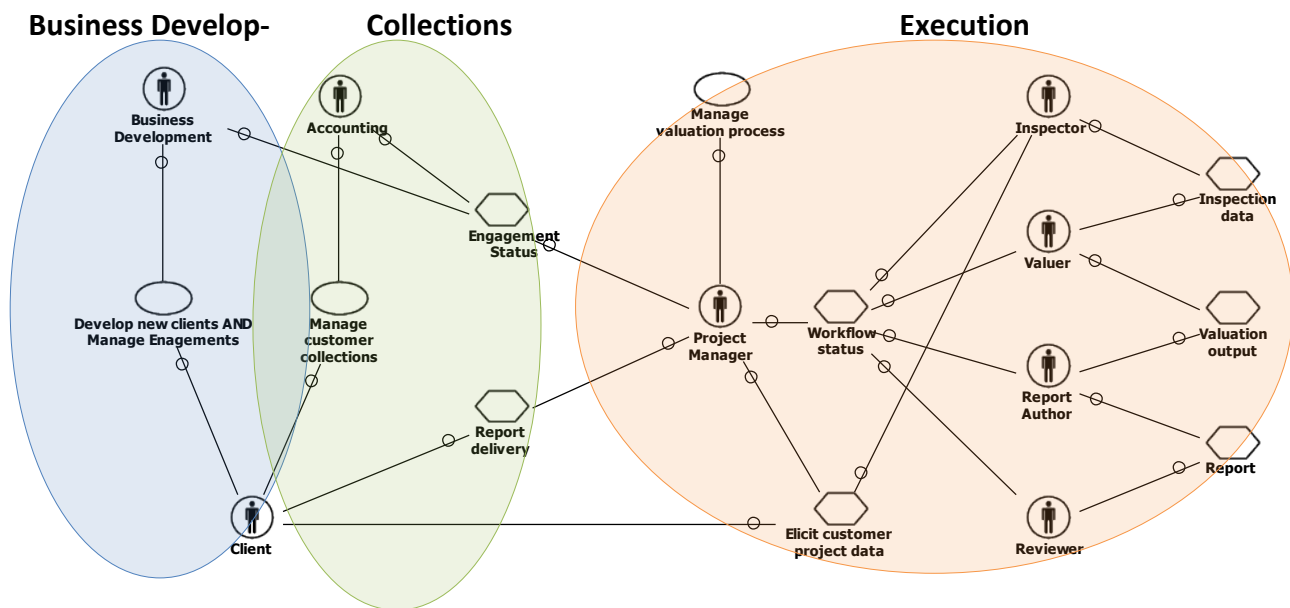




**Figure 77: Identifying structural patterns relating to Business Development, Collections and Execution in the Goal Model**

In the Goal model, each sub-structure is reflected as its own set of Business Goals that assigns its Operational sub-goals, Systems, Agents and Requirements. Each sub-structure relates to the other two structures in a hierarchical way whereby high-level goals of the entire organization breaks down to high-level goals of each business operation, which further breaks down to sub-business division goals. For example, the GAT goal model in Figure 77 shows that Business Development substructure is reflected as G1: Achieve Valuation Consulting, then it breaks down to the three major Business Development as G2: Achieve optimized business development, Execution as G3: Achieve Efficient valuation process and finally Collections as G4: Achieve Effective Collections. While each business in the case studies may name it differently, this substructure in the Goal Model is consistently identified in all the other case studies.





**Figure 78: Identifying structural patterns relating to Business Development, Collections and Execution in the Actor-Dependency Model**

In the Actor-dependency model, each business sub-structure is reflected as its own set of Actor-dependency trees that assigns its Actors to their dependency goals, resources and tasks. Each sub-structure relates to the other two sub-structures in a dependency relationship. For example, the GAT actor-dependency model in Figure 78 shows that the Business Development substructure is reflected as Goal dependency between Human-agent: Business Development and Human-agent: Client via a Goal: Develop new clients and Manage Engagements. While each business in the case studies may name it differently, this substructure in the Actor-Dependency Model is consistently identified in all the other case studies.

The benefit of identifying these structural commonalities and using this ontology is that new case studies can facilitate identifying the relevant SCFs capabilities, actors, goal, and their subcomponents and relationships across all three primary business operations.



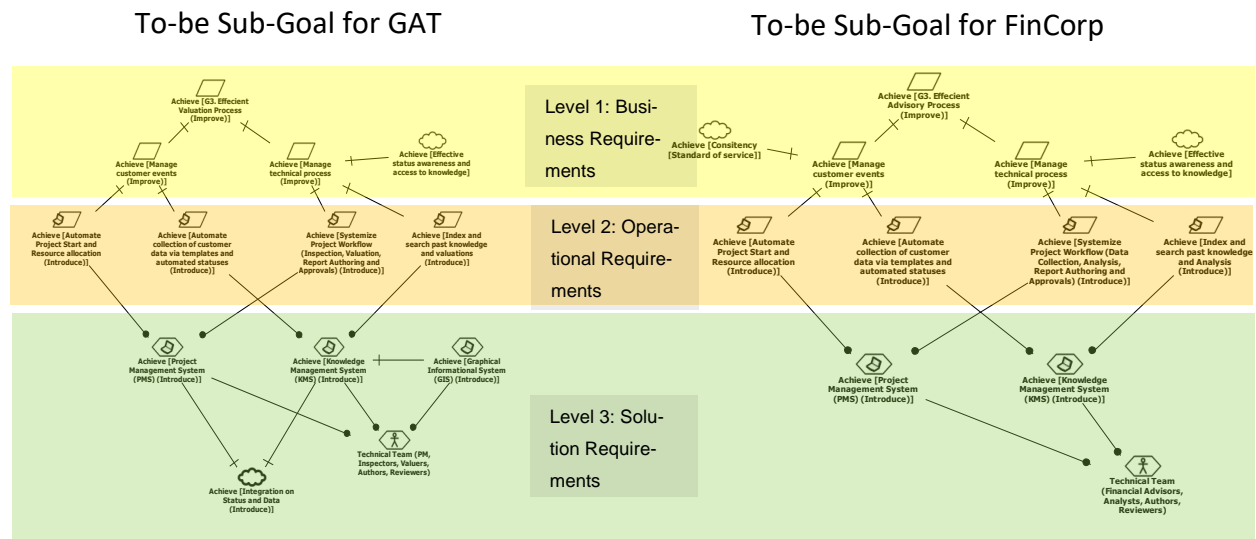
### 5.2.2 Abstraction Layer 2: Identified requirements ontological conceptual commonalities

While Layer 1 identifies patterns in the business structure, Layer 2 identifies an emerging pattern with common high-level requirements across all the use cases. The requirements abstraction structure is further sliced into three levels:

- 1- **Level 1:** Business Requirements level
- 2- **Level 2:** Operational Requirements level
- 3- **Level 3:** Solution requirements level

The top-level 1 identifies the high-level requirements tied to the business structure it serves. For example, Figure 79 below demonstrate the emerging pattern in the high-level requirements for the To-be Goal Model between the GAT and the Fincorp use cases. Both cases start with similar high-level (level 1) goals; GAT Achieve [G3: Efficient Valuation Process (Improve)], and Fincorp Achieve [G3: Efficient Advisory Process (Improve)]. Since both of those goals are maintained from the AS-IS state, they are abstracted as high-level Business Structure goals (Level 1), along with their two subgoals Achieve[Manage customer events (Improve)] and Achieve[Manage technical process (Improve)], since both are in the core of the consultancy practice that still needs to be achieved in the To-Be digital transformed business model.





**Figure 79: Demonstrating Horizontal Modeling layers**

A second level beneath them (Level 2) represent the operational goals, and similarly, a pattern emerges when analyzing the 6 case studies. For example, when comparing the GAT and Fincorp TO-BE goal model, the operational sub-goals highlighted as “Level 2: Operational Requirements” in Figure 79 is similar in both case studies. While the wording can be specific to the particular context of the operation, it can be generalized into concepts that are the same. Table 24 lists the common operational requirements at level 2 for the To-be Goal Model that emerge across all the use cases. The table maps the Abstraction Layer 1 structural pattern (Chapter 5.2.1) to the Abstraction Layer 2 Requirements pattern along with the three levels breakdown.

**Table 24: High-level requirement TO-BE goals that are common across the use cases**

Abstraction Layer 1	Structural	A) Business development	B) Execution	C) Collection
Abstraction Layer 2	Level 1	1. Optimized Business Development.	1. Efficient Execution Process 2. Well managed customer events	1. Effective collections.



			3. Well managed Technical process	
	Level 2	1. Intelligent pricing. 2. Automated tracing and follow-up. 3. Intelligent engagement terms creation. 4. Automated monitoring.	1. Automated Task start and Resource allocation. 2. Automated data collection. 3. Systemized project workflow and monitoring. 4. Indexed searchable knowledge management.	1. Automated invoicing and billing in sync with engagement terms. 2. Automated collection process and status. 3. Automated accounting.
	Level 3	1. Systemic customer management	1. Systemic project management	1. Systemic account management

Level 3 represents the Solution Requirements level whereby implementation systems, agents and processes are common across all use-cases. For example, the commonalities between the GAT and Fincorp use cases represented in “Layer 3: Solution Requirements” of Figure 79, show that both use cases share similar requirements for the solutions. A systemic project management solution that involves the correct people training, change of roles and responsibilities, modified process, and then the underlying technology with automation and “smart” programming would be needed to achieve the desired TO-BE state for G3:Efficient Valuation Process for GAT and G3: Efficient Advisory Process for Fincorp. Table 24 outlines the level 3 abstraction that is common across all the use cases.



### 5.2.3 Abstraction Layer 3: Identified generic commonalities in the implementation of “Smart” systems

Abstraction Layer 3 identifies a commonality in systems solutions across all the use cases. Since Digital Transformation, as a concept, involves the digitalization of systems and the transformation of the entire Business Model’s thought and action. In driving this concept, the patterns of solutions throughout the case studies emerged that resulted in identifying some Enterprise Management System (EMS) that is “smart” and cloud-enabled. For Digital Transformation to occur, it is also evident that it is insufficient to change the technology component alone, as the whole organization is also required to transform its processes and people, either by training or by adding new roles and eliminating old ones. The emerging pattern for Digital Transformation shows that People, Process and Technology components all transform to the following “Smart” EMS concepts. Noting that at this level of abstraction, we do not endorse a specific software or solution, but the overall features and requirements for that solution system becomes as follows:

1. **Customer Relationship Management System (CRM):** This is any system that helps manage all interactions with the customer through a portal. CRM Tasks are created with a custom trigger or event. They get assigned a unique ID, a responsible individual or team, a workflow with status updates from open until close, and it stores vital information regarding the problem to solve and the resolution achieved. The system provides automation in reminders, workflow transitions, a central communication platform, central omnichannel interaction and analysis capabilities through a dashboard or periodical reports to management.
2. **Project Management System (PMS):** Other variations are also known as **Task Management System (TMS)** or a simple **Ticketing System (TS)**. This is any system that helps manage the implementation plan of an entire project, a sub-component of a project, or simply a one-off task. It allows for defining roadmaps, assigning resources, linking sub-tasks dependencies, automated triggers, allocation of hours completed, a listing of



details, and automatic reminders and alerts. It also includes status and reporting features such as Gantt charts, dashboards, and periodical reports.

3. **Knowledge Management System (KMS):** Other variations from the case studies include a **Graphical Information System (GIS)** or a **Document Control System (DCS)**. Those are smart systems that provide holding data robustly to facilitate the collection, storage, indexing, searching, and analysing. They also hold meta-data on artefacts that facilitate re-usability, automated suggestions during use, and data analysis.
4. **Accounting Systems (AMS) or Account Management System (AMS):** Those systems hold financial and accounting information integrated with other systems. For instance, billable hours from the PMS are logged against a specific account tied to a specific company or client linked from the CRM. This system automates the collection, allocation, and processing of all the financial elements of the entire EMS so that the Accounts team can efficiently and effectively process payments, collections, taxes, and financial reporting.

Finally, all those systems must be fully integrated to provide “smart” insights, status awareness and analysis across all the systems. For example, the Account Management System (AMS) needs to get an event trigger from the Project Management System (PMS) at the end of an example task to signal the end of a project and the automatic issuance of invoices. The “smart” component of Digital Transformation revolves around the concept of automation, connectivity, integration, customizability and adaptability.

#### 5.2.4 Implementation Layer 4: Implementation is specific to each company

The higher levels of abstraction provide “reusable” components derived from patterns that repeat themselves. In contrast, the lower levels of implementation vary based on each company’s choice of technology, style of operation, and constraint of a budget. It is crucial to distinguish between conceptualization and implementation since conceptualization could be generalizable across organizations, while implementation is subject to each organisation's circumstances and current level of digitalization. Therefore, the Technology component specifying particular software or hardware devices; the People component specifying organization titles, roles and responsibilities; or the Process component specifying industry known



processes and methods; are all part of that specific implementation layer, which will be excluded from the scope of this thesis.

### 5.3 SC-COST eCORE Tool Patterns

Following identifying the abstraction layers in the previous section, a practical pattern **guide map** can facilitate future SCF Digital Transformation endeavours.

For anybody in the SCF digital transformation domain, the following process could be applied:

- 1- Install the eCORE Tool
- 2- Follow the **Structure the Process patterns (SSP)** to model the AS-IS state (see Table 26 in Appendix 7), which are intended to kick off the modelling exercise. The model structure starts with a template file, and the process of filling it up is systematic
- 3- Follow the **Transformation patterns (TP)** to model the TO-BE state (see Table 27 in Appendix 7), which are intended to guide the modelling the Digital Transformation (DT), by introducing the structure, language, and relationships of the transformed model.

Note that those patterns are not meant to be detailed manuals for self-implementation but to demonstrate the concept of creating guide maps based on patterns for the SC-COST framework and tool. During the scope of this research, these patterns were used for the case studies under direct expert supervision. Expertise presence was limited to providing the initial training and explanation of the framework, concepts and terminology before the kick-off of the exercise. The purpose was to learn more about how the SCFs function with those patterns, allowing the testing and receiving of feedback on how well the patterns represent their needs. However, in the future, ideas for developing means for decision-makers in self-learning could be further developed, including ideas such as providing a detailed manual, a software package with walk-through guides, or tutorials outside this thesis's scope.



## 5.4 Evaluation of the patterns and the SC-COST Framework

The artefact in this thesis is the SC-COST Framework, which constitutes an iterative process for utilizing the eCORE Framework, the use of structure and process patterns for SCFs, and the utility of an enabling tool, *eCORE Tools*, to facilitate the analysis.

The eCORE framework is already well established and evaluated in many different contexts in the literature (see Chapter 3.2). Therefore, in evaluating the artefact for this thesis, the primary new contribution is the introduction of structure and process patterns for SCFs, which embed into them the concepts of the eCORE framework. The evaluation thus becomes a question of evaluating the patterns that use the eCORE framework in a new context: SCFs.

During the case study setup and interviews, the patterns emerged and were iterated upon for improvements and refinement. Patterns offer practical and applied knowledge by providing high-level solutions to problems that can be converted into specific best practices and were developed for various domains based on the “best practices” derived from experts (Petter et al., 2010). The goal was to make them not too detailed to become constrictive, yet not too generic to become unuseful. One of the proven methods to evaluate an artefact is by demonstrating the utility through experimentation and case in a naturalistic and realistic setting such as case studies and action research (Hevner et al., 2004; Pries-Heje et al., 2008a; Venable, 2006). The evaluation was thus continuous throughout the lifecycle of the patterns. It begins with the early expert conceptualisation of the patterns' design and finishes with refinement via experimentation with case studies and observation of case-study transformations. Since the case studies spanned two years on average, impressions were collected pre and post-transformation, which gave insights into refining the patterns.

Table 25 lists the evaluation criteria that we derived from the literature, the traditional definition of the concept in the validation and evaluation literature, and its applied definition within the context of patterns.



**Table 25: Criteria for Evaluation Patterns from (Petter et al., 2010)**

<b>Evaluation Criteria</b>	<b>Traditional Definition</b>	<b>Adapted Definition for Patterns</b>	<b>Application Criteria</b>	<b>Evaluation Life-Cycle (Potential Evaluation Techniques)</b>
<b>Plausible</b>	The degree to which a concept is more than just a belief (Khazanchi, 1996; Sproull, 2002).	Pattern is sensible considering the current understanding of the domain (Alexander, 1979; Brown, 1998; Khazanchi & Zigurs, 2012)	<ul style="list-style-type: none"> <li>• Is the pattern believable beyond conjecture?</li> <li>• Does the pattern fit in the general realm of the problem domain?</li> <li>• Does the pattern seem reasonable for its proposed use?</li> <li>• Is it derived from practice?</li> </ul>	Development (expert review, literature, consistent with practice)
<b>Effective</b>	The degree to which a concept describes the phenomenon under study parsimoniously and stimulates inquiry (Khazanchi, 1996; Rossiter, 2002;	Pattern is described in language that is understandable; root causes of the problem are identified and addressed by the recommended	<ul style="list-style-type: none"> <li>• Is the pattern stated in precise, comprehensible, complete, internally consistent, and</li> </ul>	Development (expert review, literature, consistent with practice) Deployment (instantiation via prototype, peer review)



	Straub, Boudreau, & Gefen, 2004)	solutions (Appleton, 2000)	concise terms?	
<b>Feasible</b>	The degree to which a concept is workable or operationalizable (Khazanchi, 1996)	Pattern can be operationalized or implemented as described.	<ul style="list-style-type: none"> <li>• Can the pattern be implemented as described?</li> <li>• Can the basic pattern be tailored for specific situations/contexts?</li> </ul>	Deployment (instantiation via prototype, peer review)
<b>Predictive</b>	The degree to which a concept is capable of predicting outcomes for given conditions (Khazanchi, 1996; Sproull, 2002; Straub et al., 2004; Trochim, 2000)	Pattern produces the expected result or produces a result in the intended direction (J. O. Coplien, 1998)	<ul style="list-style-type: none"> <li>• Does the pattern lead to better results?</li> <li>• Does the pattern produce the intended result?</li> <li>• Did the pattern's recommended solutions elicit the result?</li> </ul>	Use (observational methods)
<b>Reliable</b>	The degree to which a concept is certifiable by different researchers	Pattern produces similar results regardless of the implementer or	<ul style="list-style-type: none"> <li>• Can others use the pattern and get</li> </ul>	Use (observational methods)



	using different methods (Campbell & Fiske, 1959; Khazanchi, 1996; Straub, 1989; Straub et al., 2004).	technique (Pries-Heje et al., 2008a)	similar results? <ul style="list-style-type: none"> <li>• Are the results similar when examined with differing evaluative techniques?</li> </ul>	
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The pre-transformation evaluation was conducted via observing the brainstorming and modelling exercises, while the post-implementation evaluation was made by the second round of interviews for each case study. The exploratory questions asked were:

- 1- How was transformation made?
- 2- What is the extent of transformation?
- 3- What difficulty was faced during the transformation?
- 4- What opportunities remain for improvement?
- 5- Is there any specific feedback for the SC-COST framework? To obtain insights on the eCORE Tools, model, SC-COST process, or patterns.

The findings are summarised in the Appendices (see Appendix 1.6, Appendix 2.6, Appendix 3.6, Appendix 4.6, Appendix 5.6, Appendix 6.6). The findings reveal consistency in the results with several additional insights. All six companies selected in the case studies initially started highly motivated for digital transformation; only one company faltered and did not follow through (IncomeMarketing Case 3) due to leadership challenges. Based on the feedback, the following evaluation analysis could be concluded:

#### 5.4.1 Evaluation Criterion 1: Plausible

According to (Petter et al., 2010), Patterns are higher-order abstractions of reasonable solutions to problems embedded in the real experiences of domain experts. In the context of patterns, a plausible pattern is one that makes sense, given the current understanding of



the domain. The three questions asked to determine if a pattern is plausible are; First, is the pattern *prima facie* reasonable for its purpose? Second, is the pattern believable beyond conjecture? Finally, does the pattern fit within the realm of the problem domain?

Given that the patterns are tailored explicitly for Small-Consulting-Firm (SCF) digital transformation, they are very specialized and relatable to the domain they were intended for. The Structure and Process Patterns (SPP) were derived from ideas generated by the case study stakeholders, who are the foremost subject matter experts in their AS-IS situation and their TO-BE transformation desires. They are top management, project management professionals, and world-class consultants who dissect their clients' problems, break them down and use their capabilities to devise solutions. Thus, the patterns reflect the collective decisions made by those specialists in setting up their organization and in the desired transformation that best serves their TO-BE operations. Furthermore, the patterns have been tested and iterated upon in the last three use cases based on the outcome of the first three use cases and have been received positively as a plausible guide for modelling the organization and its transformation (see Appendices for case studies 4, 5 and 6 parts 6.2). Moreover, feedback in the post-transformation interviews suggests that modified models were still consistent with the pattern, such as the case in case study 6.

Therefore, the first fundamental questions of plausibility have been addressed: the pattern is *prima facie* reasonable, and the pattern is more than conjecture and contains the necessary facets to describe it fully. This pattern also answers the second question, asking if the pattern is believable beyond conjecture. We argue that it is since it has been refined and tested across several case studies with unrelated independent stakeholders in multiple environments and circumstances, confirming its plausibility within their environments. Finally, the pattern is consistent with the principles of operating an SCF, satisfying the third plausibility criteria.

### 5.4.2 Evaluation Criterion 2: Effective

A pattern's effectiveness can be assessed during the development and deployment phases of the pattern's life-cycle (Petter et al., 2010). A complete pattern includes a meaningful



name, a problem statement, the context for the problem, the applicable forces and constraints, a solution, one or more examples, a listing of related patterns, and known uses of the pattern (Appleton, 2000).

In the context of our high-level modelling in eCORE tools, the proposed patterns include all the components recommended by Appleton for pattern descriptions. Two key facts reflect the clarity of the pattern's description; the pattern was developed by data collected from and reviewed by the key stakeholders of each use case, and the patterns were consistently used across all use cases effectively. Issues raised from any ambiguity in the use cases contributed to the clarification and refinement of the patterns. The goal was not to make it too specific for a particular case study and yet not too generic for contexts alien to the SCFs.

### 5.4.3 Evaluation Criterion 3: Feasible

A feasible pattern should ensure successful implementations for the preponderance of the pattern's instantiations (Petter et al., 2010). In the context of our high-level modelling in eCORE tools, the proposed patterns were implemented across the case studies and examined the feedback on their ability to operationalize the pattern and identify points of clarity and improvement.

The patterns were operationalized in the form of templates inside of eCORE Tools, and starting from the third case study, stakeholders could draw parallels to their organizations and organize their analysis right away. The feedback was used to refine the enabling eCORE Tools' pattern and programming, including renaming abstracted elements to generalize it further and enabling the templates to apply to more general setups without becoming too generic to obscurity. One example is the stark contrast between the transformation implemented in YAMM (case study 5) and GAT (case study 1). The former was one system that combined business development functions with project management and collections in one system, and the latter was three separate systems working in integration. Nonetheless, the patterns made the conceptual distinction clear for the former stakeholders. They helped them identify the different conceptual functions within the combined and bundled work mode, identifying the necessary transformation requirements for each function and



ensuring its satisfaction during the combined implementation (See Appendix 5.6.2). This conceptual compartmentalization helped break down the challenges to a more feasible transformation set of requirements, whereby initially, the task was deemed overwhelmingly large. After the conceptualization according to the different abstractions and functions, it became more focused and achievable.

Furthermore, other post-transformation interviews showed that the patterns were implementable and feasible, given their level of abstraction. Most stakeholders from the case studies voiced their satisfaction with the feasibility of using the patterns to achieve their transformation goals.

### 5.4.4 Evaluation Criterion 4: Predictive

A pattern is predictive if the implementation of a pattern produces the expected result, and the use of the pattern is the reason for the result (J. Coplien, 2007); therefore, the pattern must be used to evaluate its predictive nature. In the context of our high-level modelling in eCORE tools, the use cases provided naturalistic settings to determine if the artefact works (Venable, 2006).

Uses cases GAT (use case 1) and Fincorp (use case 2) did not benefit from patterns in the early pre-transformation modelling exercises because the early versions of the patterns were extracted from their experiences. When surveying the remaining case studies stakeholders post-transformation that have used the patterns, they confirmed that the patterns given to them in the form of templates and conceptual analysis guide achieved the intended results and perceived that the pattern was the reason for the result. The exception was for IncomeMarketing (use case 3), which failed to transform due to circumstantial reasons; the patterns were re-used in the second round of interviews to refine the eCORE models for the desired Digital-Transformation, further confirming their belief in its predictive abilities.

While the patterns may not have yielded the same magnitude of results every time it was applied to a new use case, because the context of application will always be different, the patterns produced the same general effect each time it was applied. For instance, a part of the TP patterns was designed to identify the business and marketing transformation goals.



## Chapter 5: Analysis of the case studies and the emergence of patterns

While the goals were identified across each use case, the final solution's implementation level varied widely. For example, GAT (use case 1) implemented a fully integrated suite for CRM with PMS and AMS, while IncomeMarketing (use case 3) only implemented an entry-level CRM that behaves as a Rolodex for their customer base while YAMM (use case 4) implemented one encompassing system that satisfied all the use cases functions.

### 5.4.5 Evaluation Criterion 5: Reliable

In the context of patterns, meeting the reliability criterion requires gathering evidence confirming (or disconfirming) that the pattern consistently produces a close approximation of the desired effect regardless of the implementer or operationalization of the principles embedded in a pattern (Petter et al., 2010).

In the context of our high-level modelling in eCORE tools, the use cases provided several opportunities to test its reliability. Given that the stakeholders from each case study implemented them independently from the other case studies, we observed the reliability of the patterns in producing similar outcomes. For example, the last three case studies: GAV, YAMM and ITEGY, which benefited from a near-complete set of patterns embedded in the eCORE tool as templates and the support guide from the researcher, have all agreed to nearly similar eCORE models for both their AS-IS and TO-BE states. While the depth and breadth of each case study are different, since many environmental factors impacted the pattern's implementation, the findings were consistent when assessing if the pattern was reliable on the higher abstraction levels. The patterns indeed affected the direction of the implementation and the analysis of the digital transformation reliably across multiple contexts and stakeholders, as presented in the models, the Digital Transformation requirements (see part 5 of each case study's appendix), and the post-transformation analysis (see part 6 of each case study's appendix).

## 5.5 Summary and reflections

The analysis of the modelling exercises for the digital transformation of the case studies in Chapter 4 identified common themes and patterns.



First, there were common digital transformation challenges, confirming many of the challenges referenced in the literature review as central problems facing enterprise digital transformation. The value of identifying those commonalities is to confirm that issues that plague the broader types of enterprises and SMEs also apply to those SCFs. Furthermore, more specific challenges to SCFs were confirmed, particularly the challenges of limited resources (time, money and personnel) and the infeasibility of using external transformation consultants. Those common challenges also established a common starting point for the SCFs and were revealed to lead to a similar dissection of the problems and devising their solutions since most consulting business models operate and compete similarly.

Second, there were commonalities across multiple layers of the SCFs: the Business Structure (Abstraction Layer 1), the Requirements conceptualization (Abstraction Layer 2), and the “Smart” Implementation systems requirements (Abstraction Layer 3). After analysing the case studies, it was also decided that specific implementations (Implementation Layer 4) are excluded as they are specific to each company's needs and thus outside the ability to generalize in patterns. The value of those abstraction commonalities is that they informed the creation of the template patterns in the eCORE Tool. These patterns encapsulated the structure, conceptualising requirements, and the generic “smart” implementation systems and were articulated using an established pattern language for theoretical representation and coded into the introductory templates of the eCORE Tool for pragmatic usage and evaluation.

Incorporating those patterns in the eCORE tool enabled the patterns to be evaluated in the case studies, thus providing the needed observation, evaluation, and refinement in the iterative spirit of the DSRM methodology. The evaluation was conducted throughout the lifecycle of the pattern, including during the design, development, and demonstration (testing) phases. The resulting refined patterns are plausible, effective, feasible, predictive, and reliable in applying the patterns and, conversely, the SC-COST framework.



## 6 Discussion and conclusion

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### 6.1 Reflections on thesis objectives

Digital transformation is an active research topic that continuously offers new challenges and opportunities for researchers and the industry. The thesis aim was to focus on challenges in Digital Transformation for Small Consulting Firms (SCFs) in light of the research gap in the literature on Capability Modelling.

Going through digital transformation for any SCF causes much anxiety to the company management, employees, and customers. Business owners and executives are stressed about it since, on the one hand, they know how important it is to their business, yet they do not know where to start with the transformation. They often do not have the capacity or the resources to make expensive mistakes during the digital transformation process. They are fearful of entertaining trials and errors at the risk of losing clients, partners or employees. Many are also fearful that they get the requirements for transformation wrong. They would prefer to either hire a specialized digital transformation consultant, which they find expensive or look for ready-made solutions out of the box that is often targetted to a specific process (like a project management system or a CRM), which often does not address the entire integrated need of the organization effectively.

The research in the problem domain was done in light of those anxieties, and the solution domain was conducted in the spirit of researching a practical solution, given the vast body of knowledge and contributions in the different research domains of transformation. The final objective was to contribute to knowledge by pushing the frontier on the capability approach. The outcome we argue meets those objectives by proposing the SC-COST framework and providing an argument of worth by testing it in six case studies. The result is an advancement in the capability approach research as it applies to SCFs, and possibly with future research as it applies to general SMEs and large enterprises' broader contexts.



## Chapter 6: Discussion and conclusion

### 6.1.1 Reflections on literature search and gap

The first objective was to establish a gap in the literature and an opportunity to advance knowledge in Requirements Engineering for Digital Transformation for SCFs.

The literature research followed a well-known framework for structuring literature reviews (Chapter 2.1.2) to help establish the research gap and answer the early research questions **RQ1**, and **RQ2** (Chapter 1.3). **RQ1** researched the state-of-the-art in the problem domain of Enterprise Transformation for Small Consulting Firms in the context of digitization, and the state-of-the-art in Strategic Management (SM), Requirements Engineering (RE), and Conceptual Modelling (CM) pertinent to SCF transformation and justified the use of these foundational topics in addressing the identified problems (See Chapter 2.1.1). **RQ2** researched the state-of-the-art capability-oriented approach and informed the direction of the research to expand on the well-researched eCORE framework. It also informed the usage of pattern theory to obtain valuable insights and discuss commonalities between the case studies and thus propose broader generalizations.

The literature provided the ideas for research and informed the incorporation of well-researched solutions. The SC-COST framework was based on the pre-existing eCORE framework and well-known requirements engineering theory, pattern theory, pattern language and evaluation criteria. The research focused on identifying and utilizing the key contributions across those research fields and then incorporating them into a new framework that responds to the needs of SCFs within the context of the specific problem domain of Digital Transformation. The conclusions and the establishment of the gap were discussed in Chapter 2.4.

### 6.1.2 Reflections on design and development of the SC-COST framework

The second objective was to design and develop a framework based on understanding from the gap in the literature review to address **RQ3**, which researches how to develop a generic extended framework applicable to the Digital Transformation of SCFs.

The thesis first identifies the need for a new intellectual framework that addresses the literature gaps at the intersection of Capability Modelling, Requirements Engineering, Strategic



Management and Pattern Theory. It proposes a new approach for helping SCFs specify, analyse, and evaluate their digital transformation requirements within a new framework named SC-COST. The SC-COST framework was designed, tested, and built upon via an iterative process as part of the design and development process informed by the Design-Science-Research-Methodology (DSRM) (See Chapter 3.6). The first building block is a literature-supported framework named the eCORE framework, which has proven effective in application to other industries but has not been applied to the consulting industry previously (See Chapter 2.3.2 for literature support and Chapter 3.2 for the components of the eCORE framework). Second, it extends it by a literature-supported pattern theory, which evolved from the observations and analysis of the commonalities in the case studies throughout their Digital Transformation conceptual modelling cycles. Third, it designed the output to become Digital Transformation Requirements in formal and informal requirements. This output serves as the main contribution of the SC-COST framework to the SCF stakeholders and decision-makers. The stakeholder has confidence that those requirements are a result of a sound process that addresses the People, Process and Technology components, the AS-IS state of the organization with its current interaction and dependencies between the different capabilities, actors, and resources, and a traceable pathway to implementing the desired TO-BE state supported by best practices implicitly provided via patterns. Finally, it provides an enabling tool, named eCORE Tool, developed to use the eCORE modelling framework and utilise patterns. The tool has enabled the modellers to apply the framework and test them more effectively than simply writing requirements and illustrating the models in drawings. The tool's interactivity and usability meant that the stakeholders, with minimal external support, focused on the digital transformation's strategic aspect rather than struggling with modelling theory and language. It also enabled more throughput of information gathered from testing the SC-COST framework over more case studies, providing more insights to evaluate the framework effectiveness better (See Chapter 5.4).

### 6.1.3 Reflections on the use of the DSRM research methodology

The third objective was to iterate the framework application development and testing via case studies in line with the DSRM approach.



The design and development of the thesis and the SC-COST Framework were well situated within the Design-Science Research Methodology (DSRM) (Chapter 1.4.2). DSRM was followed on two levels: A) the thesis and research level and B) the framework design and development level.

The first level (A) involving the thesis and research level meant that the entire approach to research followed the iterative DSRM methodology. Whereby the problem definition and motivation were situated in research from the literature. The resulting gap was based on an argument stemming from the general problems in Digital Transformation and how it affects SCFs, combined with an argument about the under-researched active research fields in solving those problems. The key contribution is identifying the gap at the intersection of several theoretical fields of the capability approach, strategic management, requirements engineering and patterns theory in devising a pragmatic alternative to complex large enterprise solutions for SCFs. The entire research was iterated several times as the framework evolved and its applications evaluated on the case studies, and thus the iterative process of DSRM carried through until the end of the research and thesis writing.

The second level (B) was on the deeper framework design and development level: an initial framework design was proposed based on the outcome of the earliest interviews of both GAT and Fincorp (Case studies 1 and 2, respectively), upon which the early versions were specific. The following iterations evolved to contribute to the framework by introducing the eCORE tool and the patterns. Therefore, the DSRM was applied in refining the artefact and thus in the research outcome on a practical level.

### 6.1.4 Reflections on practical cases and reflections on the experiences doing the project

The fourth, fifth and sixth objectives were A) to apply modelling during the case studies' pre-transformation exercise to evolve the framework and tools, B) Analyse the commonalities and draw insights to determine patterns; and C) Use the feedback and insights from the post-transformation interviews to evaluate the framework's approach, tools and patterns. The objectives serve to answer **RQ3** regarding the lessons learned, the patterns produced,



the effectiveness of the SC-COST framework and how the framework could be extended beyond the SCF applications.

The case studies provided the context for materializing the understanding of the problem domain and the challenges in digital transformation. The cases studies resulted in shared lessons from the digital transformation journeys.

Dividing the field research into two phases, pre-transformation and post-transformation, allowed gathering valuable insights into the efficacy and applicability of the SC-COST framework. The pre-transformation sessions formed the bulk of the theory and design, while the post-transformation provided the evaluation and feedback. Combined with the iterative DSRM methodology, the SC-COST framework evolved in phases.

First, the pre-transformation phases of early case studies, GAT and Fincorp (Chapters 4.1.6 and 4.2.6), produced the early naming conventions (the ontology) used through the remaining case studies. Their analysis also discovered the three core functions performed inside the SCF: *Business Development and Marketing*, *Project Management*, and *Collections and Accounting* functions. It became clear that those structure and process themes were semi-repeated in later case studies. They also informed the design of the initial structure and process of the SCF business model as described in the abstraction layers of Chapter 5.2. Moreover, they provided the grounds for developing and testing the eCORE tool. The third case study, IncomeMarketing, tested the earliest pattern in the eCORE tool; the feedback provided insights into refining the understanding of the abstraction layers and more consistency in applying the patterns.

Third, the consistent outcome of the first three case studies prompted the motivation to reevaluate the choice of SCFs for studying, and three new case studies were added with new selection criteria on the business model. While the first three case studies were all similar in that they provide one-off advisory services, whereby a client asks a “question” or poses a “problem”, seeking “advice” or “recommendation”, and the consulting firm conducts studies then responds with a resulting outcome. The new case studies introduced an element of operational involvement with the client, whereby not only did the firm advise on how to



solve a “problem” but also provided a “service” to support the execution. The goal was to seek new insights to improve the SC-COST framework and test our understanding of the abstraction layers and the patterns' effectiveness. The conclusions were discussed in the case studies (Chapters 4.4.6, 4.5.6 and 4.6.6).

Fourth, the post-transformation feedback provided insights on how effective the digital transformation was and how the tool enabled the guidance towards that transformation. The analysis of the post-transformation states provided the feedback necessary to evaluate the patterns and the process, particularly in answering the questions of whether the framework was *effective, feasible, predictive* and *reliable* (Chapter 5.4). It also confirmed many of the difficulties faced during digital transformation, including *timing, poor leadership, and resistance to change*, as demonstrated in the feedback of the case studies. IncomeMarketing (case study 3) was a prime example of those failures (see Chapter 4.3.6 and Appendix 3.6). However, the SC-COST also demonstrated resilience against other common failures such as *feasibility, lack of clear vision, lack of stakeholder participation, and ineffective gathering and leveraging of data*. As arguably the framework in its design provides a clear transformation pathway, demands all stakeholders' participation, and provide an effective gathering and analysis framework to leverage data surrounding the structure and processes of the firm to allow for effective and efficient decisions regarding digital transformation plan and implementation.

Overall feedback from the executives in the case studies was positive. Many of their earlier anxieties were alleviated once they experienced the eCORE Tools and framework that offered a template-like structure and a plan to follow, which addressed the entire organization as People, Process and Technology. The idea of patterns tested across multiple cases gave relief to the notion that the transformation will arrive at the desired outcome once a template or framework is followed. For stakeholders in the case study, their effort was thus very focused and led to a greater understanding of their current AS-IS state and their TO-Be state, offering a clearer understanding of the high-level requirements for developing a digital transformation plan that leads to a purposed selection of technology upgrades, people training and process modifications.



The benefits included increased productivity, efficiency and consistency, positively impacting quality output. This sentiment was repeated in the feedback interviews of all of the use case studies, with a consensus among top management that the transformation produced a workforce with new skills and capabilities that ultimately align with the industry's evolution in technology and processes. This change was needed in an ever competing consultancy market, which by the account of the managers translates positively to the bottom line especially post COVID-19 era.

### 6.2 Critique

Given the established gap in the literature justifying the motivation for further research for solving the SCF Digital transformation problems, the criticism becomes of whether the SC-COST framework contributes to knowledge. The following critique argues for the SC-COST framework in light of the research aims and questions.

#### 6.2.1 Critique about whether the usage of SC-COST Framework contributes to SCF Digital Transformation research.

The question relates to the value of the SC-COST framework as it pertains to satisfying the research gap on the solution axis (Chapter 2.3). The literature review argued that while several approaches are possible in digital transformation research (Chapter 2.3.1), multiple research gaps exist in the capability approach at the intersection of four research perspectives: strategic management, requirement engineering, conceptual modelling and pattern-ing theory. Situating the research at that intersection proposes a novel capability-oriented approach, named the SC-COST framework, explicitly targeted at SCFs (Chapter 2.3.2).

From a theoretical viewpoint, we argue that the SC-COST framework qualifies as a valid capability approach as it utilizes at its heart the Capability Oriented Requirement Engineering (eCORE) framework (Chapter 3.2). This framework focuses on effective and efficient requirements elicitation for the digital transformation of SCFs, using a related ontology and patterns that enable the transformation process's externalisation in a user-centric manner. The SC-COST framework is situated at the intersection of the four perspectives as follows:



First, the SC-COST framework satisfies the strategic management research philosophy (Chapter 2.3.2.1), which includes developing and adapting firms' business *operating* models to cope with technological progress. We argue that Digital Transformation of business *operating* models is satisfied when focusing on the analysis of People, Process and Technology (PP&T), which is also in line with the Enterprise Transformation philosophy in general (Alter, 2006; McKendrick, 2017). Additionally, strategic management adopts two prevalent views: Resource-Base View (RBV) and Dynamic Capability View (DCV). Both are captured in the Capability Oriented approach since the eCORE framework merges both in a conceptual framework to analyze Business Requirements by modelling the capabilities, identifying resources required for processes, people, technology, and assets, and identifying strategic gaps to align business goals. It is also evident from the analysis of the case studies how the modifications in the SCF's operating models resulted from the digital transformation exercise, whereby the TO-BE models resulted in requirements for new operating goals actor-dependencies, new capabilities, and new information systems.

Second, the SC-COST framework satisfies the Requirement Engineering (RE) philosophy (Chapter 2.3.2.2), as the primary value of the modelling exercise is to help capture, represent, share, analyze, negotiate and prioritize the Digital Transformation business level requirements. Those resulting requirements are real-world goals for organizational transformation, as evident in the outcome of the case studies. Stakeholders used the SC-COST framework to understand their current and to-be states, aided by the modelling capabilities of the eCORE Tool, to understand the complex PP&T relationships and analyse different perspectives of their organization. This analysis helped focus on negotiating and prioritizing the requirements to become feasible and avoid the failures typically faced by complex and poorly studied Digital Transformation endeavours.

Third, the SC-COST framework satisfies the Conceptual Modelling (CM) paradigm (Chapter 2.3.2.3) by adopting the eCORE conceptual modelling techniques and the support of the eCORE tool, which is used to represent the conceptualizations of



stakeholders unambiguously in the domain under investigation (Digital Transformation of SCFs). The eCORE conceptual models of the AS-IS and the TO-BE states are designed as testable artefacts that can be verified and validated against real-world practices, as stakeholders can draw parallels to their organizations' behaviour and thus the requirements for change. They also enable abstractions to help focus on specific problems and solutions without getting distracted by implementation specifics. The eCORE modelling also provides traceability from the problem domain to the solution domain and back utilizing the eCORE tool's cross-perspective linkages and cross-model relationship capabilities. Additionally, it provides a natural way to describe real-world processes supported by software-intensive systems since the modelling language supports PP&T representations across multiple viewpoints using the stakeholders' descriptives. It allows answering what-if type of questions, quantitatively and qualitatively collecting data from the field and test subjects, and editing the model in the eCORE Tool accordingly. Finally, it gives a tool and artefact to engage stakeholders effectively.

Lastly, SC-COST applies patterns theory (Chapter 2.3.2.4). Patterns were developed through the observation, design, testing and feedback from the case studies and were operationalized via templated conceptual models in the eCORE Tools. Patterning theory was applied on two levels: First, on a conceptual analysis level whereby commonalities in the business structure over four abstraction levels were identified (Chapter 5.2). Second, the abstractions defined the eCORE tool operational pattern (Chapter 5.3), written to follow a well-established pattern language. They were then evaluated according to well-established pattern evaluation criteria and found to be plausible, effective, feasible, predictive and reliable in the context of Digital Transformation business requirements elicitation for SCFs using the SC-COST framework (Chapter 5.4).

Therefore, we argue that SC-COST's theoretical framework achieves the Capability Modelling criteria as a viable approach to addressing the problem domain when it is situated at the intersection in four referenced fields in the solution axis, namely



Strategic Management, Requirements Engineering, Conceptual Modelling, and Pattern Theory.

From an application viewpoint, and based on the feedback from the case studies during and post-transformation, we found that although the transformation was still tricky and faced many obstacles, the framework was beneficial in navigating the complexities of understanding its requirements. The transformation models were sufficient in **defining** and **sizing** the transformation **requirements** and **effort**, and they were high-level enough to organize the effort in the right direction without stringent constraints on implementing or choosing a particular solution. Most of the pain points gathered from the feedback interviews revolved around the implementation struggles. For instance, in the GAT (case study 1) and Income Marketing (case study 3) case studies (Appendix 1.6 and Appendix 3.6), the firms did not hire a specialized transformation consultant (because it was expensive). However, they either hired a new IT role or replaced their existing IT support capabilities to support the transformed work environment. At the onset, it would appear that it nullified the original purpose of saving a digital transformation consultant. However, investigations revealed that an internal IT role's responsibilities and goals differed from an external digital transformation consultant and would have been a necessary component of the *people* digital transformation requirements. This was confirmed as GAT (case study 1) hired an IT support dedicated process control employee; that role would have been in need past the initial high-fee consultancy transformation phase. Similarly, Case study 3 (Income Marketing) hired a Systems Engineer to maintain and oversee the implementation and compliance of the new systems, a role that would still be required post-transformation for a company of that size.

Therefore, we argue that from both the theoretical and application viewpoints, usage of SC-COST Framework contributes to solving SCF Digital Transformation research.

### 6.2.2 Critique of the generalizability of the patterns for SCFs

Patterns emerge from lessons learned in the practice of a particular discipline. Domain experts accumulate these lessons and season them with knowledge earned by studying their theoretical base. These experts can then shape and reshape patterns re-used in the domain.



Together, these activities constitute the development of a pattern. Nevertheless, to be helpful, the pattern has to be adapted to the specific context of its intended use (Petter et al., 2010). However, more subjective and human-oriented patterns, such as digital transformation patterns in the context of SCFs, may be more challenging to evaluate the success or failure of meeting the expected result. Failure to hit a precise target may not mean a failure of the pattern if the pattern brings us closer to the desired result. The fuzzier the domain and patterns, the more necessary it is to consider the social and organizational contexts when evaluating predictive validity (Pries-Heje et al., 2008a).

Evaluating patterns using one framework or the other has its limitations and may vary based on the context; there is subjectivity in evaluating techniques and interpretations of the results. Patterns are human descriptions subject to the same fallibility associated with similar endeavours, and reliability can still be examined but considered contextually and tied to achieving the essence of a pattern rather than an exact result.

Nevertheless, we argue that the patterns that emerged and evolved over multiple iterations over the six case studies could be generalized to the broader population of SCFs, especially that they proved effective by case studies 4, 5 and 6. Moreover, we argue that following a well-researched pattern evaluation framework that provides a more consistent approach to evaluating patterns is a sound approach (Chapter 5.4).

### 6.2.3 Critique on how SC-COST contributes to new knowledge

The eCORE conceptual framework developed by (Pericles Loucopoulos et al., 2020) and applied in recent work (Dimitrakopoulos et al., 2019; Pericles Loucopoulos, 2016; Pericles Loucopoulos & Kavakli, 2016a, 2016b) is one of the building blocks of the SC-COST framework (Chapter 3.1). The research intended to utilize eCORE in a new application context (that of Digital Transformation requirements of SCFs) to identify relevant SCFs capabilities, actors, goals, and subcomponents relationships across all primary business operations. By drawing insights from modelling those relationships, stakeholders can propose practical transformation solutions and devise feasible high-level Digital Transformation strategies. The new framework (SC-COST) encapsulates the combined usage of eCORE, patterns and a



modelling tool (eCORE tool). The benefit of identifying these patterns and using this framework is particularly of value to future case studies, as tested and already proven its value for case studies 4, 5 and 6 (See Chapters 4.4.6, 4.5.6, and 4.6.5). Therefore, we argue that SC-COST contributes new knowledge beyond eCORE as it provides practical propositions for the Digital Transformation requirements engineering for SCFs, by using a framework that encapsulates a conceptual eCORE, a tool and patterns.

### 6.2.4 Critique about the efficacy and applicability of the SC-COST Framework approach

The question of efficacy addresses the effectiveness of the SC-COST framework when applied to produce the desired or intended result, while the question of applicability addresses the quality of being relevant or appropriate. While there are many reasons why Digital Transformation fails, the SC-COST framework is not intended to become a fix-for-all solution. For example, research in change management and transformation shows that one of the main hindrances for the success of transformation comes from organizational resistance to change, especially if there is no strong buy-in from upper management or the main stakeholders (Aspara et al., 2011; Karvonen et al., 2018; Nambisan, Wright, & Feldman, 2019; Ramesh & Delen, 2019; Sarker & Lee, 1999; Tiersky, 2017). The feedback from Case study 3 Income Marketing Appendix 3.6 demonstrates this main shortcoming: once the upper leadership was not present to champion the transformation, the change did not occur. The SC-COST Framework is not intended to solve this problem. Strong buy-in and willingness to change still needs to be present for transformation to succeed.

Similarly, countless hindrances can affect the SC-COST framework's quality or relevance if not correctly applied, whether by not providing sufficient resources of time and people or poor management and understanding of own's organizational state. The case studies demonstrated that when sufficient attention and resources were given in the design and implementation phases, the framework and their transformation models were sufficient in **defining** and **sizing** the transformation **requirements** and **effort**. They were high-level enough to organize the effort in the right direction without stringent constraints on implementing or



choosing a particular solution, sufficient enough in predicting the desired outcome, and feasible enough to provide a viable alternative to expensive outsourcing alternatives.

Nonetheless, certainty in the framework's efficacy and applicability could be achieved if applied to a statistically significant number of consulting organizations. We believe that a quantitative study, where we gather statistically significant empirical results from its testing and use within more contexts, may confirm that its outcome sufficiently addresses the problem of identifying the proper generalizable digital transformation requirements for SCFs.

### 6.2.5 Critique about case study SCFs selection

SCFs choice and selection criteria sample size and the depth and breadth of the investigation can all be critiqued and could be argued to have negative and positive implications to the research.

The cons of SCF choice and selection criteria (Chapter 4, Table 11) are several. First, it could be argued that it is not a generalizable representation of SCFs around the world due to the geographical locations of the sample (mainly in the MENA region). Therefore local systemic influences (like culture, politics, and local laws and regulations) could skew the behaviour of the firms for that region. Second, it could be argued that the number of employees or turnover is may not be an accurate indication of an SCF, and the unsubstantiated claims of what defines an SCF is not supported by an empirical study or supported by broader research from the literature. Third, it could be argued that there is no substantiation to how the sample size represents the whole population of SCFs as the selection could be argued to be of convenience. Fourth, it could be argued that the diversity of case studies selected are either biased or non-representative of the general SCF population, and therefore the findings and analysis could be skewed or non-representative.

The counter-arguments for the SCF choice and selection criteria critique are several. In general, a level of similarity can make for better benchmarking and comparisons between the case studies and may provide consistency during the testing of the transformation exercise. Nonetheless, the specific critiques above could also be defended; First, the common geographic locations of the SCFs was reduced by selecting SCFs that operate within multiple



borders in the region, dealing with multiple cultures, laws and local biases. Second, while no formal research is conducted on the size definition of SCFs, the choice of a number of employees or the annual turnover is paralleled with the definition of SMEs (See Chapter 1.2.4), and therefore an argument could be made that the selection criteria for SCF size closely parallels established definition of size by the broader SME understanding. Third, the sample size counter-argument is that the nature of the DSRM methodology could be applied in either a qualitative or quantitative research setup, and this research is set up in a qualitative research setup whereby evaluation was conducted from deep-diving into case study analysis and not from a quantitative survey of statistical significance. The fourth argument regarding diversity is that none of the six case studies is identical in their services or competes in the same revenue pool. Additionally, once a similarity in the mode of services was identified in case studies 1, 2 and 3, a switch was to a different mode of service was conducted for case studies 4, 5 and 6 to test for diversity in modes of services.

There is undoubtedly always room for improvement in controlling local geographic influences, sizing of SCFs, and improving representation, and there are many possible critiques for the choice of case studies and SCFs. Nonetheless, this research intends not to provide a conclusive quantitatively proven hypothesis or theory but rather is intended to make a proposition for an improved framework supported by qualitative empirical evidence regarding the subject matter at hand. Further research can undoubtedly expand the selection to a broader and more statistically significant sample choice to prove the generalizability of the findings for SCFs.

### 6.3 Future research

The following Future Research Questions (FRQ) represent the multiple directions that the thesis opens for future research.

First, the question of *generalizability* of the SC-COST framework and whether it would be applied to Large Consulting Firms (LCFs) or the broader enterprise transformation practice in general. While we believe that the research is situated within the science of enterprise transformation and thus can potentially benefit larger enterprises, factors that differentiate



between small and large enterprises still need to be investigated and tested. Future research could apply the framework via case studies of large enterprises with more complex organizational dynamics and culture. In which case it the research could also benefit from comparing it to other well-established Enterprise Transformation frameworks as outlined in the literature Chapter 2.3.1.

Second, the question of *efficacy and applicability* of the SC-COST framework to all SCFs. The number of case studies was limited and is considered a non-statistically significant sample. Our aim was not to produce a theory but rather to provide a proposition for a framework resulting from a deep dive into six case studies and draw insights and patterns. However, future research can benefit from a more comprehensive empirical study, including statistically-significant testing, further validating the hypothesis that the Capability Oriented Requirement Engineering (eCORE): SC-COST framework is a good solution for addressing the Digital Transformation requirements challenges of any SCF.

Third, the question of research into modelling the *implementation layers* of the SCFs. While the research limits the analysis to the high-level abstraction layers (Chapter 5.2), there are many opportunities to expand research into modelling the implementation layer in the context of the SC-COST framework. The problem area is vast, and multiple papers could be dedicated to further researching this area.

Finally, there is the need to *enhance the usability of eCORE tools* from their rudimentary state to a professional production state. While the tool stemmed from the need to model the eCORE framework and test the patterns, it was not developed for commercialization or widespread usage. It was a research tool by writing this thesis and served as proof that the framework and approach are possible and valid for solving real-world problems. Future enhancements of the tool and its usability and capabilities are possible areas for future research work. One expansion area includes extending the eCORE tools to produce automated low-level functional requirements statements which can be broken down further in functional point estimates and work breakdown structures (WBSs).



## Chapter 6: Discussion and conclusion

Keeping in mind all the critical points and the feedback received from the stakeholders, we genuinely believe in the amazing implications of applying this framework and the potential for greater scientific contributions to the research community.



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## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)

Company Name	Global Appraisal Tech (GAT)
Small Consulting Code	GAT
Description of services	A small consulting firm specialised in Real Estate Appraisals
Interview Date(s)	06/03/2018 07/03/2018 21/03/2018 30/07/2021 (Feedback interview) 31/07/2021 (Feedback interview)
Interview with	Mahmoud Samy (General Manager) Mohamed Aboarab (Project Manager) Moamen El Sayad, Ebrahim Said, Ahmed Rafat (Valuers) Nourhan Salama (Business Development)

### 1 Background of the firm

#### 1.1 About GAT

Global Appraisal Tech (GAT) is a Small-Consulting-Firm (SCF) specialising in appraisals. The firm is registered at the Central Bank of Egypt (CBE), the Egyptian Financial Regulatory Authority (EFRA), the TAQEEM authority in Saudi Arabia, and an International license from the RICS in the U.K. The firm operates throughout the MENA and Africa region, concentrated in North Africa and GCC countries.

Typical customers include banks, brokerages, financial advisors, asset and portfolio managers, public and private companies, governments, and courts. A few individuals also use GAT's services for personal use.



## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)

### 1.2 Products and Services offered

The firm provides the following consulting services

1. Asset valuation services (Real Estate, Machinery and Equipment).
2. Loan Supervision Services.
3. Development Feasibility studies.
4. Technical Due Diligence.

### 1.3 Workforce & Culture

The firm employs 50 full-time employees, including valuers, inspectors, report authors, surveyors, and support staff (secretary, collections officer, and marketing). The firm outsources some non-core functions such as facility management, security, courier services, HR management, and tax accounting. Depending on the project at hand, the firm also uses free-lance consultants and third party specialised firms.

The overall culture reflects the Managing Directors' character, which is very relaxed with structure (e.g., flexible office hours and no titles) but is strict with processes and results. The priority is to do the job right and deliver it on time, and the emphasis is on personal responsibility and resourcefulness to get things done. The organisation is relatively flat, with only three levels. Upper management (Typically the Managing Director and the Partners), middle management (4 managers for four departments: Project Management, Marketing, Accounting, and Office Management), and the rest of the employees are directly managed by one of those four managers.

### 1.4 Information gathering

In total, five interviews were carried out with the GAT team. The first three interviews were carried out in March 2018 and were exploratory; this was the first case study, and we still did not have a developed artefact. They were conducted in intensive several-hour white-board workshops. The eCORE framework was introduced up front, and the stakeholders collaborated with these set goals in mind:

42. Identify the central business use cases of their SCF.



## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)

43. Conceptualize and Model the AS-IS eCORE model of their SCF.
44. Design the elements of their Digital Transformation as they see fit.
45. Conceptualize and Model the TO-BE eCORE model based on that design.
46. Translate their understanding of those transformations into pragmatic requirements for change in their People, Process and Technology components.

The workshops were done in collaboration with the researcher, and the first set of models created the earliest prototype of the building blocks of the SC-COST Framework. Throughout the case study, it was clear that there was also a need for a more efficient tool to solicit requirements and conceptualize the eCORE model.

Those models were further enhanced in the second round of interviews in July of 2021, more than three years later. The second round was intended to obtain feedback on the transformation project and revise the model in hindsight. Those interviews benefited from the evolution in the tool and the process as a result of researching the other five case studies, and a more precise and consistent ontology and framework were gauged for feedback.

The outcome of that exercise is outlined in the following five sections:

## 2 Use Cases

Although many use cases could be generated for **Digital-Transformation (DT)**, the following use cases represent the core structured activities of the firm and encompass the main areas in need of digital transformation.

### 2.1 UC\_SCF1\_1: Conducting a Real Estate Valuation

Use Case ID	<UC_SCF1_1>
Goal	Conducting a Real Estate Valuation
Actor(s)	<ol style="list-style-type: none"><li>1. Client</li><li>2. Inspector</li><li>3. Project Manager</li><li>4. Valuer (Chartered Surveyor)</li><li>5. Report Author</li></ol>



## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)

	<ol style="list-style-type: none"> <li>6. Reviewer (typically a Registered Valuer or a Partner in the firm)</li> <li>7. Legal</li> <li>8. Marketing (Business Development)</li> </ol>
<b>Use Case Overview</b>	<p>When a request for a valuation project is given to the valuation team, the project manager assigned on the task allocates the proper resources, the customer is contacted to collect the asset's information, followed by site inspection, then a desktop review and investigation, followed by a valuation exercise, report writing and reviewing then approval by the principal Valuer before releasing the draft to the customer for acceptance. Once approved the assignment is closed and the task goes to collections for fees.</p>
<b>Trigger(s)</b>	<p>Marketing (Business Development) assigns a Valuation project to a Project Manager.</p>
<b>Precondition(s)</b>	<p>Engagement letter signed, and the project is set to go from the business development department.</p>
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. The Project Manager gets assigned the valuation project.</li> <li>2. The Project Manager allocates the resources required for the assignment: A Valuer, an Inspector, a Report Author and a Reviewer.</li> <li>3. The Valuer sends an email to the customer outlining the required data such as property deed, location, building drawings, asset register (if applicable), and latest maintenance records or invoices (if applicable).</li> <li>4. The Valuer conducts a Desktop Review of the documents and collects comparable data from transaction databases in the area of the asset. Data sources include primary sources collected directly by asking brokerage homes; or secondary sources, including Third-party Market Research firms that collect data on transactions from Government registry or brokers.</li> </ol>



## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)

	<p>5. The Inspector arranges a site visit on an agreed-upon date with the customer. The Inspector visits the asset, conducts measurements, takes photos, inspects the property and the surrounding, and returns to the office to write a Condition Assessment Report, then hands it over to The Valuer.</p> <p>6. The Inspector and the Valuer meet to discuss the outcome of both the data collected, the documents provided, and the inspection results, weigh the factors and the comparables and adjust to arrive at an agreed-upon value, then notify the Report Author.</p> <p>7. The Report Autor pulls together the data, pictures, and valuation tables to write the report in accordance with and in compliance with the IVS standards, then notifies the Project Manager.</p> <p>8. The Project Manager arranges a review between The Valuer and The Client over the draft report to verify assumptions, data used, and outcomes and collects feedback.</p> <p>9. The Project Manager arranges a review between the Valuer, Inspector and the Reviewer who is a senior valuer as well as review by Legal for liability and compliance.</p> <p>10. Once approved, it is printed, stamped and sent to The Client. Then the assignment is handed over to the accounting department for invoicing and collections.</p>
<b>Termination outcome</b>	A compliant official valuation report that outlines the condition assessment and the value of the property.

### 2.2 UC\_SCF1\_2: Engaging a new assignment

Use Case ID	<UC_SCF1_2>
<b>Goal</b>	Engaging in a new assignment
<b>Actor(s)</b>	<p>1. Client</p> <p>2. Marketing (Business Development)</p>



## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)

	<ol style="list-style-type: none"> <li>3. Partner (Senior Consultant or Director)</li> <li>4. Project Manager</li> <li>5. Valuer (Chartered Surveyor)</li> <li>6. Legal</li> </ol>
<b>Use Case Overview</b>	<p>When a Client approaches the firm for a valuation exercise, they first ask for a Request for Proposal (RFP), Marketing (Business Development) sends them a technical and financial offer, which they typically negotiate until approved, after which they sign an engagement letter.</p> <p>Alternatively, through personal connections, a Partner requests that Marketing send a Proposal to a specific Client.</p> <p>Alternatively, governments or public entities announce RFPs or Request for Vendors publically. Marketing subscribes to newsletters of vendor lists and applies with a proposal or application when a job is posted.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Client emails the firm with an RFP.</li> <li>• A partner develops a client and asks the firm to prepare a proposal.</li> <li>• Marketing applies for a tender or public ad for RFPs</li> </ul>
<b>Precondition(s)</b>	None
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. An email is received from a Client or a Partner requesting a quotation or proposal.</li> <li>2. Business Development opens a new case and sends the project details to Project Management for the technical offer, effort and cost estimation.</li> <li>3. Business Development prepares financial offer based on costs, customer's history, and competitiveness.</li> <li>4. Business Development reviews the proposal with a Partner and obtains approvals.</li> </ol>



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	<ol style="list-style-type: none"> <li>5. Business Development submits the proposal to the Client.</li> <li>6. The Client responds with a counter-offer, negotiates cost, time or terms.</li> <li>7. Business Development adjusts the proposal after negotiations and resubmits.</li> <li>8. Client approves the proposal, signs, and issues a work order.</li> <li>9. Business Development assigns the assignment to Project Management.</li> </ol>
<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• An engagement is signed, and the assignment commences to Project Management.</li> <li>• Alternatively: Cancelled, whereby the engagement fails and goes to a competitor.</li> </ul>

### 2.3 UC\_SCF1\_3: Collections

Use Case ID	<UC_SCF1_3>
<b>Goal</b>	Collections
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> <li>3. Project Manager</li> <li>4. Accounting</li> </ol>
<b>Use Case Overview</b>	<p>When a client signed the engagement, they have to pay a deposit, which triggers the start of the execution of the assignment.</p> <p>Or when an assignment is concluded, they have to pay the balance of payment.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Marketing approves an engagement.</li> <li>• Project Manager submits the draft report or delivers a final report.</li> </ul>
<b>Precondition(s)</b>	Approved Engagement Or Approved Draft Or Approved final report.



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<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"><li>1. Marketing pings Accounting to issue a proforma invoice for the advance payment before the start of work.</li><li>2. Accounting reviews the terms and engagement and programs the payment schedules into the accounting software.</li><li>3. Accounting issues the advance payment proforma and communicates with the client for collection.</li><li>4. Once the collection is complete, Accounting approves the commencement of the project to the Project Manager.</li></ol>
<b>Alternative Flow 1</b>	<ol style="list-style-type: none"><li>5. The Project Manager signals to Accounting that the draft has been submitted to the Client.</li><li>6. Accounting reviews the payment schedule; if a payment is due upon draft delivery, then Accounting issues another proforma invoice for the draft payment.</li><li>7. Once the collection is complete, Accounting approves the final report's release.</li></ol>
<b>Alternative Flow 2</b>	<ol style="list-style-type: none"><li>8. The Project Manager signals to Accounting the delivery of the final report.</li><li>9. Accounting issues the final payment invoice, including any amendments, taxes and additional expenses.</li><li>10. Accounting follows up with the Client until the collection is complete, then marks the assignment finished.</li></ol>
<b>Termination outcome</b>	<ul style="list-style-type: none"><li>• All the payments have been paid following the engagement agreement.</li></ul>

### 2.4 Other use cases

There are many other functions in the firm, including:



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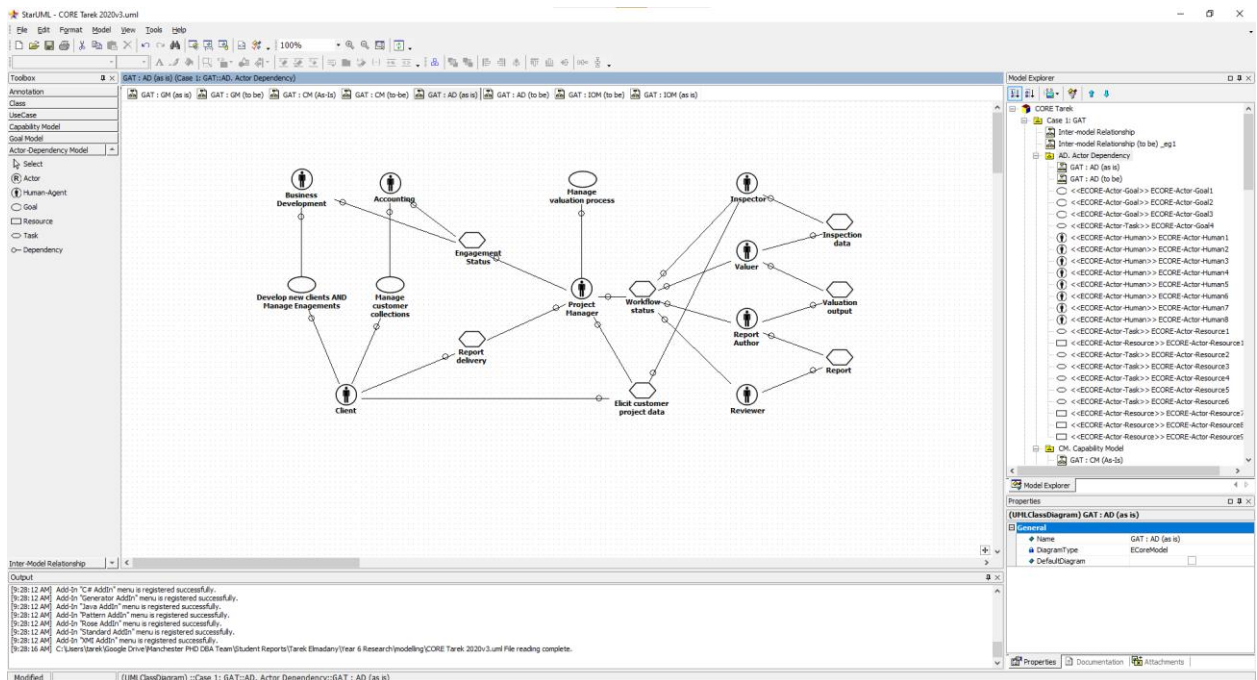
47. Accounting and expense tracking: Accounting (Financial controller) allocates hours and costs to projects. They carry out their job using excel files and desktop-based accounting software. Could benefit from a cloud-based integrated system with the PMS and CMS.
48. Asset tracking: Physical resources such as Meeting rooms, Company cars used by inspectors, and Measurement Total Stations used by Surveyors, are all shared resources that are currently tracked manually by the Office manager and require some asset tracking software with GPS enabled (for cars for instance) and integration with the PMS and CMS if possible.
49. Human Resource Management: Employees' billable hours, attendance, vacations, sick leaves, benefits, contract renewals, and more are managed manually via excel files by the Office Manager and reviewed and approved by a Partner. A Human Resource Management (HRM) system could be implemented that integrates with an automated access control device (fingerprints or cards) to calculate hours automatically, and also allows employees to enter their vacation times and leave and track their pay, bonuses, sick days and more via an online programmed portal. Possibly also integrate with the PMS to calculate billable hours automatically.



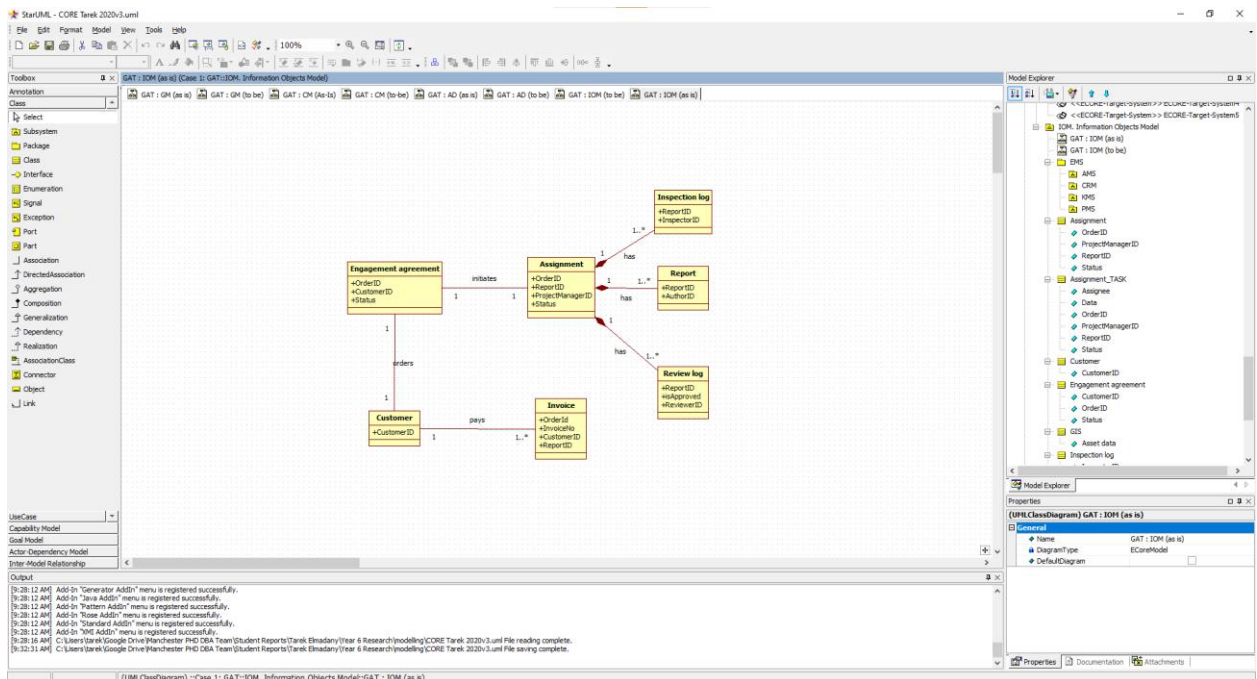




## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)



### 3.4 AS-IS Information Objects



### 3.5 AS-IS Intermodel correlation

The intermodel relationships correlate the high-level entities in each viewpoint with its counterpart in the other three viewpoint models. Those relationships are coupled in the



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eCore-Tools and are available for the modeller to navigate quickly when highlighting one entity in the intermodal view.

<b>Model Use Case</b>	<b>Capability Model</b>	<b>Goal Model</b>	<b>Actor Depend- ency</b>	<b>Informational Objects</b>
UC_SCF1_1: Conducting a Real Es- tate Valua- tion	CAP1: Project Man- agement (with re- sources and abilities)	G3. Achieve Ef- ficient Valua- tion Process	Goal: Manage Valuation pro- cess  Task: Engage- ment Status  Task: Workflow Status  Task: Elicit cus- tomer project data  Task: Report delivery  Task: Inspec- tion data  Task: Valuation output  Task: Report Actor: Project Manager  Actor: Inspec- tor  Actor: Valuer  Actor: Report Author  Actor: Reviewer	Class: Engage- ment Agree- ment  Class: Assign- ment  Class: Inspec- tion Log  Class: Report  Class: Review Log



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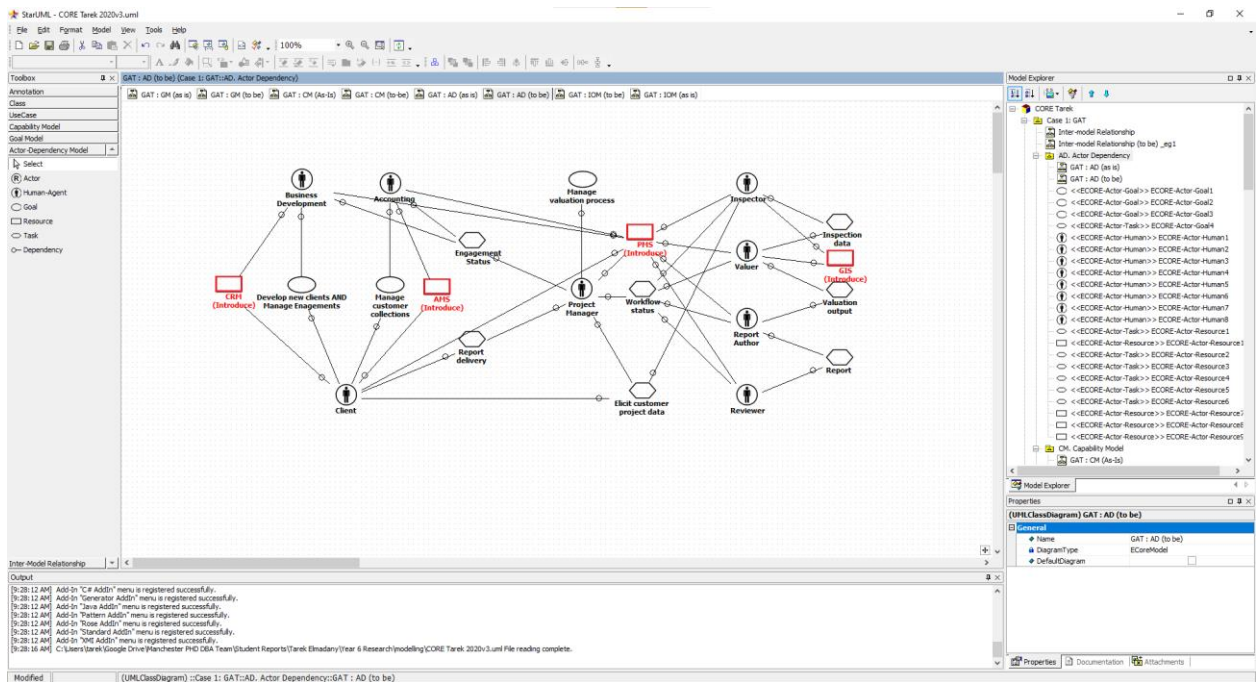
	CAP6: Business Development (with resources and abilities)	Achieve Manage customer relations and satisfaction	Task: Engagement Status	
UC_SCF1_2: Engaging a new assignment	CAP6: Business Development	G2. Achieve Optimize Business Development	Goal: Develop new clients Goal: Manage Engagements Actor: Client Actor: Business Development	Class: Engagement Class: Customer
UC_SCF1_3: Collections	CAP7: Collections (with resources and abilities)	G4. Achieve Effective Collections	Goal: Manage customer collections Task: Engagement status	Class: Invoice Class: Customer



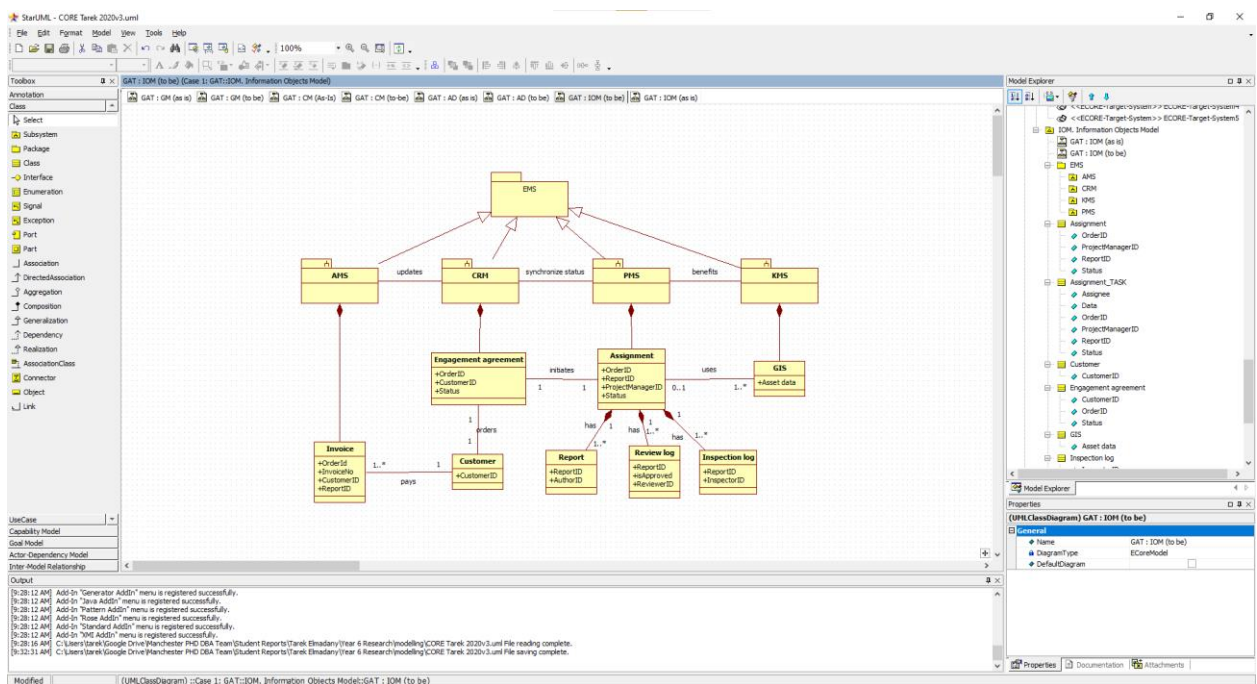




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### 4.4 To-be Information Objects Model



### 4.5 To-be Intermodel correlation







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	<ul style="list-style-type: none"> <li>• Switch to a paperless working environment to reduce cost and improve sustainability.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Version conflicts when a document is passed around.</li> <li>• Hard to search since the content is not indexed from Operating System.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More collaboration.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Content Searchability.</li> <li>• Accessibility (Connectivity).</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• [Introduce] Cloud Document Control</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Convert to cloud-based collaboration tools such as Microsoft 365 or Google Docs.</li> <li>• Use a document control system to check-in and check-out documents to avoid conflicts.</li> <li>• Cloud artefacts are content searchable.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office.</li> <li>• Emails.</li> <li>• Google Earth.</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, comparables, and statistics are all stored in excel files inside the project folder.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation.</li> </ul>



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	<ul style="list-style-type: none"> <li>• Paperless and Sustainability.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and doesn't allow simultaneous collaboration.</li> <li>• Data is not indexed, which makes it hard to search and hard to reuse for future projects.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More integration across data assets.</li> <li>• Accessibility (Connectivity)</li> <li>• Content Searchability.</li> <li>• Synchronisation and conflict avoidance.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• [Introduce] Graphical-Information-System (GIS) (Cloud-based)</li> <li>• [Introduce] Cloud Document Control.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Data could be stored on a cloud-based DB on a map (using the GIS) which enables collaboration, easy search by location and reusability of data.</li> </ul>
<b>Operation</b>	3. Mapping
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Google Earth</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Drawing the subject asset on the map.</li> <li>• Indicating the location of the comparables.</li> <li>• Taking measurements of areas of land plots.</li> <li>• Understanding the asset and the surrounding via street view before the site visit.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Ease of use.</li> <li>• Searchability.</li> </ul>



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	<ul style="list-style-type: none"> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and inaccessible outside the user's computer.</li> <li>• Data fragmented since there is no meta-data stored.</li> <li>• Does not allow simultaneous collaboration or reusability of data across desktops.</li> <li>• Hard to search and reuse old data due to non-standardised logging.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Synchronisation across assets.</li> <li>• More integration across data assets.</li> <li>• Field accessibility (connectivity).</li> <li>• Maintainability (outsourcing IT support for complex graphical infrastructure)</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• [Introduce] Graphical-Information-System (GIS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Powered by a map engine. It provides additional collaboration, accessibility, meta-data, searchability, and analytical tools.</li> <li>• Is accessible via Smart-phone and can upload data, measurements, and pictures directly from a smartphone on the field.</li> <li>• Outsources the upkeep and upgrade burden of the sophisticated graphical tools.</li> </ul>
<b>Operation</b>	4. Resource planning, Workflow and Project Management
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Emails</li> <li>• Microsoft Project</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Resource planning in Excel and tracked by emails.</li> <li>• Workflow management in Microsoft Project Communication with the client and other staff.</li> </ul>



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	<ul style="list-style-type: none"> <li>• Follow-up on tasks and assignments.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Data is kept in threads in staff inboxes.</li> <li>• Data is unorganised and often lost.</li> <li>• Inefficient Resource Planning via Excel.</li> <li>• Centralised on PMs computer and not transparent to employees.</li> <li>• Causes PM to be the bottleneck in communicating project goals and status.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Transparency (Status accessibility by everyone in the organisation).</li> <li>• Accessibility (connectivity).</li> <li>• Higher efficiency through faster status awareness and more synchrony.</li> <li>• Maintainability (outsourcing the burden of technology upkeep).</li> <li>• Integration across all company resources and assets.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• [Introduce] Project Management System (PMS) (Cloud-based)</li> <li>• [Introduce] Enterprise-Resource-Planner (ERP) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Resources, tasks and projects are all connected.</li> <li>• People have access via cloud portal and can follow up on their tasks and understand their assigned tasks.</li> <li>• Workflow is transparent, and status is clear.</li> <li>• System offers threads for comments, history, attachments.</li> <li>• Integrates with other systems such as ticketing from the client, GIS, and reports artefacts.</li> </ul>
<b>Operation</b>	5. Engagement



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<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Customers communicate with the firm via emails, and engagement is kept in email threads.</li> <li>• Customers informally communicate with staff offering valuable data via social media, messaging apps and phone calls.</li> <li>• Contracts are all created in word and printed for signing and stamping.</li> <li>• Scanned documents are stored on PC, and backed up on external drives.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Does not offer accessibility from outside the office.</li> <li>• Slow process and labour intensive.</li> <li>• Hard to track and search emails for customer history.</li> <li>• Hard to centralise communication across alternative messaging apps and social media.</li> <li>• No meta-data is stored on the customer or relation to previous engagements. Often have to rely on memory.</li> <li>• Difficult to relate the engagement to the project once transferred to PM.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> </ul>



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<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• [Introduce] Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use of a cloud-based CRM that would integrate with Project Management system and Accounting systems.</li> <li>• CMS would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp.</li> </ul>
<b>Operation</b>	6. Collections
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>• Scheduling and reminders are scheduled on Microsoft Outlook Calendar.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the customer, and PM requests from Accounting to submit a final invoice. This process is highly dependent on memory and personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> </ul>



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	<ul style="list-style-type: none"> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• [Introduce] An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM, to offer traceability and event-driven automation and reminders.</li> </ul>

### 5.2 Process Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the process component resulting from the modelling exercise

<b>Operation 1. Valuation (The core service of the consulting practice)</b>	
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Usage of MS word template for report authoring.</li> <li>• Assigning a report author (person)</li> <li>• Manual tracking of progress through weekly meetings and email chains</li> <li>• Storage on PCs and sharing of files through email chains and USB flash drives</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Process is coded in training manuals for new employees.</li> <li>• Project managers track the progress and status of jobs with their different phases in their project manager desktop software.</li> <li>• Follow-up of the process and workflow of this phase is the responsibility of the Report Author, and follow up for status and compliance is the responsibility of the Project Manager.</li> </ul>



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	<ul style="list-style-type: none"> <li>• Synchronization of status and updates are communicated through meetings and electronic channels such as emails, direct messaging, or phone calls.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Process standardization.</li> <li>• Process accountability by defining the scope of responsibility in each stage of the workflow.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Training manuals are often outdated, and updating the manuals are often postponed indefinitely in favour of getting work done.</li> <li>• The knowledge of status and stage inside the workflow is only kept with the Project Manager.</li> <li>• Adherence to the process is highly reliant on the individual's compliance.</li> <li>• Most of the institutional history, knowledge and experiences are implicitly known by the individual (personal memory) with minimal explicit knowledge recording in files or documents, making the transfer of knowledge and experience highly reliant on employee retainment.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More transparency and accessibility of status and workflow statuses and stages.</li> <li>• More standardization of process compliance across teams.</li> <li>• Better synchronisation between different actors and conflict avoidance.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• [Introduce] Workflow scheme coded inside a collaborative online Project Management System (PMS). The system allows for assigned responsibilities, updates of status workflows, automated monitoring of deadlines and reminders.</li> <li>• [Introduce] A new check-in and check-out document control process using a Cloud Document Control System.</li> </ul>



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<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• More visibility into document status and workflow status.</li> <li>• More control over document standardization and version control.</li> <li>• Automatic storage of institutional knowledge and history.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Data is collected by multiple roles from multiple sources:</li> <li>• Valuer solicits the client for project data.</li> <li>• Inspector collects field data, measurements, and site information.</li> <li>• Market Research Team collects market data and indices.</li> <li>• Data is consumed by the Valuer, the Project Manager, and the Report Author.</li> <li>• After the project is complete, the entire project folder gets archived on the company local server.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, comparables, and statistics are all stored in soft format inside the project folder on the company local server.</li> <li>• Hard-format data is digitized by scanning, then stored in a project paper folder in the archive room.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Centralization and Compartmentalization.</li> <li>• Paperless and Sustainability.</li> <li>• Traceability.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The process of collecting data and storing it is manual and not standardized.</li> <li>• Check-lists and templates are often always out of date.</li> <li>• Data sources are non-traceable, and accountability is non-measurable due to lack of a tracing or sign-in/out process.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Streamline the process across different roles.</li> <li>• Accessibility (Connectivity)</li> </ul>



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	<ul style="list-style-type: none"> <li>• Knowledge searchability and reusability.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Traceability by allowing check-in/check-out process.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• A Graphical-Information-System (GIS) (Cloud-based) archiving process allows for a searchable data collection workflow and storage.</li> <li>• A technology-enabled check-in/check-out accountable and traceable process using an accessible Cloud Document Control system (DCS)</li> <li>• Integration between the two GIS and Cloud DCS for seamless searching, locating and accessing of data.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Updated process for data collection, consumption and storage is integrated within the intuitive usage of the cloud-based Document Control System (DCS) on a map (GIS) which enables accountability, traceability, collaboration, easy search by location and reusability of data and knowledge.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Template offers, contracts and engagement letters are created in Microsoft Office / Adobe PDF and communicated via emails or snail mail (printed)</li> <li>• Negotiations and agreements are achieved via personal meetings, phone conversations, and over emails.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• The process is manual, and reliant on the personal quality and consistency of the Business Development personnel.</li> <li>• The process involves omni-channel presence via emails threads, whatsapp threads, and social media threads and all connected together in the business development personnel's head.</li> </ul>



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<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> <li>• Customer satisfaction (Omni-channel communication, friendly human interaction, and quick personal response by lowering bureaucracy).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Manual process is inefficient, inconsistent and labour intensive.</li> <li>• Process is non-traceable, often hard to hold individuals accountable, and causes many missed opportunity due to lack of tools for automated follow-up.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Consistency and automated reminders, status updates and effective workflow management.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• Software Task-oriented programmed workflow designed in a Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Technology-enabled processes using the cloud-based CRM would force a consistent and quality engagement experience, follow-up and reminders.</li> <li>• CMS would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp to allow for a single point of process follow-up and management.</li> <li>• Updates to online templates and improvements in check-lists on the CRM automatically persists into the future without remembering to change it manually every time, hence less risk to human error.</li> </ul>
<b>Operation</b>	4. Collections



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<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> </ul> <p>Scheduling and reminders are scheduled on Microsoft Outlook Calendar.</p>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the customer, and PM requests from Accounting to submit a final invoice. This process is highly dependent on memory and personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>



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<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM, to offer traceability and event-driven automation and reminders.</li> </ul>
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### 5.3 People Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the people component resulting from the modelling exercise.

Operation	1. Valuation (The core service of the consulting practice)
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Project Managers</li> <li>• Valuers</li> <li>• Inspectors</li> <li>• Report Authors</li> <li>• Reviewers</li> <li>• Support staff (Secretaries, drivers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• The central leader is the Project Manager, who has to coordinate the entire process, starting with assigning roles, coordinating schedules, maintaining the pace of the progress, and ensuring status updates, follow-up and quality control.</li> <li>• Valuers and Inspectors collaborate in the core of the consulting work, which is to arrive at an opinion of value.</li> <li>• Report Authors and Reviewers use the results from the Valuers and Inspectors to produce standard-compliant reports.</li> <li>• Support staff help with printing, delivery and non-technical support work.</li> </ul>
<b>Why was it setup that way?</b>	<ul style="list-style-type: none"> <li>• Specialization and efficiency.</li> </ul>



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	<ul style="list-style-type: none"> <li>• Role accountability by defining the scope of responsibility in each stage of the workflow.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The Project Manager is the only central point of synchronization; his/her role is on a critical path to completion, introducing risk.</li> <li>• Communication and synchronization are slow and inconsistent.</li> <li>• Consistency and Quality are often forgone for speed and delivery.</li> <li>• Process and Workflow are People dependent. While everyone knew what needs to be delivered, every team had their way of achieving it, which mainly relied on people skills and experience and less on standardized systems.</li> <li>• People used varying non-standardized enabling technologies with no centralized technology strategy, which often caused multiple synchronizations and quality problems.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Achieve decoupling of the dependency on people and shift to the dependency on systems and technology.</li> <li>• Achieve higher efficiency from people who are distracted by context switching and repetitive non-productive synchronizing and admin work.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Current roles to train on the usage of enabling new technology and integrated system processes and workflows.</li> <li>• [Introduce] GIS admin, IT systems admin, Process compliance admin.</li> <li>• [Introduce] Automated workflows and processes, including standardized scheduling, automating assignment based on workflow stages, automatic reminders, integrated centralized communication and document repository that is auto-synchronized and status aware.</li> <li>• [Cease] Manual communication support roles and replace with technology.</li> </ul>



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<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Improves people's productivity by eliminating much of the manual work.</li> <li>Reduces errors and improves quality by shifting some standardization onto systems and technology previously used to suffer from people error.</li> <li>Enhances people value since technological enhancements free up people's wasted attention and time and instead shift the focus on improving their core consulting competency and skills.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>Project Managers</li> <li>Valuers</li> <li>Inspectors</li> <li>Marketing (Business development) specialists</li> <li>Support staff (secretaries, security, facility management, drivers.)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>Data of different types and scopes are collected by each specialists depending on their needs. For example, a valuer will collect documents and comparative evidence, while an inspector will collect measurements and site information.</li> <li>Data is collected and stored with each person on their devices. At the end of the project, the Project Manager tries to gather all the files and artefacts in one archived folder on the local computer server.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>Specialization</li> <li>Responsibility: It would be clear who is collecting and keeping the data.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>Inconsistent data collection procedures that depends on the quality of each team.</li> </ul>



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	<ul style="list-style-type: none"> <li>• No central owner or responsible person for data management and archiving.</li> <li>• Ineffective data reusability and mining since it depends on people's memories.</li> <li>• Highly reliant on individual due diligence and personal capability.</li> <li>• Clients complain that many people reach out to them from the firm asking for data all the time.</li> <li>• Many concerns on data privacy and security control.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• To improve the quality and comprehensiveness of data collection.</li> <li>• To centralize control of data for security, liability, compliance, traceability, and responsibility purposes.</li> <li>• For better indexing, searching, and reusability of data which is the foundation of the knowledge base.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] KM and GIS admin: responsible for data management using technology-enabled cloud-controlled data-traceable data and knowledge management systems (including cloud drives, GIS, and indexable databases).</li> <li>• [Improve] The roles of Project management, Valuers, Inspectors and Marketing to train on the new technologies and processes for data collection, control and storage.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Maintains specialization.</li> <li>• Introduces control and standardization.</li> <li>• Introduces Knowledge reuse capabilities.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Main Consulting Partners</li> <li>• Marketing (Business development) specialists</li> </ul>



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	<ul style="list-style-type: none"> <li>• Support staff (secretaries, couriers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Partners and Marketing specialists use their connections to solicit past clients, current clients and future clients (client acquisition) to procure new jobs.</li> <li>• Once a request for proposal is made, engagement agreements are prepared and signed.</li> <li>• Procedures for communicating, signing and exchanging documents are handled by the Marketing (Business development) staff.</li> <li>• Contracts and agreements are stored on company computers under the responsibility of the business development staff.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide high customer personal care.</li> <li>• Focus on personal responsibility.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of standardized agreements resulting in many missed opportunities and errors.</li> <li>• Followup is reliant on individuals diligence in setting up personal reminders and memory.</li> <li>• Tracing of engagement status is reliant on individual memory.</li> <li>• Customer care level is reliant on individual skills and experience.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Personnel want more standardized artefacts, including offer documents, engagement agreements and data collection criteria.</li> <li>• The need to decouple customer service level from relying on individual skills to relying on a system of service standards that could be quickly followed and trained by any individual.</li> </ul>
<b>To-Be People</b>	<ul style="list-style-type: none"> <li>• [Improve] Train marketing staff on Customer Relation Management (CRM) system, including a new standardized process.</li> </ul>



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<b>improve-ments</b>	<ul style="list-style-type: none"> <li>• [Improve] Train marketing staff on the new Cloud-based Document Control System (DCS) to store the artefacts and understand how it is integrated with the CRM and the Accounts Management System (AMS)</li> <li>• [Introduce] Automation in the customer follow-up and engagement workflow to add reminders, automatic assignment of roles, automated status updates, and automatic linkages of previous engagements and knowledge.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Personnel offer a more consistent and higher quality of client experience.</li> <li>• Personnel have more robust traceability, status awareness and workflow management capability.</li> <li>• Personnel can more accurately price and generate higher revenues due to better client knowledge and historical understanding.</li> </ul>
<b>Operation</b>	4. Collections
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Accounting and finance personnel.</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, security, couriers, drivers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Accounting depends on Marketing to obtain status updates on contract and engagement agreements and stages in the workflow.</li> <li>• Accounting liaises directly with the clients and vendors to process payments, settle invoices and taxation requirements.</li> <li>• Accounting liaises with Project Management to give the signal to release the start of progress (in the case of fulfilment of down-payment) or to release the final report once the Client fulfils the final payment.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide a high level of customer care.</li> <li>• Protect and fulfil business financial rights and obligations effectively.</li> </ul>



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	<ul style="list-style-type: none"> <li>• Privacy and security of financial dealings from the rest of the organization and the competitors.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The reliance on individuals can sometimes act as a bottleneck and hinders progress.</li> <li>• Non-standardized or integrated system to communicate status efficiently leads to mistakes, lost revenues and angry customers.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Better synergy with the workflow of the core business.</li> <li>• Faster response times.</li> <li>• Higher status awareness and synchronization.</li> <li>• Higher collection and effective customer handling in alignment with Marketing and Project Management.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] A new dependency between Accounting and the CRM system via integrating the newly introduced Account Management System (AMS).</li> <li>• [Improve] Train the accounting personnel to use the newly introduced Account Management System (AMS) that automates communication, provides seamless status synchronization across systems, and leads to real-time status awareness.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Provides a more consistent customer experience.</li> <li>• Maintains the primary business goals of privacy, specialization, protection of business financial interest while eliminating the ineffective communications problem.</li> </ul>



## 6 Post-Transformation Feedback

### 6.1 Analysis of the transformation

A round of interviews was conducted after a while (as per interview dates above) to assess the feedback and progress of the digital transformation. The following summarizes the findings:

Operation	1. Valuation (The core service of the consulting practice)
How was transformation implemented?	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>A new cloud-based Project Management System (PMS) was installed, whereby all the valuation assignments were inputted as a trackable unit named “<i>assignment</i>”.</li> <li>Each <i>assignment</i> in the system had attributes following the Information Object Model, represented in data fields. Data are inputted via forms and attachments either filled out at the beginning or throughout the workflow (e.g. assignment date, inspection date, address, description, attachments, etc.)</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>A new workflow was codified, where the task would pass through eight workflow statuses: Assignment, Data collection, Inspection, Desktop Review, Report Authoring, Revision, Approval, Delivery.</li> <li>As soon as Business Development creates the <i>assignment</i> in the system, they pass it on to the Project Manager (PM) by selecting the right field. The system would notify the PM, who would then assign the team working on it by filling out the appropriate fields. The team members are all notified about their roles, deadlines, and statuses in the workflow by viewing the <i>assignment</i> on the system, and they get access to all their assignments via their system dashboard.</li> </ul>



	<ul style="list-style-type: none"> <li>Team members finish their tasks and sign off on the PMS; the PMS automates the workflow by passing it on to the subsequent assignee on the workflow and is programmed to utilize all the necessary notifications, alerts, status updates and reminders.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>Employees were re-trained to use the system and adapt their pre-transformed workflow to the new technology and process.</li> <li>Employees were assigned to the different <i>assignments</i> in the PMS system and could find all their relevant data, update artefacts, trace the history of all their work and other peoples' work from their dashboard.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>Almost all of the workflow was transformed to the new digital technology and process, including the document repository, which allowed efficient check-in and check-out, sharing security, and traceability and conflict avoidance.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>The company elected to run two systems in parallel (pre and post-transformation) for a year to ensure all the kinks were sorted out.</li> <li>Many employees resisted the change, and only when management employed a new <u>IT support dedicated process control employee</u> did much of the initial resistance subside. Today the company is wholly dependent on the new system.</li> <li>Management complained that they underestimated the resources needed to digitize the backlog. Additionally, the effort initially slowed down work and hindered the teams from achieving their targets in the first year.</li> </ul>



	<ul style="list-style-type: none"> <li>One “old-school” partner did not adapt well to the new work mode and is still struggling two years into the transformation with accomplishing basic tasks.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>Management wished there was a better way to digitize the backlog.</li> <li>Employees benefited significantly from having a dedicated <i>IT support dedicated process control employee</i> to answer their frustrations when they were stuck until they became fully trained. Management has contemplated the need to have a supporting role at the beginning of transformation projects of this kind.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The transformation models were sufficient in <b>defining</b> and <b>sizing</b> the transformation <b>requirements</b> and <b>effort</b>. They were high-level enough to organize the effort in the right direction without stringent constraints on implementing or choosing a particular solution.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>Four new technologies were installed and integrated seamlessly to form the Knowledge Management Meta-System of the firm: A Project Management System (PMS), a Cloud Document Repository (DRS), a Graphical Information System (GIS), and a Customer Relationship Management System (CRM).</li> <li>The Business Development team filled out the right fields in the CRM that specifies the correct contact person from the client and the fields. Then the technical team sent data collection forms to the correct client via the PMS directly by selecting the respective client contacts integrated from the CRM, and replies with data were auto associated with the linked assignment in the PMS. The GIS and the DRS stored the spatial data and the attached documents accordingly. All the information was accessible and seamlessly available from the</li> </ul>



	<p>Assignment task in the PMS. The result is that all the knowledge is in the same assignment task, well connected, indexed and reusable.</p> <ul style="list-style-type: none"> <li>• Process:</li> <li>• The new workflow was codified in the PMS, whereby the technical team would have complete visibility into the data collection status and the next steps that need to be taken to collect more data, manage existing data, or select the appropriate data for analysis and results.</li> <li>• People:</li> <li>• Employees were re-trained to use the new data collection and usage system and adapt their pre-transformed workflow to the new technology and process.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• A complete transformation from previously depending on manual emails, USB drives, Google Earth and hard copies to an entirely digitally integrated data collection, management and storage system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• Although the company ran two systems in parallel (old and new), this component was the quickest to let go of the old system due to the intuitiveness and the ease of use of the new system.</li> <li>• Digitizing the backlog is still a considerable concern as it is labour-intensive and cumbersome.</li> <li>• A few privacy and security concerns were raised several times for data confidentiality across the company.</li> <li>• There were also concerns over data integrity and due diligence.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Add more data intelligence systems to draw more insights from the knowledge base.</li> <li>• Better digitizing system for backlog entry.</li> <li>• Need to explore how to draw data from market research automatically.</li> </ul>



<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The transformation models were sufficient in <b>defining</b> and <b>sizing</b> the transformation <b>requirements</b> and <b>effort</b>. They were high-level enough to organize the effort in the right direction without stringent constraints on implementing or choosing a particular solution. <u>However, more goals could have been added explicitly surrounding data privacy and integrity.</u></li> </ul>
<b>Operation</b>	<b>3. Engagement</b>
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>A new cloud Customer Relationship Management (CRM) that stores all the client information, contact data, roles, and is integrated with the Project Management System (PMS), and the Accounting Management System (AMS)</li> <li>With the new system, Business Development can communicate with the client via the portal, submit quotations, follow up on the engagement procedures track the client history with previous assignments, payment track record, and rating.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>When a client sends a Request for Proposal (RFP) to the company official email, the new CRM picks it up and creates a new Client Request. The Business Development team can then categorize it as a new request or belonging to an existing request.</li> <li>Business Development then proceeds to process the request. If it is a new request for quotation, then Business Development assigns a Project Management the sub-task of <i>scoping and sizing</i>. Once complete, Business development proceeds to finalize the offer and send it back to the Client for negotiations and approval.</li> <li>If the request belongs to an existing request, then it is rerouted to the correct system. If it is requested in the offer phase, then Business</li> </ul>



## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)

	<p>Development handles it, if it is a work in progress, then it gets tagged with the assignment-ID and gets re-routed to the PMS for processing; otherwise, if it is a payment issue, then it is handled after re-routing to the AMS system for handling. All systems communicate with one another and are fully integrated.</p> <ul style="list-style-type: none"> <li>• People:</li> <li>• Business Development specialists were trained to operate the new CRM, no new hires were required.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• Near-complete digital transformation of all Business Development tasks and operations except for a few functions such as mailing, printing, scanning and courier delivery of artefacts that still require manual processing and adapting to the digitally transformed work process.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• A large backlog of offers, customer information, offer templates had to be digitized, which was abandoned halfway through the digitizing effort due to lack of resources, poor quality control during entry, and lack of need to carry the digital library beyond the past two years. Management decided to split the artefacts into pre-transformation and post-transformation and physically archive any files older than two years past.</li> <li>• Resistance to change by one particular senior employee due to perceived difficulty in handling computers.</li> <li>• The integration between the PMS and the CRM was sluggish initially, with client confidential privacy data poorly managed and mistakenly accessible to unauthorized employees. This caused a delay in adopting the CRM fully until all the technical issues were dealt with.</li> </ul>



	<ul style="list-style-type: none"> <li>Quality of entry was an issue with wrong client information and inaccurate connection to the respective assignments in the PMS; however, it was solved diligently over time.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>More business intelligence for tracking customers' value, maybe add features to score client behaviour to draw more insights into a better price for a particular job and customer?</li> <li>Need to integrate into Market Data for better competitive analysis.</li> <li>How to benefit from social media better?</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The model was sufficient at this abstraction level of analyzing and driving the main requirements for transformation. Most of the hurdles were at the implementation layer.</li> </ul>
<b>Operation</b>	<b>4. Collections</b>
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>A complete transformation to a cloud-based Account Management System (AMS), that integrated with the Customer Relationship Management System (CRM) and the Project Management System (PMS).</li> <li>The AMS is integrated with the CRM concerning invoicing and payment follow-up.</li> <li>The AMS is integrated with the PMS regarding costing, billable hours, and status of assignments in the workflow for payment processing.</li> <li>Additionally, the team had a Human-Resource-Management (HRM) and an Asset Resource Management System (ARMS), which were also integrated for payroll, leave, asset management and expenses related to them.</li> <li>Process:</li> </ul>



## Appendix 1: Case Study 1: Global Appraisal Tech (GAT)

	<ul style="list-style-type: none"> <li>• Accounting department is pinged via the system once a Proforma invoice is submitted from Business Development via the integrated CRM, along with the terms of engagement and payment plan.</li> <li>• Accounting then schedules the invoices to the client and processes them via the new system.</li> <li>• The System sends automatic reminders to the Client and the Accounting team to follow up on payments.</li> <li>• The AMS also handles the company accounting for costs incurred, billable hours, and taxes.</li> <li>• People: <ul style="list-style-type: none"> <li>• Accounting and Finance individuals were fully trained to work on the new technology and process.</li> </ul> </li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• An almost complete transformation from the old desktop system to the new integrated cloud system.</li> <li>• Physical handling of paper invoicing and courier services are still the same except that they are getting printed and processed from a new system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• Although the transition from desktop software to online cloud software was almost seamless, the new integration features with the CRM and PMS significantly departed from the old ways of day-to-day operations for the team. They switched from phone calls and manual follow-up to checking system status, program reminders, and automated next steps. There was a struggle, in the beginning, to get everything right.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Many integration points between the systems still need ironing out.</li> </ul> <p>50.</p>



<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>• The team expanded on their transformation model to include the Human Resources use case of managing employee attendance, payroll and taxes, and they also expanded on the Resource Management to manage company vehicles, computers, measurement equipment, etc.</li> <li>• Management wished we expanded the analysis to the excluded scope of HR and Resource Management.</li> <li>• In principle, those were purposefully not in our initial analysis for the thesis purposes, but the SC-COST framework and ECORE tool enabled them to take it a step further on their own.</li> </ul>
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## 6.2 Evaluation of SC-COST

Separately, the interviews conducted asked the stakeholders about their opinion on the SC-COST framework as follows:

Evaluation of pre-transformation modelling exercise
<p>The stakeholder found the research involvement very useful in guiding the brainstorming discussion. The level of stakeholder engagement was high, and the outcome was beneficial for both the firm and the researcher. The insights gained were significant for the firm and the development of the SC-COST framework.</p>
Evaluation of patterns
<p>There were no patterns at the time of this case study, and therefore when they were presented with the patterns post-transformation, they did not have any objections to it, as it reflected quite closely their structure at the abstraction levels presented.</p>
Evaluation of the eCORE tool
<p>The eCORE tool needed many more bug fixes and features; however, it was sufficient in a research setup to achieve its intended outcome.</p>



## Appendix 2: Case Study 2: FinCorp

Company Name	FinCorp Investments
Small Consulting Code	FinCorp
Description of services	A small consulting firm specialised in Financial Advisory services
Interview Date(s)	10/03/2018 11/03/2018 15/04/2018 15/08/2021 (Feedback interview)
Interview with	Tarek Salem (Partner & General Manager) Hatem El Hady (Senior Advisor) Ahmed Samy (Finance Departement)

### 1 Background of the firm

#### 1.1 About Fincorp

Fincorp is a Small-Consulting-Firm (SCF) specialising in financial advisory services. The firm is registered in Egypt and Saudi Arabia and operates throughout the MENA and Africa region, concentrated in North Africa and GCC countries.

Typical customers include Banks, Corporations, Private Equity Funds, Tax Authorities, Financial portfolio managers, Public and Private Companies, Governments, and Courts. A few individuals also use Fincorp's services for personal use.

#### 1.2 Products and Services offered

The firm provides the following consulting services

1. Business Valuation services.
2. Financial Feasibility studies.
3. Financial Due Diligence.
4. Purchase price allocation.



### 5. Financial reviews and tax audits.

#### 1.3 Workforce & Culture

The firm employs 30 people, including directors, analysts, researchers, accountants, and support staff (secretary, collections officer, and marketing). The firm outsources non-core functions such as facility management, security, courier services, and HR management. The firm also uses freelance consultants and third-party specialised firms depending on the project.

The overall culture reflects the Managing Directors' character, which is formal in appearance and relaxed with structure (e.g., flexible office hours and no titles), but is strict with processes and results. The priority is to do the job right and deliver it on time, and the emphasis is on personal responsibility and resourcefulness to get things done. The organisation is relatively flat, with only three levels. Upper management (Typically the Managing Director and the Partners), middle management (2 managers for two main departments: Financial Advisory and Financial Research), and the rest of the employees are directly managed by one of those two managers.

#### 1.4 Information gathering

In total, four interviews were carried out with the FinCorp team. The first three interviews were carried out in March and April of 2018 and were exploratory; this was the second case study, and although we still did not have a developed artefact, we could bring up established concepts from the first case study. They were conducted in intensive several-hour whiteboard workshops. The eCORE framework was introduced up front, and the stakeholders collaborated with these set goals in mind:

51. Identify the central business use cases of their SCF.
52. Conceptualize and Model the AS-IS eCORE model of their SCF.
53. Design the elements of their Digital Transformation as they see fit.
54. Conceptualize and Model the TO-BE eCORE model based on that design.
55. Translate their understanding of those transformations into pragmatic requirements for change in their People, Process and Technology components.



The workshops were done in collaboration with the researcher, and the first set of models was contrasted with the previous case study to see if there were similarities. Repeated themes were witnessed at this point, and although the team may have named tasks and processes differently, they were essentially the same function—for example, Engagement vs Business Development or Assignment vs Job. Commonalities were noted for testing with the third case study. The eCORE tool was not fully developed yet in its final version, we used RE tools as a modeller, but at this point, we had a solid case to justify its development.

Those models were further enhanced in the second round of interviews in August of 2021, more than three years later. The second round was intended to obtain feedback on the transformation project and revise the model in hindsight. Those interviews benefited from the evolution in the tool and the process as a result of researching the other five case studies, and a more precise and consistent ontology and framework were gauged for feedback.

The outcome of that exercise is outlined in the following five sections:

## 2 Use Cases

Although many use cases could be generated for **Digital-Transformation (DT)**, the following use cases represent the core structured activities of the firm and encompass the main areas in need of digital transformation.

### 2.1 UC\_SCF2\_1: Conducting a Financial Services assignment

Use Case ID	<UC_SCF2_1>
<b>Goal</b>	Conducting a Financial Service Assignment
<b>Actor(s)</b>	<ol style="list-style-type: none"><li>1. Client</li><li>2. Analyst</li><li>3. Financial Advisor</li><li>4. Reviewer (typically a Partner in the firm)</li><li>5. Marketing (Business Development)</li></ol>
<b>Use Case Overview</b>	When a request for a Financial Service Assignment is given to the valuation team, the Financial Advisor assigned on the task allocates the proper



	resources based on the size and complexity of the task at hand. The customer is contacted to collect the required financial data and company documents, followed by a desktop review and investigation, followed by a valuation exercise, report writing and reviewing then approval by the partner before releasing the draft to the customer for acceptance. Once approved the assignment is closed and the task goes to collections for fees.
<b>Trigger(s)</b>	Marketing (Business Development) assigns a new project to a Financial Advisor
<b>Precondition(s)</b>	Engagement letter signed, and the project is set to go from the business development department.
<b>Basic Flow</b>	<p>Description: This scenario describes the project flow</p> <ol style="list-style-type: none"> <li>1. The Financial Advisor gets assigned to the project.</li> <li>2. The Financial Advisor allocates the resources required for the assignment: Analyst(s), Report Author(s) and a Reviewer.</li> <li>3. The Financial Advisor sends an email to the customer outlining the required data such as the latest financial statements, invoices, updated asset register, latest budgets, which changes from one service to the other depending on the purpose of the assignment.</li> <li>4. The Financial Advisor and the Analyst both conduct a series of meetings with the Client's financial representatives and perform a Desktop Review of the statements and documents to prepare the standardized financial models that are compliant with the standards. Depending on the service required, several outcomes are devised. For instance, if a business valuation is required, then the Analyst prepares the adjusted financial statements, and if a tax audit is required, then he prepared the adjusted budgets.</li> <li>5. The Analyst and the Financial Advisor meet to discuss the outcome of both the data collected, the documents provided, and the analysis</li> </ol>



	<p>results, weigh the factors and the applied adjustments to agree on the final advice.</p> <p>6. The Analyst pulls together the data, analysis tables, and the adjusted financial models and statements to write the report following and compliance with the IFRS and GAAP standards, then notifies the Partner.</p> <p>7. The Partner arranges a review between the Advisor and The Client over the draft report to verify assumptions, data used, and outcomes and collects feedback.</p> <p>8. Once approved, it is printed, stamped and sent to the Client. Then the assignment is handed over to the accounting department for invoicing and collections.</p>
<b>Termination outcome</b>	A standard-compliant official report with attachments outlines the outcome of the service. This could be an opinion of value (if a business valuation is requested), or the audited and finalized financial statements (if a financial audit is requested).

## 2.2 UC\_SCF2\_2: Engaging a new assignment

Use Case ID	<UC_SCF2_2>
<b>Goal</b>	Engaging in a new assignment
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> <li>3. Partner (Senior Consultant or Director)</li> <li>4. Financial Advisor</li> <li>5. Legal</li> </ol>
<b>Use Case Overview</b>	When a Client approaches the firm for a financial service, they first ask for a Request for Proposal (RFP), Marketing (Business Development) sends them a technical and financial offer, which they typically negotiate until approved, after which they sign an engagement letter.



	<p>Alternatively, through personal connections, a Partner requests that Marketing send a Proposal to a specific Client.</p> <p>Alternatively, governments or public entities announce RFPs or Request for Vendors publically. Marketing subscribes to newsletters of vendor lists and applies with a proposal or application when a job is posted.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Client emails the firm with an RFP.</li> <li>• A partner develops a client and asks the firm to prepare a proposal.</li> <li>• Marketing applies for open tenders.</li> </ul>
<b>Precondition(s)</b>	None
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. An email is received from a Client or a Partner requesting a quotation or proposal.</li> <li>2. Business Development opens a new case and sends the project details to Project Management for the technical offer, effort and cost estimation.</li> <li>3. Business Development prepares financial offer based on costs, customer's history, and competitiveness.</li> <li>4. Business Development reviews the proposal with a Partner and obtains approvals.</li> <li>5. Business Development submits the proposal to the Client.</li> <li>6. The Client responds with a counter-offer, negotiates cost, time or terms.</li> <li>7. Business Development adjusts the proposal after negotiations and resubmits.</li> <li>8. Client approves the proposal, signs, and issues a work order.</li> <li>9. Business Development assigns the assignment to Project Management.</li> </ol>



<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• An engagement is signed, and the assignment commences to Project Management.</li> <li>• Alternatively: Cancelled, whereby the engagement fails and goes to a competitor.</li> </ul>
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### 2.3 UC\_SCF2\_3: Collections

Use Case ID	<UC_SCF2_3>
<b>Goal</b>	Collections
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> <li>3. Financial Advisor</li> <li>1. Accounting</li> </ol>
<b>Use Case Overview</b>	<p>When a client signed the engagement, they have to pay a deposit, which triggers the start of the execution of the assignment.</p> <p>Or when an assignment is concluded, they have to pay the balance of payment.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Marketing approves an engagement.</li> <li>• Financial advisor submits the final report.</li> </ul>
<b>Precondition(s)</b>	Approved Engagement Or Approved final report.
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. Marketing pings Accounting to issue a proforma invoice for the advance payment before the start of work.</li> <li>2. Accounting reviews the terms and engagement and programs the payment schedules into the accounting software.</li> <li>3. Accounting issues the advance payment proforma and communicates with the client for collection.</li> </ol>



	4. Once the collection is complete, Accounting approves the commencement of the project to the Financial Advisor.
<b>Alternative Flow</b>	<p>5. The Financial Advisor signals to Accounting the delivery of the final report.</p> <p>6. Accounting issues the final payment invoice, including any amendments, taxes and additional expenses.</p> <p>7. Accounting follows up with the Client until the collection is complete, then marks the assignment finished.</p>
<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• All the payments have been paid per the engagement agreement.</li> </ul>

#### 2.4 Other use cases:

There are many other functions in the firm that were excluded from our analysis but are nonetheless subject to digital transformation, including:

- 1- Accounting and expense tracking: Accounting (Financial controller) allocates hours and costs to projects. They carry their job using excel files and desktop-based accounting software. Could benefit from a cloud-based integrated system with a Task/Job Manager and Customer Relations Management System (CRM).
- 2- Asset tracking: Physical resources such as meeting rooms, company laptops and cell phones, are all shared resources that are currently tracked manually by the Office Manager, and require some resource management software and integration with the PMS and CRM if possible.
- 3- Human Resource Management: Employees billable hours, attendance, vacations, sick leaves, benefits, contract renewals, and more are managed manually via excel files by the Office Manager and reviewed and approved by a Partner. A Human Resource Management (HRM) system could be implemented that integrates with an automated access control device (fingerprints or cards) to calculate hours automatically, and also allows employees to enter their vacation times and leave and track

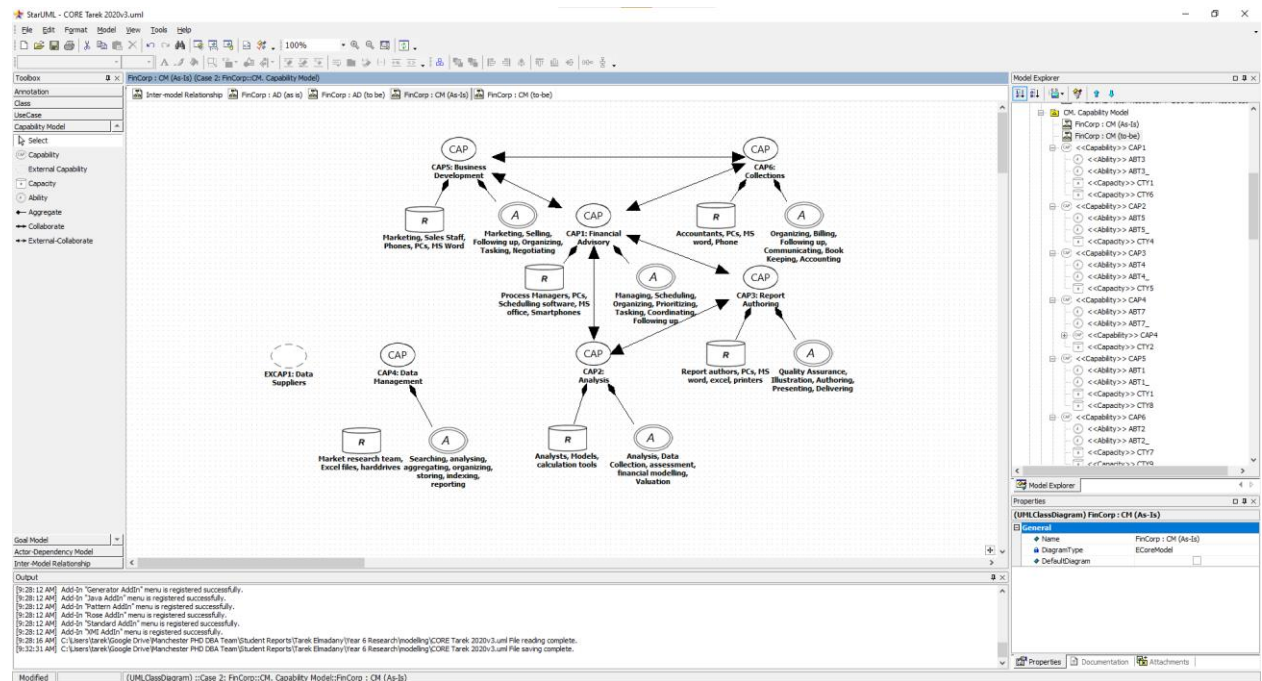


## Appendix 2: Case Study 2: FinCorp

their pay, bonuses, sick days and more via an online programmed portal. Possibly also integrate with the PMS to calculate billable hours automatically.

### 3 ECORE AS IS Modelling components

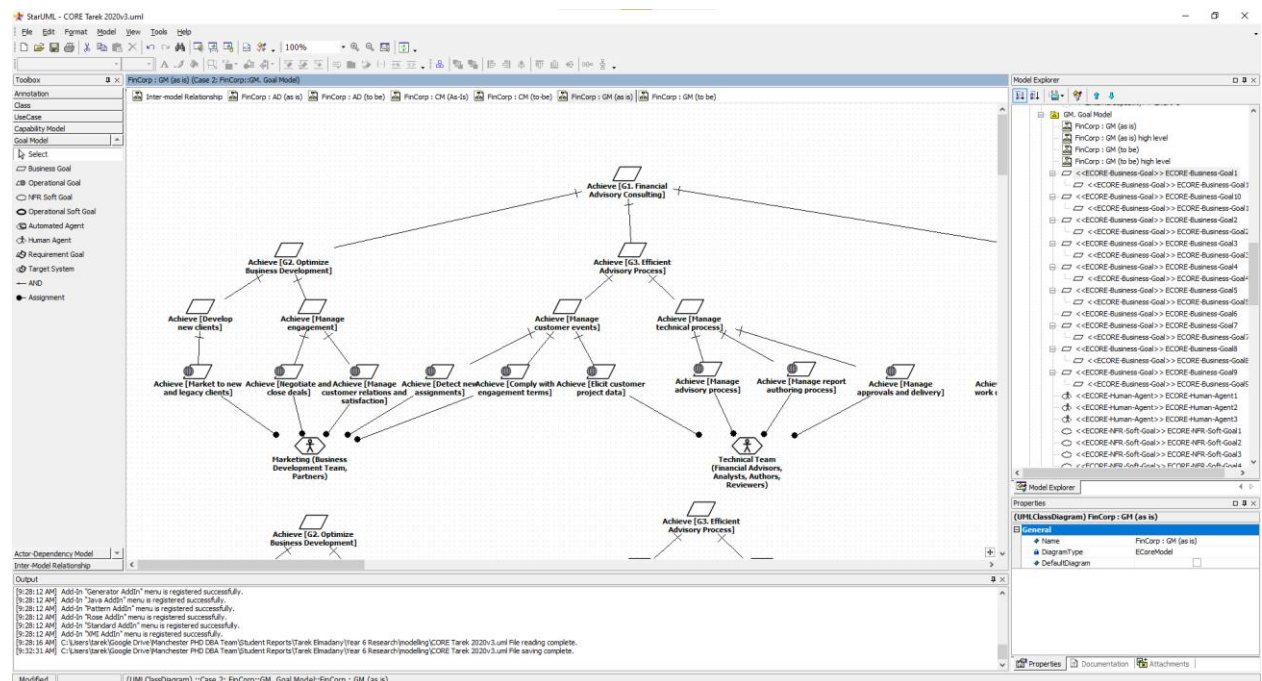
#### 3.1 AS-IS Capability Model



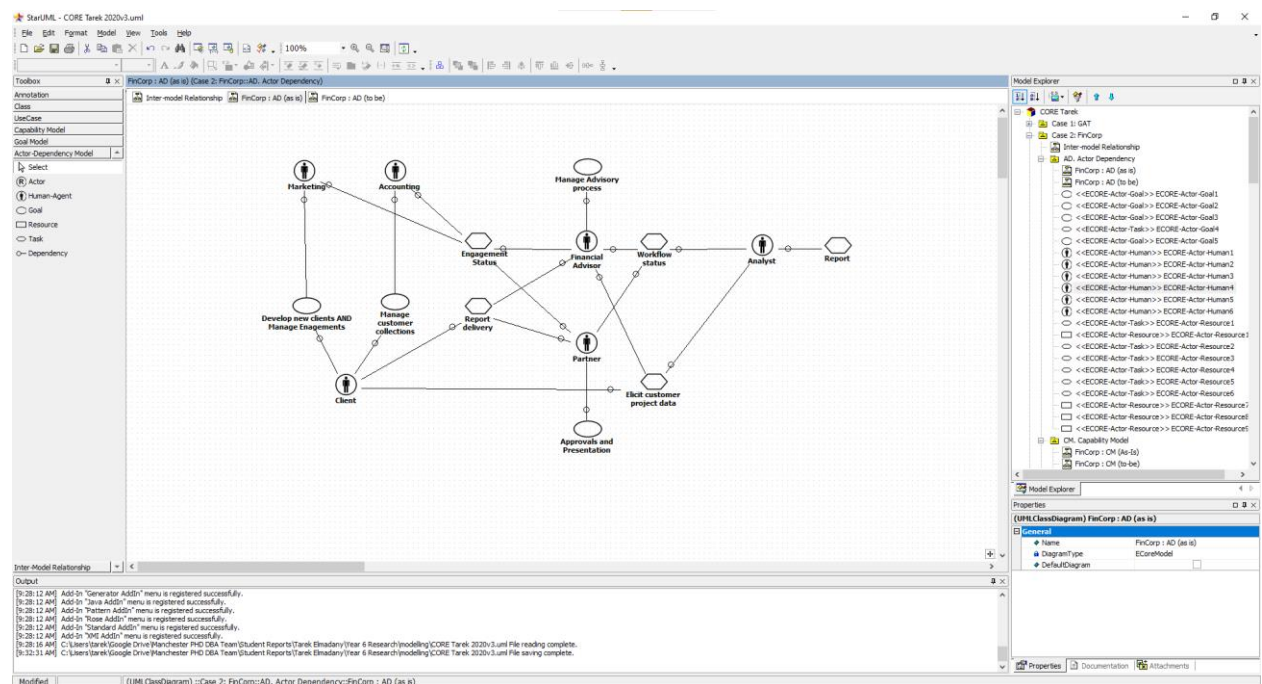


## Appendix 2: Case Study 2: FinCorp

### 3.2 AS-IS Goal Model



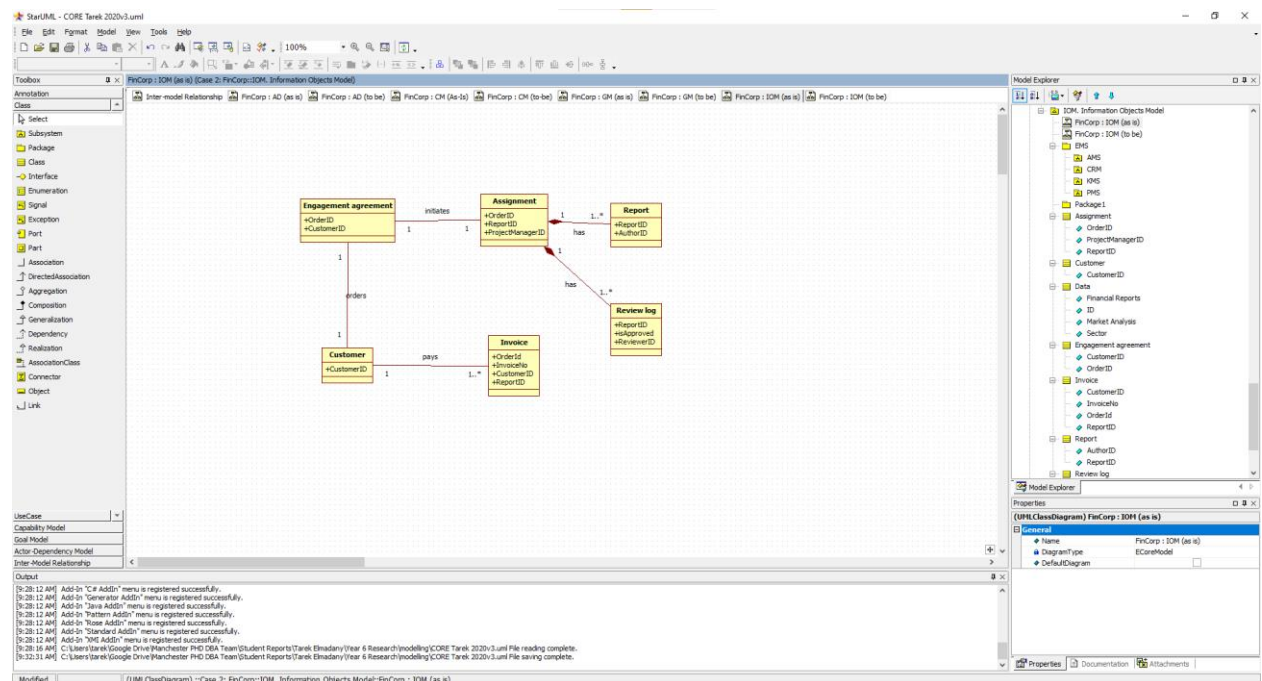
### 3.3 AS-IS Actor Dependency Model



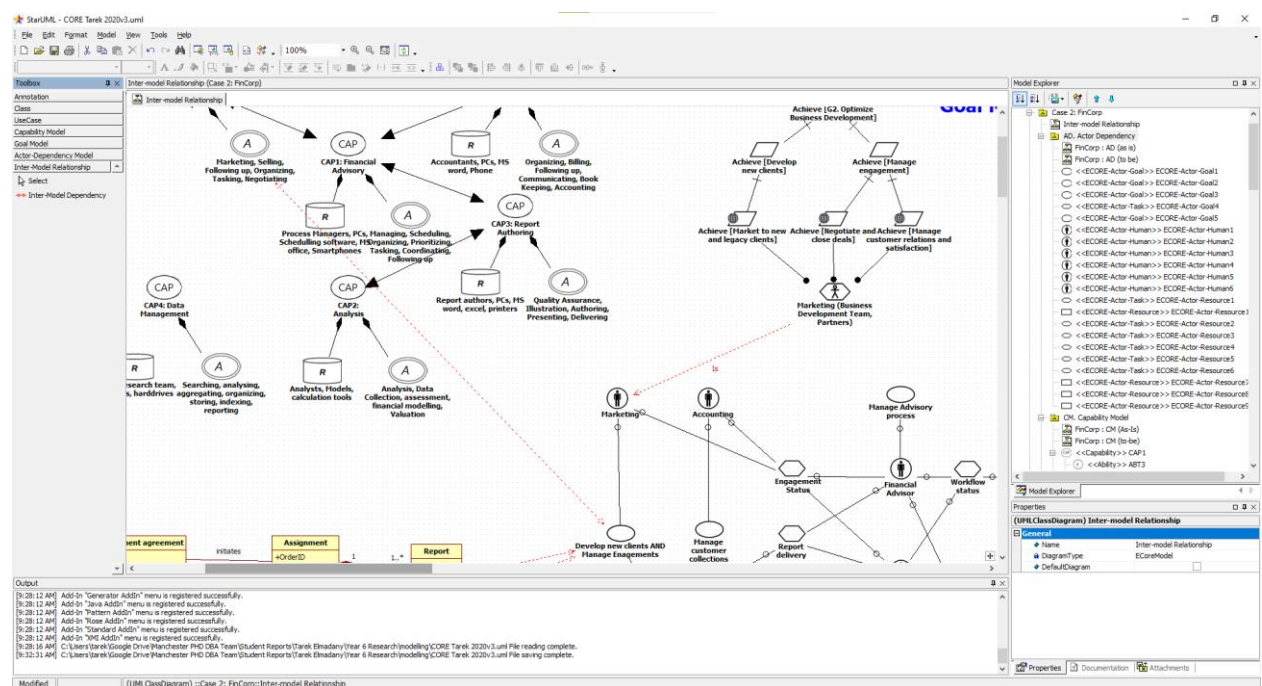


## Appendix 2: Case Study 2: FinCorp

### 3.4 AS-IS Information Objects



### 3.5 AS-IS Intermodel correlation

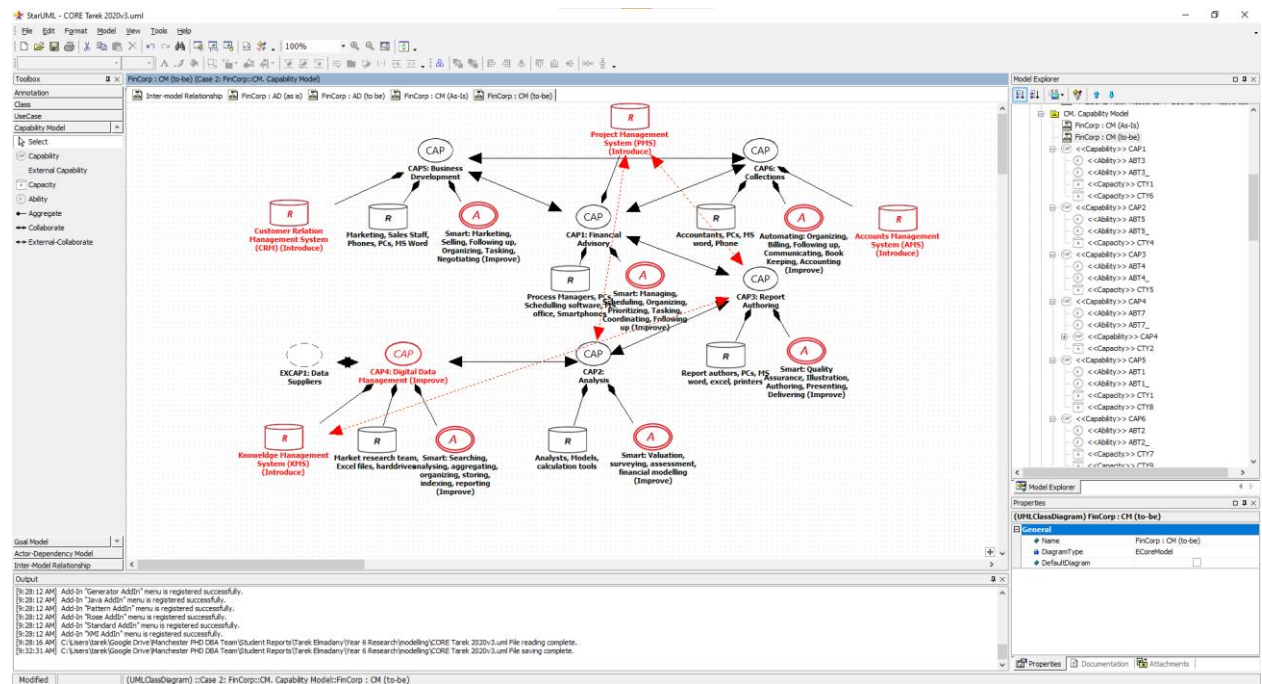




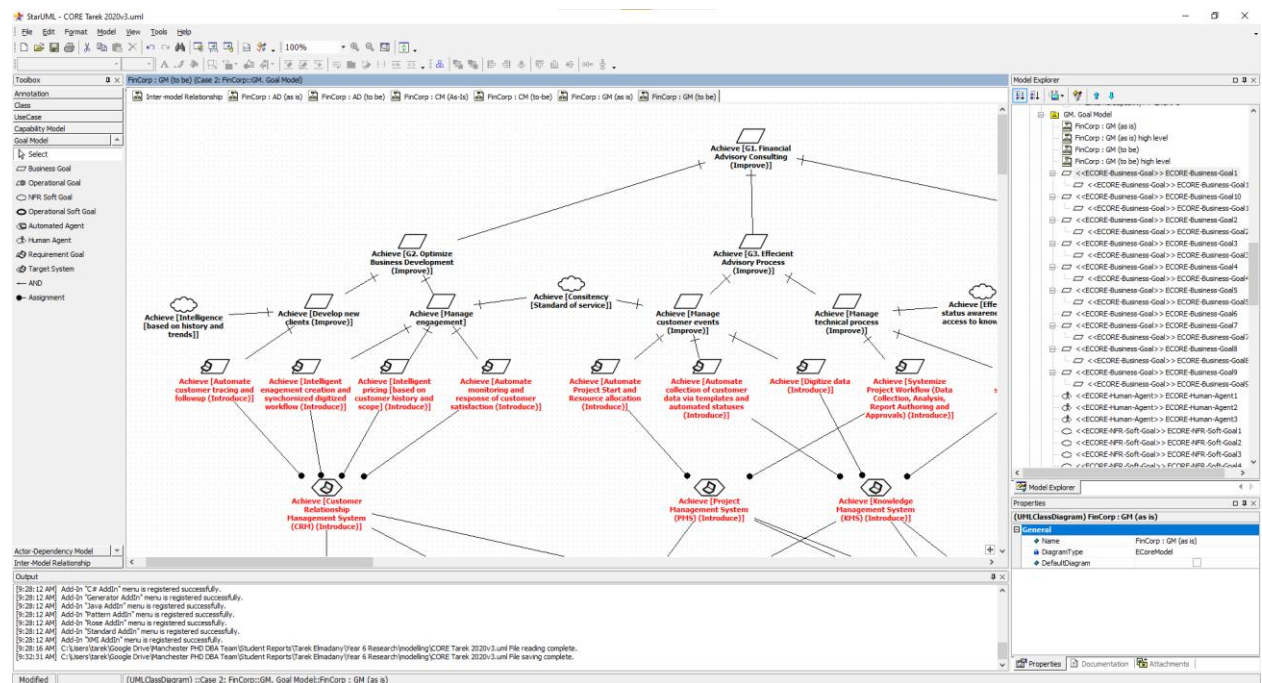
## Appendix 2: Case Study 2: FinCorp

### 4 ECORE TO-BE Modelling components

#### 4.1 To-be Capability Model



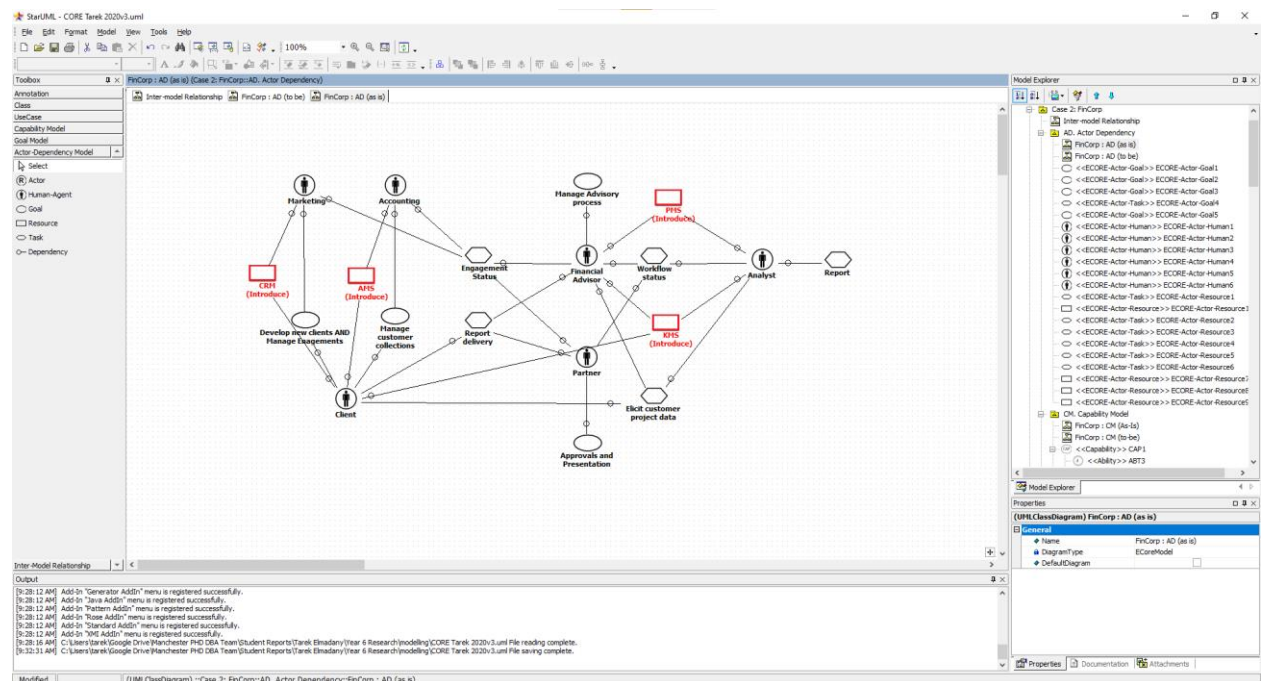
#### 4.2 To-be Goal Model



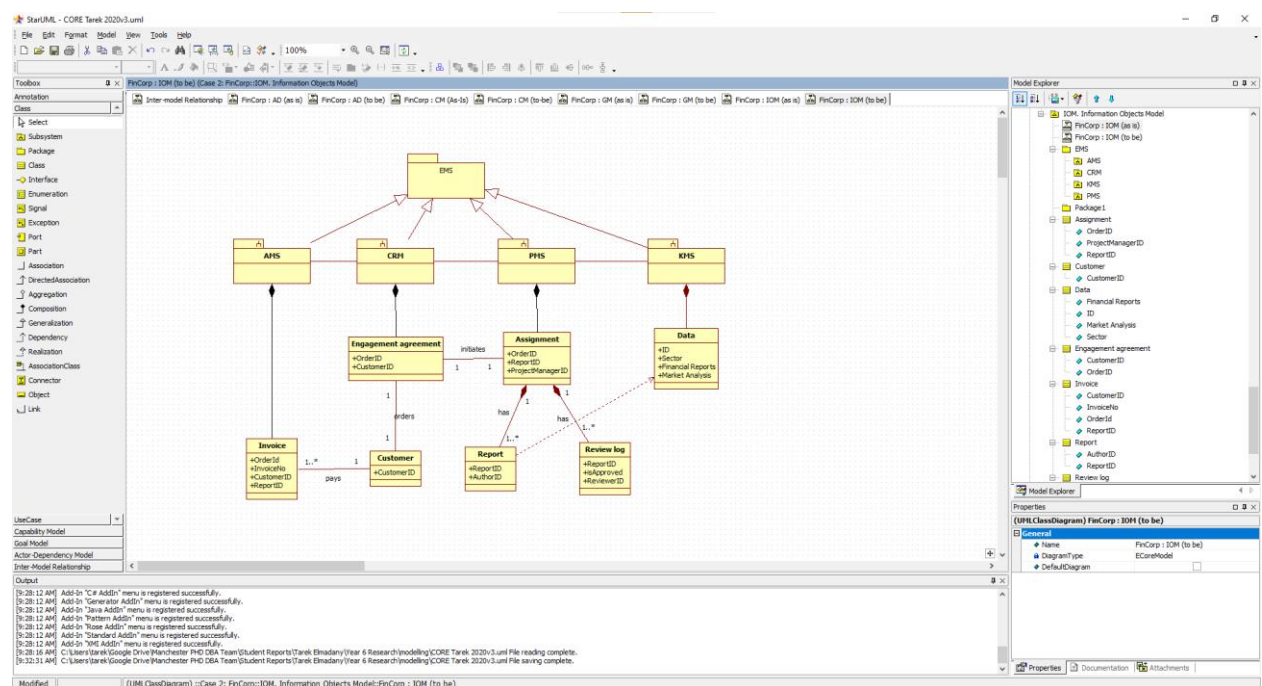


## Appendix 2: Case Study 2: FinCorp

### 4.3 To-be Actor Dependency Model



### 4.4 To-be Information Objects Model





## 5 Digital Transformation Requirement List

### 5.1 Technology Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the technology component resulting from the modelling exercise.

Operation 1. Report Authoring and Calculations	
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office (Word &amp; Excel)</li> <li>• Desktop harddrives, flash drives, emails</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Report Authoring on Desktop Word.</li> <li>• Calculations on Desktop Excel.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Higher quality report authoring (templates and spell checkers)</li> <li>• Improved productivity (Excel calculations)</li> <li>• Documents are mostly paperwork (analogue format)</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Physical-paper based, therefore, very low searchability, indexing and sharing capabilities.</li> <li>• Version conflicts when electronic documents are passed around.</li> <li>• Hard to search since the content is not indexed from Operating System.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Digitization is crucial.</li> <li>• Need for more collaborative formats and modes of work.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Content Searchability.</li> <li>• Accessibility (Connectivity).</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Document Control</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Convert to cloud-based collaboration tools such as Microsoft 365 or Google Docs.</li> <li>• Use a document control system to check-in and check-out documents to avoid conflicts.</li> <li>• Cloud artefacts are content searchable.</li> <li>• Paperless (sustainability)</li> <li>• Standardisation of artefacts and templates.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Emails.</li> <li>• Local computer drives</li> <li>• Physical shelves</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, comparables, and statistics are all stored in excel files inside the project folder.</li> <li>• Data stored on local folders in personal computers.</li> <li>• Paper documents are stored in physical folders on people's desks and shelves.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation.</li> <li>• Paperless and Sustainability.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Data is not indexed, which makes it hard to search and hard to reuse for future projects.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More integration across data assets.</li> <li>• Accessibility (Connectivity)</li> <li>• Content Searchability.</li> </ul>



	<ul style="list-style-type: none"> <li>• Synchronisation and conflict avoidance.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Document Control.</li> <li>• OCR software</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Data could be stored on a cloud-based DB which enables collaboration, easy search by date and reusability of data.</li> <li>• Modify data collection process to request electronic formats</li> <li>• Use OCR software to digitize legacy documents</li> <li>• Paperless (sustainability)</li> </ul>
<b>Operation</b>	3. Resource planning, Workflow and Task Management
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Emails</li> <li>• In-person</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Resource planning is conducted in person and tracked on an individual manager level.</li> <li>• Workflow management in email communication with the client and other staff.</li> <li>• Follow-up on tasks and assignments.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Responsibility.</li> <li>• Personalization.</li> <li>• Localization.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Status and updates are kept in threads in staff inboxes.</li> <li>• Data is unorganised and often lost.</li> <li>• Inefficient Resource Planning in person.</li> <li>• Centralised to the Financial Advisor and dependent on each person's style and discipline and not transparent to the rest of the team.</li> </ul>



	<ul style="list-style-type: none"> <li>• Causes the Financial Advisor to be the bottleneck in communicating project goals and status.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Transparency (Status accessibility by everyone in the organisation).</li> <li>• Accessibility (connectivity).</li> <li>• Higher efficiency through faster status awareness and more synchrony.</li> <li>• Maintainability (outsourcing the burden of technology upkeep).</li> <li>• Integration across all company resources and assets.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Project Management System (PMS) (Cloud-based) with a module for Enterprise-Resource-Planner (ERP) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Resources, tasks and projects are all connected.</li> <li>• Members of the team have access via cloud portal and can follow up on their tasks and understand their assigned tasks.</li> <li>• Workflow is transparent, and status is clear.</li> <li>• System offers threads for comments, history, attachments.</li> <li>• Integrates with other systems such as ticketing from the client, document control, and reports artefacts (KMS).</li> <li>• Paperless (sustainability)</li> </ul>
<b>Operation</b>	4. Engagement
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Customers communicate with the firm via emails, and engagement is kept in email threads.</li> <li>• Customers informally communicate with staff offering valuable data via social media, messaging apps and phone calls.</li> <li>• Contracts are all created in word and printed for signing and stamping.</li> </ul>



	<ul style="list-style-type: none"> <li>Scanned documents are stored on PC, and backed up on external drives.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>Personalization.</li> <li>Responsibility.</li> <li>Localization.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>Does not offer accessibility from outside the office.</li> <li>Slow process and labour intensive.</li> <li>Hard to track and search emails for customer history.</li> <li>Hard to centralise communication across alternative messaging apps and social media.</li> <li>No meta-data is stored on the customer or relation to previous engagements. Often have to rely on memory.</li> <li>Difficult to relate the engagement to the project once transferred to Analyst.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>Accessibility (connectivity).</li> <li>Faster and more accurate response to customer status.</li> <li>Integration with the project management system for a more efficient status update.</li> <li>Higher quality of customer service.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Use of a cloud-based CRM that would integrate with Task management system and Accounting systems.</li> <li>CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp.</li> <li>Paperless (sustainability)</li> <li>Standardisation of artefacts and templates.</li> </ul>



Operation	5. Collections
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp (Social media)</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> </ul> <p>Scheduling and reminders are scheduled on Microsoft Outlook Calendar.</p>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the customer, and Financial Advisor requests from Accounting to submit a final invoice. This process is highly dependent on memory and personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections.</li> </ul>



<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM, to offer traceability and event-driven automation and reminders.</li> </ul>

## 5.2 Process Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the process component resulting from the modelling exercise

<b>Operation 1. Financial Advisory (The core service of the consulting practice)</b>	
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Usage of MS word template for report authoring.</li> <li>• Assigning both the Analyst and the Financial Advisor the report authoring responsibility.</li> <li>• Manual tracking of progress through weekly meetings and email chains.</li> <li>• Storage on PCs and sharing of files through email chains and USB flash drives</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Process is not coded but handed down from generation to generation by means of mentorship.</li> <li>• Financial Advisors track the progress and status of jobs with their different phases manually.</li> <li>• Follow-up of the process and workflow of this phase is the responsibility of the Analyst, and follow up for status and compliance is the responsibility of the Financial Advisor.</li> <li>• Synchronization of status and updates are communicated through meetings and electronic channels such as emails, direct messaging, or phone calls.</li> </ul>



<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Personalization</li> <li>• Responsibility.</li> <li>• Process leanness and quick response to customer communication.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of codified training hinders the onboarding of new employees.</li> <li>• Process leanness is often applied as poor process adherence.</li> <li>• The knowledge of status and stage inside the workflow is only kept with single people.</li> <li>• Compliance with regulations is highly reliant on the individual's compliance.</li> <li>• Most of the institutional history, knowledge and experiences are implicitly known by the individual (personal memory) with minimal explicit knowledge recording in files or documents, making the transfer of knowledge and experience highly reliant on employee retainment.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More transparency and accessibility of status and workflow statuses and stages.</li> <li>• More standardization of process compliance across teams.</li> <li>• Better synchronisation between different actors and conflict avoidance.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• [Introduce] Workflow scheme coded inside a collaborative online Project Management System (PMS). The system allows for assigned responsibilities, updates of status workflows, automated monitoring of deadlines and reminders.</li> <li>• [Introduce] A new check-in and check-out document control process using a Cloud Document Control System.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• More visibility into document status and workflow status.</li> <li>• More control over document standardization and version control.</li> <li>• Automatic storage of institutional knowledge and history.</li> <li>• More standardization of process workflow can allow substitution easier.</li> </ul>



Operation	2. Data Collection and Management
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Data is collected by multiple roles from multiple sources:</li> <li>• Multiple individuals solicit the client for project data.</li> <li>• After the project is complete, the entire project folder gets archived on the Financial Advisor's hard drive.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, comparables, and statistics are all stored in soft format inside the project folder on the personal computers.</li> <li>• Hard-format data is digitized by scanning, then stored in a project paper folder in the archive room.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Centralization and Compartmentalization.</li> <li>• Responsibility and Personalization.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The process of collecting data and storing it is manual and not standardized.</li> <li>• Check-lists and templates are often always out of date.</li> <li>• Data sources are non-traceable, and accountability is non-measurable due to lack of a tracing or sign-in/out process.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Streamline the process across different roles.</li> <li>• Accessibility (Connectivity)</li> <li>• Knowledge searchability and reusability.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Traceability by allowing check-in/check-out process.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• A technology-enabled check-in/check-out accountable and traceable process using an accessible Cloud Document Control system (DCS)</li> <li>• Integration between the two PMS and Cloud DCS for seamless searching, locating and accessing of data.</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Updated process for data collection, consumption and storage is integrated within the intuitive usage of the cloud-based Document Control System (DCS) which enables accountability, traceability, collaboration, easy search by location and reusability of data and knowledge.</li> <li>Paperless (sustainability).</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>Template offers, contracts and engagement letters are created in Microsoft Office / Adobe PDF and communicated via emails or snail mail (printed)</li> <li>Negotiations and agreements are achieved via personal meetings, phone conversations, and over emails.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>The process is manual, and reliant on the personal quality and consistency of the Business Development personnel.</li> <li>The process involves omni-channel presence via emails threads, whatsapp threads, and social media threads and all connected together in the business development personnel's head.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>Standardisation of artefacts and templates.</li> <li>Customer satisfaction (Omni-channel communication, friendly human interaction, and quick personal response by lowering bureaucracy).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>Manual process is inefficient, inconsistent and labour intensive.</li> <li>Process is non-traceable, often hard to hold individuals accountable, and causes many missed opportunity due to lack of tools for automated follow-up.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>Accessibility (connectivity).</li> <li>Faster and more accurate response to customer status.</li> </ul>



	<ul style="list-style-type: none"> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Consistency and automated reminders, status updates and effective workflow management.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• Software Task-oriented programmed workflow designed in a Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Technology-enabled processes using the cloud-based CRM would force a consistent and quality engagement experience, follow-up and reminders.</li> <li>• CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp to allow for a single point of process follow-up and management.</li> <li>• Updates to online templates and improvements in check-lists on the CRM automatically persists into the future without remembering to change it manually every time, hence less risk to human error.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Operation</b>	4. Collections
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> </ul> <p>Scheduling and reminders are scheduled on Microsoft Outlook Calendar.</p>



<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the customer, and Financial Advisor requests from Accounting to submit a final invoice. This process is highly dependent on memory and personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM, to offer traceability and event-driven automation and reminders.</li> <li>• Paperless (Sustainability)</li> </ul>

### 5.3 People Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the people component resulting from the modelling exercise.

<b>Operation</b>	<b>1. Financial Advisory (The core service of the consulting practice)</b>
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<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Financial Advisors</li> <li>• Analysts</li> <li>• Support staff (Secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• The central leader is the Financial Advisor, who has to coordinate the entire process, starting with assigning roles, coordinating schedules, maintaining the pace of the progress, ensuring status update, follow-up and quality control.</li> <li>• Analysts conduct the market research, feed it to the Financial Advisor, analyse submitted data, and use the results from the Financial Advisors to produce standard-compliant reports.</li> <li>• Financial Advisors take the data, run models and arrive at the outlined strategy for analysts to research.</li> <li>• Continuous communication between the Financial Advisor, the Analyst and the Client involves iterating over financial models, analysis, and outcomes.</li> <li>• Support staff help with printing, delivery and non-technical support work.</li> </ul>
<b>Why was it setup that way?</b>	<ul style="list-style-type: none"> <li>• Specialization and personalization.</li> <li>• Teamwork effort to arrive at the desired customer outcome.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The Financial Advisor is the sole responsible person to drive the process; his/her role is to manage the project to delivery, which means that he/she is the only person aware of the status and could pose a risk if absent or on leave.</li> <li>• Communication and synchronization are slow and inconsistent.</li> <li>• Consistency and Quality are often forgone for speed and delivery.</li> <li>• Process and Workflow are People dependent. While everyone knew what needs to be delivered, every team had their way of achieving it, which</li> </ul>



	<p>mainly relied on people skills and experience and less on standardized systems.</p> <ul style="list-style-type: none"> <li>• People used varying non-standardized enabling technologies with no centralized technology strategy, which often caused multiple synchronizations and quality problems.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Achieve decoupling of the dependency on people and shift to the dependency on systems and technology.</li> <li>• Achieve higher efficiency from people who are distracted by context switching and repetitive non-productive synchronizing and admin work.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Current roles to train on the usage of enabling new technology and integrated system processes and workflows.</li> <li>• [Introduce] IT systems admin, Process compliance admin.</li> <li>• [Introduce] Automated workflows and processes, including standardized scheduling, automating assignment based on workflow stages, automatic reminders, integrated centralized communication and document repository that is auto-synchronized and status aware.</li> <li>• [Cease] Manual communication support roles and replace with technology.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Improves people's productivity by eliminating much of the manual work.</li> <li>• Reduces errors and improves quality by shifting some standardization onto systems and technology previously used to suffer from people error.</li> <li>• Enhances people value since technological enhancements free up people's wasted attention and time and instead shift the focus on improving their core consulting competency and skills.</li> </ul>
<b>Operation</b>	2. Data Collection and Management



<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Financial Advisor</li> <li>• Analyst</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Data of different types and scopes are collected by each specialists depending on their needs. For example, an analyst will collect documents and comparative evidence, while a Financial Advisor will interview the client to gain insights into the operations of the client's firm.</li> <li>• Data is collected and stored with each person on their devices. At the end of the project, the Financial Advisor tries to gather all the files and artefacts in one archived folder on the local computer.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Specialization</li> <li>• Responsibility</li> <li>• Quickness</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Inconsistent data collection procedures that depends on the quality of each team, it is not clear who is collecting and keeping the data.</li> <li>• No central owner or responsible person for data management and archiving.</li> <li>• Ineffective data reusability and mining since it depends on people's memories.</li> <li>• Highly reliant on individual due diligence and personal capability.</li> <li>• Clients complain that many people reach out to them from the firm asking for data all the time.</li> <li>• Many concerns on data privacy and security control.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• To improve the quality and comprehensiveness of data collection.</li> <li>• To centralize control of data for security, liability, compliance, traceability, and responsibility purposes.</li> </ul>



	<ul style="list-style-type: none"> <li>• For better indexing, searching, and reusability of data which is the foundation of the knowledge base.</li> <li>• Adherence to paperless data collection (sustainability)</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] KM admin: responsible for data management using technology-enabled cloud-controlled data-traceable data and knowledge management systems (including cloud drives, and indexable databases).</li> <li>• [Improve] The roles of Financial Advisors, Analysts, and Marketing to train on the new technologies and processes for data collection, control and storage.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Maintains specialization.</li> <li>• Introduces control and standardization.</li> <li>• Introduces Knowledge reuse capabilities.</li> <li>• Ceases paper-dependent procedures and shifts to paperless data collection procedures.</li> </ul>
<b>Operation</b>	<b>3. Engagement</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Main Consulting Partners</li> <li>• Financial Advisors.</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, couriers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Partners, Financial Advisors and Marketing specialists use their connections to solicit past clients, current clients and future clients (client acquisition) to procure new jobs.</li> <li>• Once a request for proposal is made, engagement agreements are prepared and signed.</li> <li>• Procedures for communicating, signing and exchanging documents are handled by the Marketing (Business development) staff.</li> </ul>



	<ul style="list-style-type: none"> <li>• Contracts and agreements are stored on company computers under the responsibility of the business development staff.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide high customer personal care.</li> <li>• Focus on personal responsibility.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of standardized agreements resulting in many missed opportunities and errors.</li> <li>• Followup is reliant on individuals diligence in setting up personal reminders and memory.</li> <li>• Tracing of engagement status is reliant on individual memory.</li> <li>• Customer care level is reliant on individual skills and experience.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Personnel want more standardized artefacts, including offer documents, engagement agreements and data collection criteria.</li> <li>• The need to decouple customer service level from relying on individual skills to relying on a system of service standards that could be quickly followed and trained by any individual.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Train marketing staff on Customer Relation Management (CRM) system, including a new standardized process.</li> <li>• [Improve] Train marketing staff on the new Cloud-based Document Control System (DCS) to store the artefacts and understand how it is integrated with the CRM and the Accounts Management System (AMS)</li> <li>• [Introduce] Automation in the customer follow-up and engagement workflow to add reminders, automatic assignment of roles, automated status updates, and automatic linkages of previous engagements and knowledge.</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Personnel offer a more consistent and higher quality of client experience.</li> <li>• Personnel have more robust traceability, status awareness and workflow management capability.</li> <li>• Personnel can more accurately price and generate higher revenues due to better client knowledge and historical understanding.</li> <li>• Paperless procedures.</li> </ul>
<b>Operation</b>	4. Collections
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Accounting and finance personnel.</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, security, couriers, drivers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Accounting depends on Marketing to obtain status updates on contract and engagement agreements and stages in the workflow.</li> <li>• Accounting liaises directly with the clients and vendors to process payments, settle invoices and taxation requirements.</li> <li>• Accounting liaises with Financial Advisor to give the signal to release the start of progress (in the case of fulfilment of down-payment) or to re-release the final report once the Client fulfils the final payment.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide a high level of customer care.</li> <li>• Protect and fulfil business financial rights and obligations effectively.</li> <li>• Privacy and security of financial dealings from the rest of the organization and the competitors.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The reliance on individuals can sometimes act as a bottleneck and hinders progress.</li> </ul>



	<ul style="list-style-type: none"> <li>• Non-standardized or integrated system to communicate status efficiently leads to mistakes, lost revenues and angry customers.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Better synergy with the workflow of the core business.</li> <li>• Faster response times.</li> <li>• Higher status awareness and synchronization.</li> <li>• Higher collection and effective customer handling in alignment with Marketing and Financial Advisors.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] A new dependency between Accounting and the CRM system via integrating the newly introduced Account Management System (AMS).</li> <li>• [Improve] Train the accounting personnel to use the newly introduced Account Management System (AMS) that automates communication, provides seamless status synchronization across systems, and leads to real-time status awareness.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Provides a more consistent customer experience.</li> <li>• Maintains the primary business goals of privacy, specialization, protection of business financial interest while eliminating the ineffective communications problem.</li> <li>• Paperless (sustainability)</li> </ul>

## 6 Post-Transformation Feedback

### 6.1 Analysis of the transformation

A round of interviews was conducted after a while (as per interview dates above) to assess the feedback and progress of the digital transformation. The following summarizes the findings:

<b>Operation</b>	<b>1. Financial Advisory (The core service of the consulting practice)</b>
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<p><b>How was transformation implemented?</b></p>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• A new cloud-based Task Management System (TMS) was installed, whereby all the advisory assignments were inputted as a trackable unit named “<i>job</i>”.</li> <li>• A <i>job</i> stored all the data involved, including attachments, either filled out at the beginning or throughout the workflow (e.g. start date, end date, description, deadlines, client, etc.)</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• A new <i>workflow</i> was codified, where the <i>job</i> would pass through several standardized steps, including <i>start</i>, <i>data collection</i>, <i>data analysis</i>, <i>report authoring</i>, <i>reviewing</i>, <i>approving</i> and finally <i>submitting</i>.</li> <li>• As soon as Marketing creates the <i>job</i> in the system, they pass it on to the <i>Financial Advisor</i> by assigning the <i>job</i>. The system would notify the Financial Advisor, who would then assign the <i>Analyst</i> working via the portal. The Analyst is notified about their roles, deadlines, and statuses in the workflow by viewing the <i>job</i> on the system dashboard, and they get access to all their jobs via their system dashboard.</li> <li>• Team members, including Financial Advisors, Analysts and Reviewers, finish their tasks and sign off; the system automates the workflow by assigning the next in line and updating the status. The system has features and can be programmed to send notifications, alerts, status updates and reminders at specific programmable triggers and events.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>• Employees were re-trained to use the system and adapt their pre-transformed workflow to the new technology and process.</li> </ul>
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	<ul style="list-style-type: none"> <li>Employees were assigned to the different <i>jobs</i> in the TMS system and could find all their relevant data, update artefacts, trace the history of all their work and other peoples' work from their dashboard.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>Almost all of the workflow was transformed to the new digital technology and process, including the document repository, which allowed efficient check-in and check-out, sharing security, and traceability and conflict avoidance.</li> <li>There are still elements of manual workflow, specifically with the heavy interaction with the clients in face-to-face meetings and phone calls.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>For the system to be efficient and reliable in the workflow, every phone conversation, personal meeting, and customer interaction needs to be documented into the TMS so that the next employee down the line can get up to speed and commence with their task effectively. However, many employees find it an overburden above their usual stressful work, and many forget or add incomplete comprehensive data, which causes teams to subside the system sometimes when under pressure from deadlines.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>Management wished there was a better way to interact through the system by integrating more communication technology. COVID-19 enabled that in a big way where employees were forced to work from home, communicate more through the system enabled conferencing technologies and logging. COVID-19 is when the digital system was tested and proved its worth.</li> <li>Management hired a “process and data” control individual responsible for oversight and supervising adherence and compliance with the new digitally transformed system.</li> </ul>



<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The models were a good start, and the feedback loop helped refine and crystallize the overarching goals and resulting relationships.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>Three technologies were integrated to enable the Knowledge Management Meta-System of the firm: The Task Management System (TMS), a Cloud Document Repository (DRS), and a Customer Relationship Management System (CRM).</li> <li>The Analyst used the TMS and the CRM to address the client and collect the data using template forms and data collection checklists. The client replied to the forms with the data and uploaded documents to the forms. The TMS generated the forms, and the data and documents were auto-associated with that job in the TMS.</li> <li>The Analyst can track the status of the data and check its integrity and all that information was accessible and seamlessly available from the job in the TMS. The result is that all the knowledge in the job was well connected, indexed and reusable.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>The new workflow was codified in the TMS, whereby the Analyst and Financial Advisor team would have complete visibility into the data collection status and the next steps</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>Employees were re-trained to use the new data collection and usage system and adapt their pre-transformed workflow to the new technology and process.</li> </ul>



<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• A complete transformation from previously depending on manual emails, phone calls, USB drives, and hard copies to an entirely digitally integrated data collection, management and storage system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• Data collected informally via conversations in person or on the phone are still an issue.</li> <li>• Management expressed concern about over data integrity and due diligence.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Management expressed the desire to have deep analytics on the collected data.</li> <li>• Managed wanted to explore more digital transformation opportunities for managing informally collected data.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>• The model sufficiently scoped and outlined the high-level goals, dependencies and relationships necessary for this use case.</li> </ul>
<b>Operation</b>	3. Engagement
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• A new cloud Customer Relationship Management (CRM) that stores all the client information, contact data, roles, and is integrated with the Task Management System (TMS), and the Accounting Management System (AMS)</li> <li>• With the new system, Marketing can communicate with the client via the portal, submit quotations, follow up on the engagement procedures, track the client history with previous jobs, payment track record, and rating.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• When a client sends a Request for Proposal (RFP) to the company official email, the new CRM picks it up and creates a new Client</li> </ul>



	<p>Request. The Marketing team can then categorize it as a new request or belonging to an existing request.</p> <ul style="list-style-type: none"> <li>• Marketing then proceeds to process the request. If it is a new request for quotation, then Marketing prepares a quotation and submits it to the Client for negotiations and approval.</li> <li>• If the request belongs to an existing request, then it is rerouted to the correct system. If it is requested in the offer phase, then Marketing handles it; if it is a work in progress, then it gets tagged with the job-ID and gets re-routed to the TMS for processing; otherwise, if it is a payment issue, then it is handled after re-routing to the AMS system for handling. All systems communicate with one another and are fully integrated.</li> <li>• People:</li> <li>• Marketing specialists were trained to operate the new CRM, no new hires were required.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• Near-complete digital transformation of all Business Development tasks and operations except for a few functions such as mailing, printing, scanning and courier delivery of artefacts that still require manual processing and adapting to the digitally transformed work process.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• Some resistance to change at the beginning.</li> <li>• Initially, the system was not helpful with little customer data, so a backlog project was launched to fill the system with past client information.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Given the number of synergies between Marketing and Finance, management has expressed their desire to combine both teams into</li> </ul>



	one, possibly splitting accounting responsibilities into accounting in Marketing and accounting in expenses and tax reporting.
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The model would most likely need to take a revamp given the new ideas by the Management team enabled by the new digital transformation to synergies departments in the firm. A follow-up remodeling is earmarked for the year 2022.</li> </ul>
<b>Operation</b>	4. Collections
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>A complete transformation to a cloud-based Account Management System (AMS), that integrated with the Customer Relationship Management System (CRM) and the Task Management System (TMS).</li> <li>The AMS is integrated with the CRM with regard to invoicing and payment follow-up.</li> <li>The AMS is integrated with the TMS regarding costing, billable hours, and status of jobs in the workflow for payment processing.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>Accounting department, via the integrated system, handles all the payment handling from the client as per the engagement agreement submitted in the job by Marketing.</li> <li>Accounting then schedules the invoices to the client and processes them, and the System sends automatic reminders to the Client to follow up on payments.</li> <li>The AMS also handles the company accounting for costs incurred, billable hours, and taxes.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>Accounting employees were fully trained to work on the new technology and process.</li> </ul>



<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• An almost complete transformation from the old desktop system to the new integrated cloud system.</li> <li>• Physical handling of paper invoicing and courier services are still the same except that they are getting printed and processed from a new system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• Although the transition from desktop software to online cloud software was almost seamless, the new integration features with the CRM and TMS significantly departed from the team's old ways of day-to-day operations. They switched from phone calls and manual follow-up to checking system status, program reminders, and automated next steps. There was a struggle, in the beginning, to get everything right.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Many integration points between the systems still need to be fixed.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>• The synergies between half the Accounting team handling the Client and Marketing were many, prompting Management to consider re-modelling the functions accordingly.</li> </ul>

## 6.2 Evaluation of SC-COST

Separately, the interviews conducted asked the stakeholders about their opinion on the SC-COST framework as follows:

<b>Evaluation of pre-transformation modelling exercise</b>
The stakeholder found the research involvement very useful in guiding the brainstorming discussion. The level of stakeholder engagement was high, and the outcome was beneficial for both the firm and the researcher. The insights gained were significant for the firm and the development of the SC-COST framework.
<b>Evaluation of patterns</b>



There were no patterns at the time of this case study; however, the researcher learned some lessons from the second use case that helped identify critical missing considerations for the modelling exercise, such as identifying the difference between marketing and collections. Although they were both in the same department, they were two different conceptual functions that the stakeholders implied in their brainstorming sessions. When the stakeholders were presented with the patterns post-transformation, they did not have any objections to it, as it reflected their structure at the abstraction levels presented. The patterns captured the essence of their modelling and transformation, and they agreed to their ontology and structure.

### Evaluation of the eCORE tool

The eCORE tool needed many more bug fixes and features; however, it was sufficient in a research setup to achieve its intended outcome.



## Appendix 3: Case Study 3: Income Marketing

Company Name	Income Marketing (IncomeMarketing)
Small Consulting Code	IM
Description of services	A small Market research consultancy firm
Interview Date(s)	13/04/2018 17/04/2018 02/10/2021 (Feedback interview) 07/10/2021 (Feedback interview) 16/10/2021 (Feedback interview)
Interview with	Hesham Hussein (Chairman and the Managing Director) Ismaeel Azm (Senior consultant)

### 1 Background of the firm

#### 1.1 About IncomeMarketing (IM)

IncomeMarketing (IM) is a Small-Consulting-Firm (SCF) specialized in a wide range of marketing and financial consultancy services, including market research, economic feasibility studies, assessment of investment opportunities, and relevant specialized and customized training programs. The firm is registered in Dubai, has a Joint-venture agreement with a sister consulting network in the Netherlands, and operates in 13 countries.

Typical customers include Corporations, Private Equity Funds, Financial portfolio managers, Public and Private Companies, Governments, and Courts. A few individuals also use IM's services for personal use.

#### 1.2 Products and Services offered

For the scope of this study, we will focus on the following consulting services

1. Market research.
2. Sales & Marketing consulting.



### 3. Training consulting.

#### 1.3 Workforce & Culture

The firm employs approximately 165 people, including directors, consultants, analysts, researchers, accountants, and support staff (HR, secretary, collections officer, and marketing). The firm outsources non-core functions such as facility management, security, and courier services. The firm also uses freelance consultants and third party specialised firms depending on the project at hand.

The overall culture reflects the management character, which is formal in appearance and relaxed with structure (e.g., flexible office hours, and no titles) but is strict with quality and results. The priority is to do the job right and deliver it on time, and the emphasis is on personal responsibility and resourcefulness to get things done. The organisation is relatively flat with only three levels, with the management typically involved in day-to-day operations. Upper management consists of the Partners who happen to act as Directors of the firm, while middle management includes four managers for four central departments: Market Research, Sales & Marketing Consulting, Training, Office management, and all other employees are directly managed by one of those four managers.

#### 1.4 Information gathering

In total, five interviews were carried out with the Income Marketing team. The first two interviews were carried out in April of 2018 and were aimed at confirming the findings in the framework's design. This was the third case study; at this point, we had some commonalities from the first two case studies that required confirmation. The interviews were shorter than the first two as we already had a better handle soliciting the structure and processes. They were conducted in intensive several-hour whiteboard workshops. The eCORE framework was introduced up front, and the stakeholders collaborated with these set goals in mind:

1. Identify the central business use cases of their SCF.
2. Conceptualize and Model the AS-IS eCORE model of their SCF.
3. Design the elements of their Digital Transformation as they see fit.
4. Conceptualize and Model the TO-BE eCORE model based on that design.



5. Translate their understanding of those transformations into pragmatic requirements for change in their People, Process and Technology components.

The workshops were done in collaboration with the researcher, and the first set of models was contrasted with the previous case studies to see if there were similarities. Repeated themes were confirmed at this point, and although the team may have named tasks and processes differently, functions and processes looked very similar.

Those models were further enhanced in the second round of interviews in October of 2021, more than three years later. The second round was intended to obtain feedback on the transformation project and revise the model in hindsight. Those interviews benefited from the evolution in the tool and the process as a result of researching the other five case studies, and a more precise and consistent ontology and framework were gauged for feedback.

**Note:** After completing the information gathering for this case study, the research had to take a different turn, as adding more case studies of the exact nature did not challenge the artefact design. Similarly, the use of the RE tools was insufficient, as it did not fully encapsulate the ontological concepts discovered, nor was it efficient in modelling those components. The research took a break from interviews after this case study to repair those two drawbacks to rectify the choice of case studies and develop a more competent conceptualizing tool.

The outcome of that exercise is outlined in the following five sections:

## 2 Use Cases

Although many use cases could be generated for **Digital-Transformation (DT)**, the following use cases represent the core structured activities of the firm and encompass the main areas in need of digital transformation.

### 2.1 UC\_SCF3\_1: Conducting a market research assignment

Use Case ID	<UC_SCF3_1>
Goal	Conducting a market research assignment



### Appendix 3: Case Study 3: Income Marketing

<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Researcher</li> <li>3. Consultant</li> <li>4. Analyst</li> <li>5. Reviewer (typically a Partner in the firm)</li> <li>6. Marketing (Business Development)</li> </ol>
<b>Use Case Overview</b>	<p>When a request for a Market Research Assignment is given to the consulting team, the Consultant assigned to the task allocates the proper resources based on the size and complexity of the task at hand. The Client is contacted to collect the required research parameters and scope of work, followed by a kick-off meeting to brainstorm the approach and method and the extent of the investigation, followed by a market research exercise, report writing and reviewing then approval by the partner before releasing the draft to the client for acceptance. Once approved the assignment is closed and the project goes to collections for fees.</p>
<b>Trigger(s)</b>	Marketing (Business Development) assigns a new project to a Consultant
<b>Precondition(s)</b>	Engagement letter signed, and the project is set to go from the business development department.
<b>Basic Flow</b>	<p>Description: This scenario describes the project flow</p> <ol style="list-style-type: none"> <li>1. The Consultant gets assigned to the project.</li> <li>2. The Consultant allocates the resources required for the assignment: Researcher(s), analyst(s) and a Reviewer.</li> <li>3. The Consultant sends an email to the Client outlining the required data such as the research parameters, the purpose, the end-use for the data, and the scope of work, which changes from one service to the other depending on the purpose of the assignment.</li> <li>4. The Consultant and the Researcher(s) conduct a series of meetings with the Client and perform a brainstorm kick-off meeting to discuss</li> </ol>



	<p>the extent of the investigation and how it will get used. Depending on the extent required, different outcomes are preselected. For instance, if the Client wants to do market research for a new mall development, the Consultant advises that they conduct Market Research on demand and supply, competitive analysis, and pricing analysis for the mall respective catchment area.</p> <ol style="list-style-type: none"> <li>5. The Researcher and the Analyst then set about to collect the data, analyse it, and prepare it in a presentable format.</li> <li>6. The Researcher and the Consultant discuss the outcome of the data collected, the documents provided, and the analysis results from the Analyst, weigh the factors and the applied adjustments to agree on the final presentation of the findings.</li> <li>7. The Consultant and the Researcher(s) arrange a presentation meeting with the Client to discuss the outcomes and take feedback.</li> <li>8. The Consultant takes the feedback and iterates through the research findings, possibly doing more research work until they finally agree to a satisfying outcome.</li> <li>9. Once approved by the Client, the Consultant finalizes the Market Research report and gets it printed and delivered to the Client.</li> <li>10. Then the assignment is handed over to the Accounting department for invoicing and collections.</li> </ol>
<b>Termination outcome</b>	A presentation report with findings, along with any excel based numbers and data representing the analysis for use by the Client.

## 2.2 UC\_SCF3\_2: Engaging a new assignment

Use Case ID	<UC_SCF3_2>
<b>Goal</b>	Engaging in a new assignment
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> </ol>



### Appendix 3: Case Study 3: Income Marketing

	<ol style="list-style-type: none"> <li>3. Partner (Senior Consultant or Director)</li> <li>4. Consultant</li> <li>5. Legal</li> </ol>
<b>Use Case Overview</b>	<p>When a Client approaches the firm for a market research study, they first ask for a Request for Proposal (RFP), Marketing (Business Development) sends them a technical and financial offer, which they typically negotiate until approved, after which they sign an engagement letter.</p> <p>Alternatively, through personal connections, a Partner requests that Marketing send a Proposal to a specific Client.</p> <p>Alternatively, governments or public entities announce RFPs or Request for Vendors publically. Marketing subscribes to newsletters of vendor lists and applies with a proposal or application when a job is posted.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Client emails the firm with an RFP.</li> <li>• A partner develops a client and asks the firm to prepare a proposal.</li> <li>• Marketing applies for open tenders.</li> </ul>
<b>Precondition(s)</b>	None
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. An email is received from a Client or a Partner requesting a quotation or proposal.</li> <li>2. Business Development opens a new case and sends the project details to a Consultant for the technical offer, effort and cost estimation.</li> <li>3. Business Development prepares financial offer based on costs, client's history, and competitiveness.</li> <li>4. Business Development reviews the proposal with a Consultant and obtains approvals.</li> <li>5. Business Development submits the proposal to the Client.</li> </ol>



## Appendix 3: Case Study 3: Income Marketing

	<ol style="list-style-type: none"> <li>6. The Client responds with a counter-offer, negotiates cost, time or terms.</li> <li>7. Business Development adjusts the proposal after negotiations and resubmits.</li> <li>8. Client approves the proposal, signs, and issues a work order.</li> <li>9. Business Development assigns the assignment to the Consultant.</li> </ol>
<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• An engagement is signed, and the assignment commences to the Consultant.</li> <li>• Alternatively: Cancelled, whereby the engagement fails and goes to a competitor.</li> </ul>

### 2.3 UC\_SCF3\_3: Collections

Use Case ID	<UC_SCF3_3>
<b>Goal</b>	Collections
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> <li>3. Consultant</li> <li>2. Accounting</li> </ol>
<b>Use Case Overview</b>	<p>When a Client signed the engagement, they have to pay a deposit, which triggers the start of the execution of the assignment.</p> <p>Or, when an assignment is concluded, they have to pay the balance of payment.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Marketing approves an engagement.</li> <li>• Consultant submits the final report.</li> </ul>
<b>Precondition(s)</b>	Approved Engagement Or Approved final report.
<b>Basic Flow</b>	Description: This scenario describes the typical valuation flow



## Appendix 3: Case Study 3: Income Marketing

	<ol style="list-style-type: none"><li>1. Marketing pings Accounting to issue a proforma invoice for the advance payment before the start of work.</li><li>2. Accounting reviews the terms and engagement and programs the payment schedules into the accounting software.</li><li>3. Accounting issues the advance payment proforma and communicates with the client for collection.</li><li>4. Once the collection is complete, Accounting approves the commencement of the project to the Consultant.</li></ol>
<b>Alternative Flow</b>	<ol style="list-style-type: none"><li>1. The Consultant signals to Accounting the delivery of the final report.</li><li>2. Accounting issues the final payment invoice, including any amendments, taxes and additional expenses.</li><li>3. Accounting follows up with the Client until the collection is complete, then marks the assignment finished.</li></ol>
<b>Termination outcome</b>	<ul style="list-style-type: none"><li>• All the payments have been paid following the engagement agreement.</li></ul>

### 2.4 Other use cases:

There are many other functions in the firm that were excluded from our analysis but are nonetheless subject to digital transformation, including::

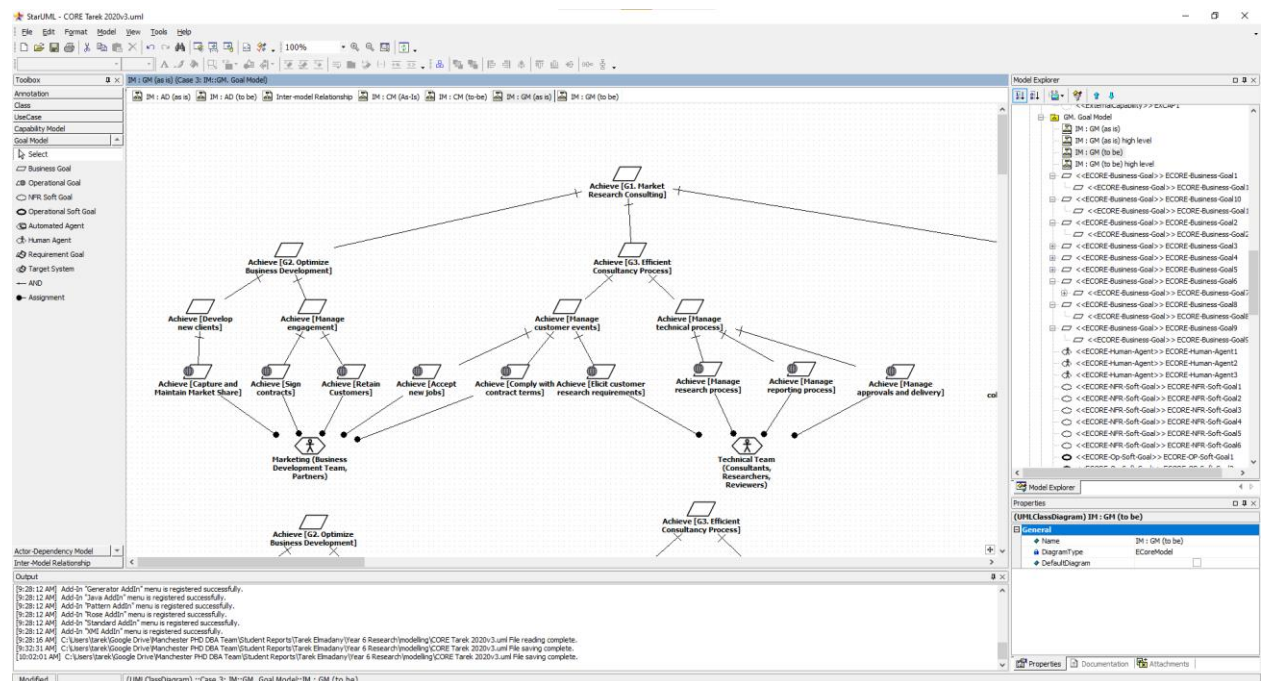
- 1- Accounting and expense tracking: Accounting (Financial controller) allocates hours and costs to projects. They carry their job using excel files and desktop-based accounting software. Could benefit from a cloud-based integrated system with a Task/Job Manager and Customer Relations Management System (CRM).
- 2- Asset tracking: Physical resources such as meeting rooms, vehicles, company laptops, and cell phones are all shared resources currently tracked manually by the Office Manager and require resource management software and integration with the PMS and CRM.
- 3- Human Resource Management: Employees billable hours, attendance, vacations, sick leaves, benefits, contract renewals, and more are managed manually via excel



files by the Office Manager and reviewed and approved by a Partner. A Human Resource Management (HRM) system could be implemented that integrates with an automated access control device (fingerprints or cards) to calculate hours automatically, and also allows employees to enter their vacation times and leave and track their pay, bonuses, sick days and more via an online programmed portal. Possibly also integrate with the PMS to calculate billable hours automatically.



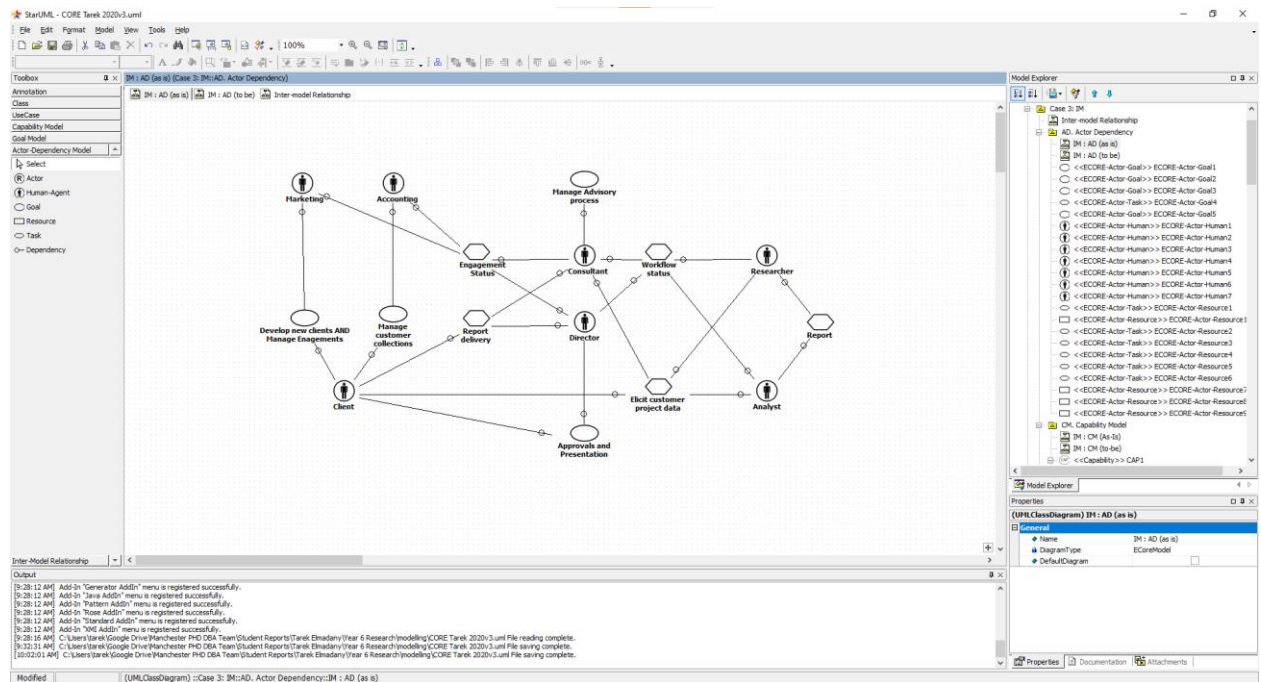
### 3.1 AS-IS Capability Model



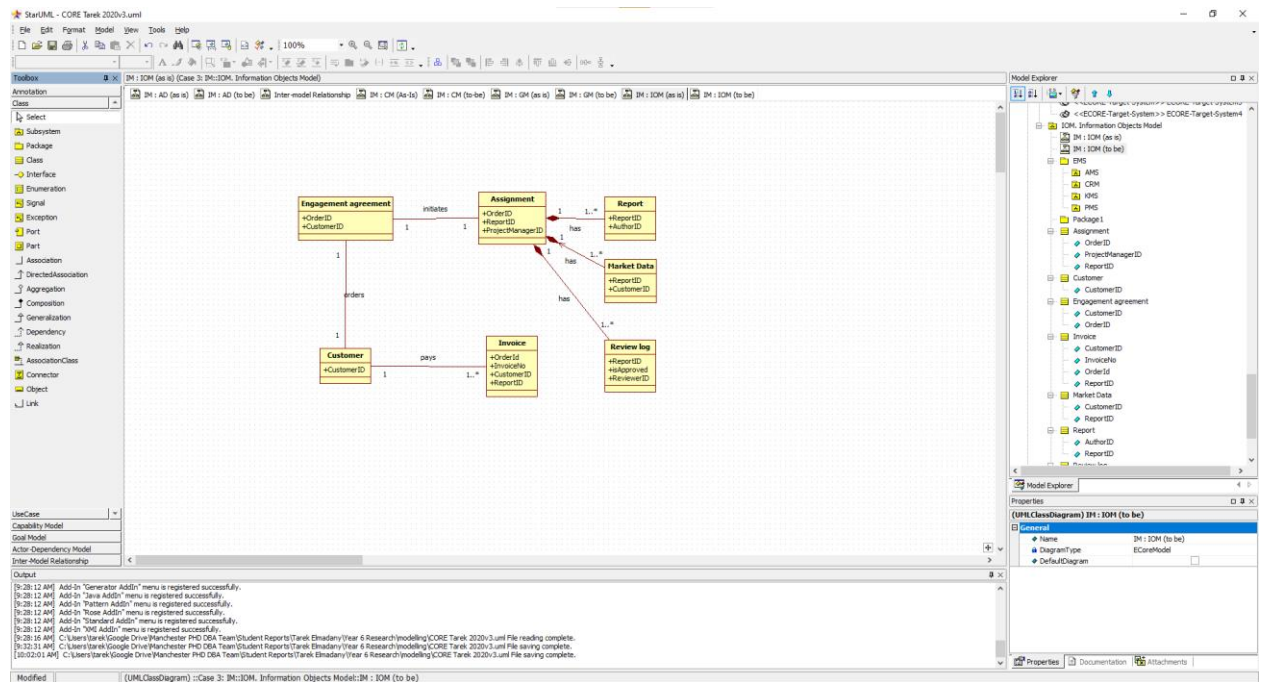
### 3.3 AS-IS Actor Dependency Model



## Appendix 3: Case Study 3: Income Marketing



### 3.4 AS-IS Information Objects



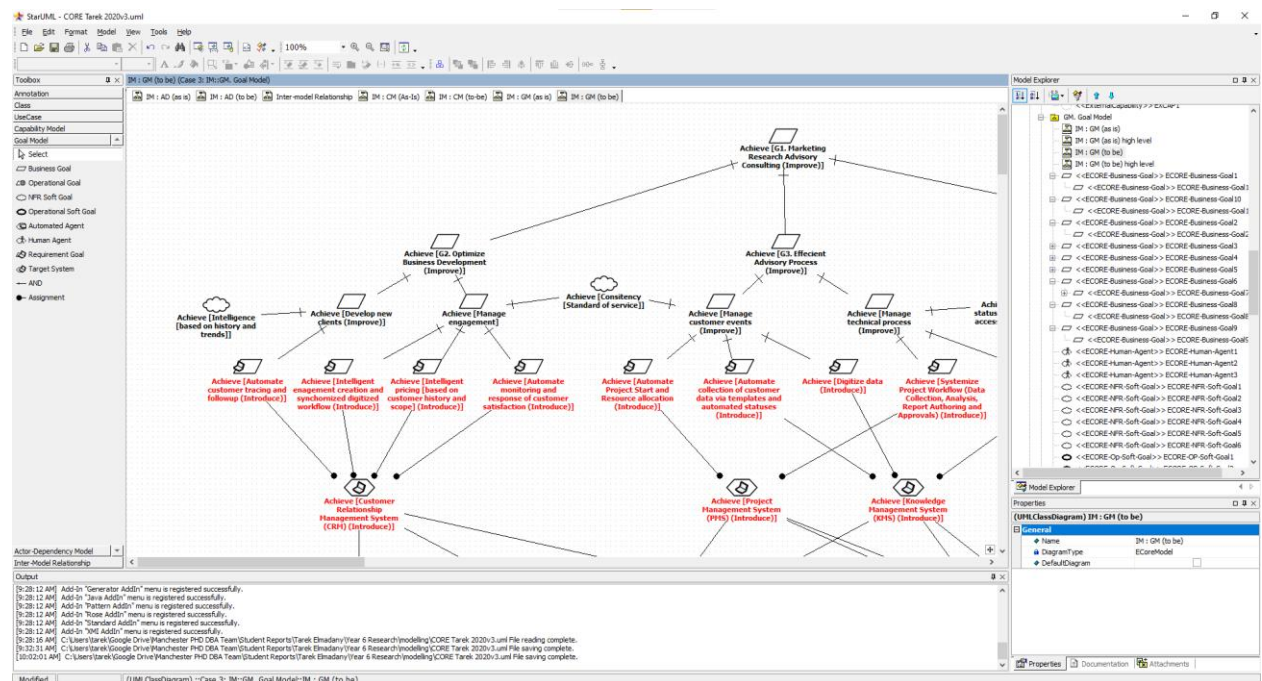
### 3.5 AS-IS Intermodel correlation







#### 4.1 To-be Capability Model



### 4.3 To-be Actor Dependency Model



#### 4.4 To-be Information Objects Model



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### Appendix 3: Case Study 3: Income Marketing

The following table describes the operational level Digital Transformation requirements for the technology component resulting from the modelling exercise.

Operation 1. Report Authoring and Calculations	
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office (Word &amp; Excel)</li> <li>• Desktop harddrives, flash drives, emails</li> <li>• Paperwork</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Report Authoring on Desktop Word.</li> <li>• Calculations on Desktop Excel.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Higher quality report authoring (templates and spell checkers)</li> <li>• Improved productivity (Excel calculations)</li> <li>• For easy recycling of data and refactoring of studies</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Version conflicts when electronic documents are passed around.</li> <li>• Hard to search since the content is not indexed from Operating System.</li> <li>• Most of the reports are archived on the company server with no easy data mining or reusability capability.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Need for the ability to recycle data more efficiently and consistently.</li> <li>• Need for more collaborative formats and modes of work.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Content Searchability.</li> <li>• Accessibility (Connectivity).</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Document Control</li> <li>• Knowledge Management System (KMS)</li> </ul>



### Appendix 3: Case Study 3: Income Marketing

<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Convert to cloud-based collaboration tools such as Microsoft 365 or Google Docs.</li> <li>• Use a document control system to check-in and check-out documents to avoid conflicts.</li> <li>• Cloud artefacts are content searchable.</li> <li>• Paperless (sustainability)</li> <li>• Standardisation of artefacts and templates.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Emails.</li> <li>• Local computer drives</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, comparables, and statistics are all stored in excel files inside the project folder.</li> <li>• Data stored on local folders on company server.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation.</li> <li>• Recyclability of data.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Data is not indexed, which makes it hard to search and hard to reuse for future projects.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More integration across data assets.</li> <li>• Accessibility (Connectivity)</li> <li>• Content Searchability.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Easier reusability of data assets.</li> </ul>



### Appendix 3: Case Study 3: Income Marketing

<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Document Control.</li> <li>• Knowledge Management System (KMS)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Data could be stored on a cloud-based DB which enables collaboration, easy search by date and reusability of data.</li> <li>• Modify data collection process to request electronic formats</li> <li>• Storage of data in an index Knowledge database such as a cloud wiki for ease of data recyclability.</li> </ul>
<b>Operation</b>	3. Resource planning, Workflow and Task Management
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Emails</li> <li>• In-person</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Resource planning is conducted in person and tracked on an individual consultant level.</li> <li>• Workflow management in email communication with the client and other staff.</li> <li>• Follow-up on tasks and assignments.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Responsibility.</li> <li>• Personalization.</li> <li>• Localization.</li> <li>• Standard of service.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Status and updates are kept in threads in staff inboxes.</li> <li>• Data is unorganised and often lost.</li> <li>• Inefficient Resource Planning in person.</li> <li>• Centralised to the Consultant and dependent on each person's style and discipline and not transparent to the rest of the team.</li> </ul>



### Appendix 3: Case Study 3: Income Marketing

	<ul style="list-style-type: none"> <li>• Causes the Consultant to be the bottleneck in communicating project goals and status.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Transparency (Status accessibility by everyone in the organisation).</li> <li>• Accessibility (connectivity).</li> <li>• Higher efficiency through faster status awareness and more synchrony.</li> <li>• Maintainability (outsourcing the burden of technology upkeep).</li> <li>• Integration across all company resources and assets.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Project Management System (PMS) (Cloud-based) with a module for Enterprise-Resource-Planner (ERP) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Resources, tasks and projects are all connected.</li> <li>• Members of the team have access via cloud portal and can follow up on their tasks and understand their assigned tasks.</li> <li>• Workflow is transparent, and status is clear.</li> <li>• System offers threads for comments, history, attachments.</li> <li>• Integrates with other systems such as ticketing from the client, document control, and reports artefacts (KMS).</li> </ul>
<b>Operation</b>	4. Engagement
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Customers communicate with the firm via emails, and engagement is kept in email threads.</li> <li>• Customers informally communicate with staff offering valuable data via social media, messaging apps and phone calls.</li> <li>• Contracts are all created in word and printed for signing and stamping.</li> </ul>



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	<ul style="list-style-type: none"> <li>Scanned documents are stored on PC, and backed up on external drives.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>Personalization.</li> <li>Responsibility.</li> <li>Localization.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>Does not offer accessibility from outside the office.</li> <li>Slow process and labour intensive.</li> <li>Hard to track and search emails for customer history.</li> <li>Hard to centralise communication across alternative messaging apps and social media.</li> <li>No meta-data is stored on the customer or relation to previous engagements. Often have to rely on memory.</li> <li>Difficult to relate the engagement to the project once transferred to Re-searcher.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>Accessibility (connectivity).</li> <li>Faster and more accurate response to customer status.</li> <li>Integration with the project management system for a more efficient status update.</li> <li>Higher quality of customer service.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Use of a cloud-based CRM that would integrate with Task management system and Accounting systems.</li> <li>CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp.</li> <li>Paperless (sustainability)</li> <li>Standardisation of artefacts and templates.</li> </ul>



Operation	5. Collections
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp (Social media)</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>• Scheduling and reminders are scheduled on Google Calendar.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the customer, and the Consultant to clear the requests from Accounting to submit a final invoice. This process is highly dependent on memory and personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections.</li> </ul>



<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM, to offer traceability and event-driven automation and reminders.</li> </ul>

## 5.2 Process Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the process component resulting from the modelling exercise

<b>Operation 1. Marketing Research Consultancy (The core service of the consulting practice)</b>	
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Usage of MS word template for report authoring.</li> <li>• Assigning both the Researcher and the Consultant the responsibility of conducting the study.</li> <li>• Manual tracking of progress through weekly meetings and email chains.</li> <li>• Storage on PCs, company servers and sharing of files through email chains and USB flash drives</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Process is not coded but based on peer training and on-the-hand experience.</li> <li>• Consultants track the progress and status of jobs with their different phases manually.</li> <li>• Follow-up of the process and workflow of this phase is the responsibility of the Researcher, and follow up for status and compliance is the responsibility of the Consultant</li> <li>• Synchronization of status and updates are communicated through meetings and electronic channels such as emails, direct messaging, or phone calls.</li> </ul>



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<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Personalization</li> <li>• Responsibility.</li> <li>• Process leanness and quick response to customer communication.</li> <li>• Repeatability -&gt; Higher reusability of research data and assets.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of codified training hinders the on-loading of new employees.</li> <li>• Process leanness is often applied as poor process adherence.</li> <li>• The knowledge of status and stage inside the workflow is only kept with single people.</li> <li>• Compliance with regulations is highly reliant on the individual's compliance.</li> <li>• Most of the institutional history, knowledge and experiences are implicitly known by the individual (personal memory) with minimal explicit knowledge recording in files or documents, making the transfer of knowledge and experience highly reliant on employee retainment.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More transparency and accessibility of status and workflow statuses and stages.</li> <li>• More standardization of process compliance across teams.</li> <li>• Better synchronisation between different actors and conflict avoidance.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• [Introduce] Workflow scheme coded inside a collaborative online Project Management System (PMS). The system allows for assigned responsibilities, updates of status workflows, automated monitoring of deadlines and reminders.</li> <li>• [Introduce] A new check-in and check-out document control process using a Cloud Document Control System.</li> <li>• [Introduce] A process of reliance on recycling data in a properly indexed Knowledge Management System (KMS)</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• More visibility into document status and workflow status.</li> <li>• More control over document standardization and version control.</li> <li>• Automatic storage of institutional knowledge and history.</li> <li>• More standardization of process workflow can allow substitution easier.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Data is collected by multiple roles from multiple sources:</li> <li>• Multiple individuals solicit the client for project data.</li> <li>• After the project is complete, the entire project folder gets archived on the company server in a central archive.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, comparables, and statistics are all stored in soft format inside the project folder on company server.</li> <li>• Hard-format data is digitized by scanning, then stored in a project paper folder in the archive room.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Centralization and Compartmentalization.</li> <li>• Responsibility and Personalization.</li> <li>• Reusability.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The process of collecting data and storing it is manual and not standardized.</li> <li>• Checklists and templates are often always out of date.</li> <li>• Data sources are non-traceable, and accountability is non-measurable due to the lack of a tracing or sign-in/out process.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Streamline the process across different roles.</li> <li>• Accessibility (Connectivity)</li> <li>• Knowledge searchability and reusability.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Traceability by allowing check-in/check-out process.</li> </ul>



	<ul style="list-style-type: none"> <li>• Quicker reusability.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• A technology-enabled check-in/check-out accountable and traceable process using an accessible Cloud Document Control system (DCS)</li> <li>• Integration between the two PMS and Cloud DCS for seamless searching, locating and accessing of data.</li> <li>• Integration between the DCS and the Knowledge Management System (KMS) for better reusability of data.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Updated process for data collection, consumption, and storage is integrated within the intuitive usage of the cloud-based Document Control System (DCS), enabling accountability, traceability, collaboration, easy search by location, and reusability of data and knowledge.</li> <li>• More efficient reusability of previously mined data.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Template offers, contracts and engagement letters are created in Microsoft Office / Adobe PDF and communicated via emails or snail mail (printed)</li> <li>• Negotiations and agreements are achieved via personal meetings, phone conversations, and emails.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• The process is manual and reliant on the personal quality and consistency of the Business Development personnel.</li> <li>• The process involves omnichannel presence via emails threads, WhatsApp threads, and social media threads and all connected in the business development personnel's head.</li> </ul>
<b>Why was it</b>	<ul style="list-style-type: none"> <li>• Standardisation of artefacts and templates.</li> <li>• Customer satisfaction (Omni-channel communication, friendly human interaction, and quick personal response by lowering bureaucracy).</li> </ul>



<b>managed that way?</b>	
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Manual process is inefficient, inconsistent and labour intensive.</li> <li>• Process is non-traceable, often hard to hold individuals accountable, and causes many missed opportunity due to lack of tools for automated follow-up.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Consistency and automated reminders, status updates and effective workflow management.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• Software Task-oriented programmed workflow designed in a Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Technology-enabled processes using the cloud-based CRM would force a consistent and quality engagement experience, follow-up and reminders.</li> <li>• CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp to allow for a single point of process follow-up and management.</li> <li>• Updates to online templates and improvements in checklists on the CRM automatically persists into the future without remembering to change it manually every time, hence less risk to human error.</li> </ul>
<b>Operation</b>	4. Collections
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> </ul>



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	<ul style="list-style-type: none"> <li>• Whatsapp</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>• Scheduling and reminders are scheduled on Microsoft Outlook Calendar.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the customer, and Consultants requests from Accounting to submit a final invoice. This process is highly dependent on personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM to offer traceability and event-driven automation and reminders.</li> <li>• More efficient use of time and resources.</li> </ul>



### 5.3 People Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the people component resulting from the modelling exercise.

Operation	1. Market Research Consultancy (The core service of the consulting practice)
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Consultant</li> <li>• Researcher</li> <li>• Analyst</li> <li>• Support staff (Secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• The central leader is the Consultant, who has to coordinate the entire process, starting with assigning roles, coordinating schedules, maintaining the pace of the progress, ensuring status update, follow-up and quality control.</li> <li>• Researchers and Analyst carry the technical grunt work of the market research, feed it to the Consultant, analyse submitted data, and use the findings to compile Market Research Reports.</li> <li>• Researchers compile the data, review their alignment with the re-search goals, and arrange for review meetings with the Consultant.</li> <li>• Continuous communication between the Consultant and the Client involves iterating over data collection, analysis, and outcomes.</li> <li>• Support staff help with printing, delivery and non-technical support work.</li> </ul>
<b>Why was it setup that way?</b>	<ul style="list-style-type: none"> <li>• Specialization and personalization.</li> <li>• Teamwork effort to arrive at the desired customer outcome.</li> <li>• Focus on efficiency and reusability of market data.</li> </ul>



<b>Problems</b>	<ul style="list-style-type: none"> <li>• The Consultant is the sole responsible person to drive the process; his/her role is to manage the project to delivery, which means that he/she is the primary person aware of the status and could pose a risk if absent or on leave.</li> <li>• Communication and synchronization are slow and inconsistent.</li> <li>• Consistency and Quality are often forgone for speed and delivery.</li> <li>• Process and Workflow are People dependent. While everyone knew what needs to be delivered, every team had their way of achieving it, which mainly relied on people skills and experience and less on standardized systems.</li> <li>• People used varying non-standardized enabling technologies with no centralized technology strategy, which often caused multiple synchronizations and quality problems.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Achieve decoupling of the dependency on people and shift to the dependency on systems and technology.</li> <li>• Achieve higher efficiency from people who are distracted by context switching and repetitive non-productive synchronizing and admin work.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Current roles to train on the usage of enabling new technology and integrated system processes and workflows.</li> <li>• [Introduce] IT systems admin, Process compliance admin.</li> <li>• [Introduce] Automated workflows and processes, including standardized scheduling, automating assignment based on workflow stages, automatic reminders, integrated centralized communication and document repository that is auto-synchronized and status aware.</li> <li>• [Cease] Manual communication support roles and replace with technology.</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Improves people's productivity by eliminating much of the manual work.</li> <li>• Reduces errors and improves quality by shifting some standardization onto systems and technology previously used to suffer from people error.</li> <li>• Enhances people value since technological enhancements free up people's wasted attention and time and instead shift the focus on improving their core consulting competency and skills.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Consultant</li> <li>• Researcher</li> <li>• Analyst</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Data of different types and scopes are collected by each specialists depending on their needs. For example, a Researcher will collect documents and comparative evidence, while a Consultant will interview the client to gain insights into the needs of the client's firm.</li> <li>• Data is collected and stored with each person on their devices. At the end of the project, the Consultant tries to gather all the files and artefacts in one archived folder on the company server.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Specialization</li> <li>• Responsibility</li> <li>• Quickness</li> <li>• Reusability</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Inconsistent data collection procedures that depend on the quality of each team, it is not clear who is collecting and keeping the data.</li> </ul>



	<ul style="list-style-type: none"> <li>• No central owner or responsible person for data management and archiving.</li> <li>• Ineffective data reusability and mining since it depends on people's memories.</li> <li>• Highly reliant on individual due diligence and personal capability.</li> <li>• Clients complain that many people reach out to them from the firm asking for data all the time.</li> <li>• Many concerns on data privacy and security control.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• To improve the quality and comprehensiveness of data collection.</li> <li>• To centralize control of data for security, liability, compliance, traceability, and responsibility purposes.</li> <li>• For better indexing, searching, and reusability of data which is the foundation of the knowledge base.</li> <li>• Adherence to paperless data collection (sustainability)</li> </ul>
<b>To-Be People improve-ments</b>	<ul style="list-style-type: none"> <li>• [Introduce] KM admin: responsible for data management using technology-enabled cloud-controlled data-traceable data and knowledge management systems (including cloud drives and indexable data-bases).</li> <li>• [Improve] The roles of Consultant, Researcher, Analyst and Marketing to train on the new technologies and processes for data collection, control and storage.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Maintains specialization.</li> <li>• Introduces control and standardization.</li> <li>• Introduces Knowledge reuse capabilities.</li> <li>• Ceases paper-dependent procedures and shifts to paperless data collection procedures.</li> </ul>
<b>Operation</b>	3. Engagement



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<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Director</li> <li>• Consultants</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, couriers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Directors, Consultants and Marketing specialists use their connections to solicit past clients, current clients and future clients (client acquisition) to procure new jobs.</li> <li>• Once a request for proposal is made, engagement agreements are prepared and signed.</li> <li>• Procedures for communicating, signing and exchanging documents are handled by the Marketing (Business development) staff.</li> <li>• Contracts and agreements are stored on company computers under the responsibility of the business development staff.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide high customer personal care.</li> <li>• Focus on personal responsibility.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of standardized agreements resulting in many missed opportunities and errors.</li> <li>• Followup is reliant on individuals diligence in setting up personal reminders and memory.</li> <li>• Tracing of engagement status is reliant on individual memory.</li> <li>• Customer care level is reliant on individual skills and experience.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Personnel want more standardized artefacts, including offer documents, engagement agreements and data collection criteria.</li> <li>• The need to decouple customer service level from relying on individual skills to relying on a system of service standards that could be quickly followed and trained by any individual.</li> </ul>



<b>To-Be People improve-ments</b>	<ul style="list-style-type: none"> <li>• [Improve] Train marketing staff on Customer Relation Management (CRM) system, including a new standardized process.</li> <li>• [Improve] Train marketing staff on the new Cloud-based Document Control System (DCS) to store the artefacts and understand how it is integrated with the CRM and the Accounts Management System (AMS)</li> <li>• [Introduce] Automation in the customer follow-up and engagement workflow to add reminders, automatic assignment of roles, auto-mated status updates, and automatic linkages of previous engagements and knowledge.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Personnel offer a more consistent and higher quality of client experience.</li> <li>• Personnel have more robust traceability, status awareness and workflow management capability.</li> <li>• Personnel can more accurately price and generate higher revenues due to better client knowledge and historical understanding.</li> <li>• Paperless procedures.</li> </ul>
<b>Operation</b>	<b>4. Collections</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Accounting and finance personnel.</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, security, couriers, drivers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Accounting depends on Marketing to obtain status updates on contract and engagement agreements and stages in the workflow.</li> <li>• Accounting liaises directly with the clients and vendors to process payments, settle invoices and taxation requirements.</li> </ul>



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	<ul style="list-style-type: none"> <li>Accounting liaises with Consultants to give the signal to release the start of progress (in the case of fulfilment of down-payment) or to re-release the final report once the Client fulfils the final payment.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>Maintain Specialization.</li> <li>Provide a high level of customer care.</li> <li>Protect and fulfil business financial rights and obligations effectively.</li> <li>Privacy and security of financial dealings from the rest of the organization and the competitors.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>The reliance on individuals can sometimes act as a bottleneck and hinders progress.</li> <li>Non-standardized or integrated system to communicate status efficiently leads to mistakes, lost revenues and angry customers.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>Better synergy with the workflow of the core business.</li> <li>Faster response times.</li> <li>Higher status awareness and synchronization.</li> <li>Higher collection and effective customer handling in alignment with Marketing and Consultants.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>[Introduce] A new dependency between Accounting and the CRM system via integrating the newly introduced Account Management System (AMS).</li> <li>[Improve] Train the accounting personnel to use the newly introduced Account Management System (AMS) that automates communication, provides seamless status synchronization across systems, and leads to real-time status awareness.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Provides a more consistent customer experience.</li> </ul>



	<ul style="list-style-type: none"> <li>• Maintains the primary business goals of privacy, specialization, protection of business financial interest while eliminating the ineffective communications problem.</li> <li>• Paperless (sustainability)</li> </ul>
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## 6 Post-Transformation Feedback

### 6.1 Analysis of the transformation

A round of interviews was conducted after a while (as per interview dates above) to assess the feedback and progress of the digital transformation.

This company went through a crisis by having its CEO pass away during COVID-19. The plans for digital transformation were delayed, and only the Customer Relationship Management (CRM) was semi-operational. When the feedback interviews were conducted in late 2021, some stakeholders remembered the work and lobbied to present the work completed from 2019 to the new upper management since they still needed to digitally transform. The result was a fruitful round of refreshing the business model discussions, and many insights were drawn from this use case.

The following summarizes the findings:

Operation	1. Marketing Research Consultancy (The core service of the consulting practice)
How was transformation implemented?	<ul style="list-style-type: none"> <li>• Nothing was transformed yet; therefore, a post-transformation assessment was not yet possible.</li> </ul>
Extent of Transformation	<ul style="list-style-type: none"> <li>• Nothing was transformed yet; therefore, a post-transformation assessment was not yet possible.</li> </ul>



<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>Nothing was transformed yet; therefore, a post-transformation assessment was not yet possible.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>The full transformation is still planned to start in 2022</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>Nothing was transformed yet; therefore a post-transformation assessment was not yet possible.</li> </ul>
<b>Operation</b>	2. Data Collection and Management
<b>How was transformation implemented?</b>	<ul style="list-style-type: none"> <li>Nothing was transformed yet, therefore a post transformation assessment was not yet possible.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>Nothing was transformed yet, therefore a post transformation assessment was not yet possible.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>Nothing was transformed yet, therefore a post transformation assessment was not yet possible.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>The full transformation is still planned to start in 2022</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>Nothing was transformed yet, therefore a post transformation assessment was not yet possible.</li> </ul>
<b>Operation</b>	3. Engagement



<p><b>How was transformation implemented?</b></p>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• A new cloud Customer Relationship Management (CRM) that stores all the client information, contact data, and roles.</li> <li>• With the new system, Marketing can communicate with the client via the portal, submit quotations, follow up on the engagement procedures, track the client history with previous jobs, payment track record, and rating.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• When a client sends a Request for Proposal (RFP) to the company official email, the new CRM picks it up and creates a new Client Request. The Marketing team can then categorize it as a new request or belonging to an existing request.</li> <li>• Marketing then proceeds to process the request. If it is a new request for quotation, then Marketing prepares a quotation and submits it to the Client for negotiations and approval.</li> <li>• If the request belongs to an existing request, then it is rerouted to the correct implementation team. If it is requested in the offer phase, then Marketing handles it; if it is a work in progress, then the Consultants are notified to handle it; otherwise, if it is a payment issue, then it is handled by the Accounting department.</li> <li>• Notifications and reminders are all in the CRM, and the communication routes are still by email.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>• Marketing specialists were trained to operate the new CRM, no new hires were required.</li> </ul>
<p><b>Extent of Transformation</b></p>	<ul style="list-style-type: none"> <li>• Business Development tasks were utilizing the CRM but no other integrated systems were running to connect with yet.</li> </ul>



<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>The only stakeholders who were present in the initial modeling exercise who championed their transformation was the Marketing Manager. The rest of the company went through delay after delay with lack of buy-in from strong upper leadership.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>Given the number of synergies between Marketing and Finance, management has expressed their desire to combine both teams into one, possibly splitting accounting responsibilities into accounting in Marketing and accounting in expenses and tax reporting.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The model would most likely need to take a revamp given the new ideas by the Management team enabled by the new digital transformation to synergies departments in the firm. A follow-up remodeling is earmarked for the year 2022.</li> </ul>
<b>Operation</b>	4. Collections
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>The planned transformation was not implemented, instead the team relied on the embedded limited features of the Customer Relationship Management (CRM) system for following up on invoices. The old technology of recording the invoices and storing them is still done in excel sheets and on the desktops of the accountants. The only additional technological advancement was utilizing the connection, reminder and followup features of the CRM.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>Accounting department still followed their old processes, the only additional benefit is utilizing the CRM to connect and followup with customers.</li> </ul> <p><b>People:</b></p>



	<ul style="list-style-type: none"> <li>Accounting employees were trained alongside the business development team to understand how to use the CRM for their application.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>The intended transformation was not yet implemented, and was planned for 2022.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>Due to the difficulty in transforming an accounting and collection system online, it was originally planned as a last step in the original transformation initiative. The sentiment remains the same due to the large backlog of accounts that need to be catalogued and the digitalization of all the physical templates and documents to electronic mode of work.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>Nothing was transformed yet, therefore a post transformation assessment was not yet possible.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The synergies between half the Accounting team handling the Client and Marketing were many, prompting Management to consider remodelling the functions accordingly.</li> </ul>

## 6.2 Evaluation of SC-COST

Separately, the interviews conducted asked the stakeholders about their opinion on the SC-COST framework as follows:

<b>Evaluation of pre-transformation modelling exercise</b>
The stakeholder found the research involvement helpful in guiding the brainstorming discussion. The level of stakeholder engagement was significant, and the outcome was beneficial for both the firm and the researcher. The insights gained were equally significant for the firm and the SC-COST framework and patterns development.
<b>Evaluation of patterns</b>



An updated pattern was introduced from the outcomes of the earlier use cases; it was embedded as templates in the eCORE tool, along with a descriptive guide on how to use it. Through observing its utilization, the researcher learned some lessons to improve its descriptions and guide. When the stakeholders were presented with the templates, they did not have any objections, as it reflected their structure at the abstraction levels presented quite closely. They found it plausible, and after iterating the eCORE templates to fit their models, they found it feasible to implement. The patterns captured the essence of their modelling and transformation, and they agreed to their ontology and structure. Unfortunately, there was no post-transformation feedback since they failed to transform for circumstantial reasons; the re-run of the pre-transformation modelling exercise verified their understanding of the models and their plausibility.

#### Evaluation of the eCORE tool

The eCORE tool needed many more bug fixes and features; however, it was sufficient in a research setup to achieve its intended outcome.



## Appendix 4: Case Study 4: GAV

Company Name	Global Auctions and Valuation (GAV)
Small Consulting Code	GAV
Description of services	A small agency specialised in scrap and liquidated real estate auctions
Interview Date(s)	23/04/2020 27/04/2020 05/08/2021 (Feedback interview)
Interview with	Nasreldin Mohamed (Director) Vana Tarek (Marketing) Mamdouh Ibrahim (Legal) Ibrahim Elsayed (Agent)

### 1 Background of the firm

#### 1.1 About GAV

GAV is a Small-Consulting-Firm (SCF) specialising in liquidation and selling distressed assets via direct sale or auction. They hold a license from the Ministry of Supply and Internal Trade (MSIT) in Egypt, which gives them the authority to help set up, organize, supervise and approve public sales and auctions of public and private property.

Typical customers include Corporations, Private Equity Funds, Financial portfolio managers, Public and Private Companies, Governments, and Courts. A few individuals also use GAV's services for personal use.

#### 1.2 Products and Services offered

The firm provides the following consulting services

1. Sale strategy consulting.
2. Auction setup and organization consulting.



### 1.3 Workforce & Culture

The firm employs approximately 20 people, including directors, consultants, auctioneers, agents, accountants, and support staff. The firm outsources some non-core functions such as facility management, security, human resource, and courier services. Depending on the project at hand, the firm also uses freelance consultants and third party specialised firms.

The overall culture reflects the management character, which is informal and loose in behaviour but strict with processes and quality of service. There is much importance placed on good customer service and due diligence in completing the proper paperwork. The organisation is flat, with only three levels, with the management typically involved in day-to-day operations. Upper management (One Director), middle management (two managers for four central departments: Auctions & Agency), and all employees are directly managed by those three managers.

### 1.4 Information gathering

In total, three interviews were carried out with the GAV team. The first two interviews were carried out in April 2020, about two years after the first three case studies. At this point, we had fully redeveloped the RE-Tools into the new eCORE Tools (See Chapter 3.5) and have developed an initial version of the patterns from the learnings of the first three case studies. The information gathering exercise aimed to confirm the findings in the framework's design and test the tool's use and patterns. The interviews were shorter than the first three case studies as we already had a better handle on soliciting the structure and processes and better tools to support the solicitation. They were conducted in intensive several-hour online workshops (since COVID-19 restrictions were in place by then). The eCORE framework was introduced up front, and the stakeholders collaborated with these set goals in mind:

- 56. Verify the central business use cases of their SCF.
- 57. Test Conceptualize and Model the AS-IS eCORE model of their SCF.
- 58. Design the elements of their Digital Transformation as they see fit.
- 59. Conceptualize and Model the TO-BE eCORE model based on that design.



60. Translate their understanding of those transformations into pragmatic requirements for change in their People, Process and Technology components.

The workshops were done in collaboration with the researcher, and the first set of models was contrasted with the previous case studies to see if there were similarities. Repeated themes were confirmed at this point, and although the team may have named tasks and processes differently, functions and processes looked very similar. At this point, it was clear that although the business model was starkly different, with a few abstractions, the patterns could be modified to be generalized enough to fit the narrative.

Those models were further enhanced in the second round of interviews in May of 2021, more than a year later. The second round was intended to obtain feedback on the transformation project and revise the model in hindsight. Those interviews benefited from the evolution in the tool and the process as a result of researching the other five case studies, and a more precise and consistent ontology and framework were gauged for feedback.

The outcome of that exercise is outlined in the following five sections:

## 2 Use Cases

Although many use cases could be generated, for **Digital-Transformation (DT)**, the following use cases represent the core structured activities of the firm and encompass the main areas in need of digital transformation.

### 2.1 UC\_SCF4\_1: Conducting an auction

Use Case ID	<UC_SCF4_1>
<b>Goal</b>	Conducting an auction consultancy
<b>Actor(s)</b>	1. Client (Typically Government or Public entity) 2. Agent 3. Auction Consultant 4. Buyers



	<p>5. Legal</p> <p>6. Marketing (Business Development)</p>
<b>Use Case Overview</b>	<p>When a request for an auction is given to the Agency team, the Agent assigned on the task allocates the proper resources based on the size and complexity of the task at hand. The Client is contacted to collect the asset data and paperwork, followed by a kick-off meeting to brainstorm the sales strategy. The paperwork is collected and a devised sales plan is agreed upon, signed off by the Auction Consultant and the Director. The Auction Consultant then supervises the process until the sale is completed by the Client.</p>
<b>Trigger(s)</b>	<p>Marketing (Business Development) assigns a new project to an Agent.</p>
<b>Precondition(s)</b>	<p>Engagement letter signed, and the project is set to go from the business development department.</p>
<b>Basic Flow</b>	<p>Description: This scenario describes the project flow</p> <ol style="list-style-type: none"> <li>1. The Agent is assigned an auction case for review and assessment.</li> <li>2. The Agent meets with the Client to get the data and parameters of the asset under auction.</li> <li>3. The Agent involves the Auction Consultant to determine the best strategy for selling, whether to use close envelopes, open tender, open public auction or direct private sale.</li> <li>4. The strategy is presented to the Client for selection based on the recommendation from the Auction Consultant and the Agent.</li> <li>5. The Auction consultant then prepares a conditions handbook and the necessary selling templates for the Auction.</li> <li>6. The Legal department then gets the approval paperwork from the concerned authorities and public officers.</li> <li>7. The Auction Consultant, upon getting the green light to proceed from The Client, and the necessary official approvals, starts the three-phase implementation:</li> </ol>



## Appendix 4: Case Study 4: GAV

	<ol style="list-style-type: none"> <li>a. Phase 1: Manage the marketing campaign launch (Ads, direct calls, marketing blitz) through external partners.</li> <li>b. Phase 2: Accept bids and offers from Buyers.</li> <li>c. Phase 3: Assist the Client (Seller) in executing the sale based on the highest approved bid.</li> </ol> <ol style="list-style-type: none"> <li>8. The job is handed over to Legal to commence for the transfer of ownership procedures and contract signing.</li> <li>9. Then the job is handed over to the Accounting department for invoicing and collections of fees and commissions.</li> </ol>
<b>Termination outcome</b>	An executed Transfer of ownership.
<b>Alternative outcome</b>	<ol style="list-style-type: none"> <li>1. Refusal to commence with the job (at any stage) and halting the operation.</li> <li>2. OR: failure to achieve the stop-loss price for sale, which would induce a repeat of the cycle.</li> </ol>

### 2.2 UC\_SCF4\_2: Engaging a new assignment

Use Case ID	<UC_SCF4_2>
<b>Goal</b>	Engaging in a new assignment
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client (Seller)</li> <li>2. Marketing (Business Development)</li> <li>3. Director</li> <li>4. Agent</li> <li>5. Legal</li> </ol>
<b>Use Case Overview</b>	When a Client approaches the firm for an Auction Consulting job, they first ask for a Request for Proposal (RFP), Marketing (Business Development) sends them a technical and financial offer, which they typically negotiate until approved, after which they sign an engagement letter.



	<p>Alternatively, through personal connections, a Director requests that Marketing send a Proposal to a specific Client.</p> <p>Alternatively, governments or public entities announce RFPs or Request for Vendors publically. Marketing subscribes to newsletters of vendor lists and applies with a proposal or application when a job is posted.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Client (Seller) emails the firm with an RFP.</li> <li>• An Agent or Director develops a client and asks the firm to prepare a proposal.</li> <li>• Marketing applies for open tenders.</li> </ul>
<b>Precondition(s)</b>	None
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. An email is received from a Client (Seller) or an Agent requesting a quotation or proposal.</li> <li>2. Business Development opens a new case and sends the project details to an Agent for the technical offer, effort and cost estimation.</li> <li>3. Business Development prepares financial offer outlining the retainer fees, commission, and cost of campaign. The offer is calculated based on operation costs, the ticket size, the client's history, and the competitiveness of the job market.</li> <li>4. Business Development reviews the proposal with an Agent and obtains approvals.</li> <li>5. Business Development submits the proposal to the Client.</li> <li>6. The Client responds with a counter-offer, negotiates cost, time or terms.</li> <li>7. Business Development adjusts the proposal after negotiations and resubmits.</li> <li>8. The client approves the proposal, signs it, and issues a work order.</li> </ol>



## Appendix 4: Case Study 4: GAV

	9. Business Development assigns the assignment to the Consultant.
<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• An engagement is signed, and the assignment commences to the Agent.</li> <li>• Alternatively: Cancelled, whereby the engagement fails and goes to a competitor.</li> </ul>

### 2.3 UC\_SCF4\_3: Collections

Use Case ID	<UC_SCF4_3>
<b>Goal</b>	Collections
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> <li>3. Agent</li> <li>3. Accounting</li> </ol>
<b>Use Case Overview</b>	<p>When a Client signed the engagement, they have to pay a retainer, which triggers the start of the execution of the project.</p> <p>Or when a project is concluded, they have to pay the balance of payment.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Marketing approves an engagement.</li> <li>• Agent submits a final bill of costs and fees.</li> </ul>
<b>Precondition(s)</b>	Approved Engagement Or Approved final bill.
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. Marketing pings Accounting to issue a proforma invoice for the advance retainer before the start of work.</li> <li>2. Accounting reviews the terms and engagement and programs the payment schedules into the accounting software.</li> <li>3. Accounting issues the advance retainer proforma and communicates with the client for collection.</li> </ol>



	4. Once the collection is complete, Accounting approves the commencement of the project to the Agent.
<b>Alternative Flow</b>	<ol style="list-style-type: none"> <li>1. The Agent signals to Accounting the completion of the sale process with the total resulting fees.</li> <li>2. Accounting issues the final payment invoice, including any amendments, taxes and additional expenses.</li> <li>3. Accounting follows up with the Client until the collection is complete, then marks the assignment finished.</li> </ol>
<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• All the payments have been paid in accordance with the engagement agreement.</li> </ul>

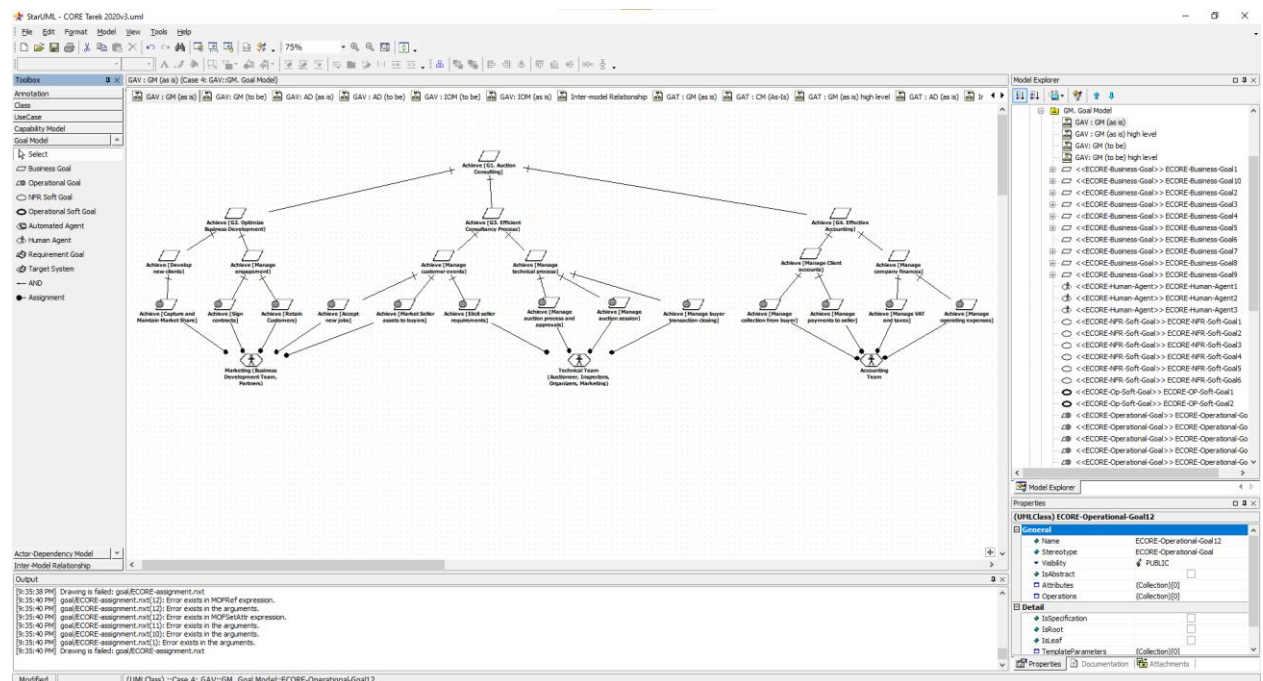
#### 2.4 Other use cases:

There are many other functions in the firm, including:

- 1- Accounting and expense tracking: Accounting (Financial controller) allocates hours and costs to projects. They carry their job using excel files and desktop-based accounting software. Could benefit from a cloud-based integrated system with a Task/Job Manager and Customer Relations Management System (CRM).
- 2- Asset tracking: Physical resources such as meeting rooms, company vehicles, laptops and cell phones, are all shared resources that are currently tracked manually by the Office Manager, and require some resource management software and integration with the PMS and CRM if possible.
- 3- Human Resource Management: Employees billable hours, attendance, vacations, sick leaves, benefits, contract renewals, and more are managed manually via excel files by the Office Manager and reviewed and approved by a Partner. A Human Resource Management (HRM) system could be implemented that integrates with an automated access control device (fingerprints or cards) to calculate hours automatically, and also allows employees to enter their vacation times and leave and track their pay, bonuses, sick days and more via an online programmed portal. Possibly also integrate with the PMS to calculate billable hours automatically.



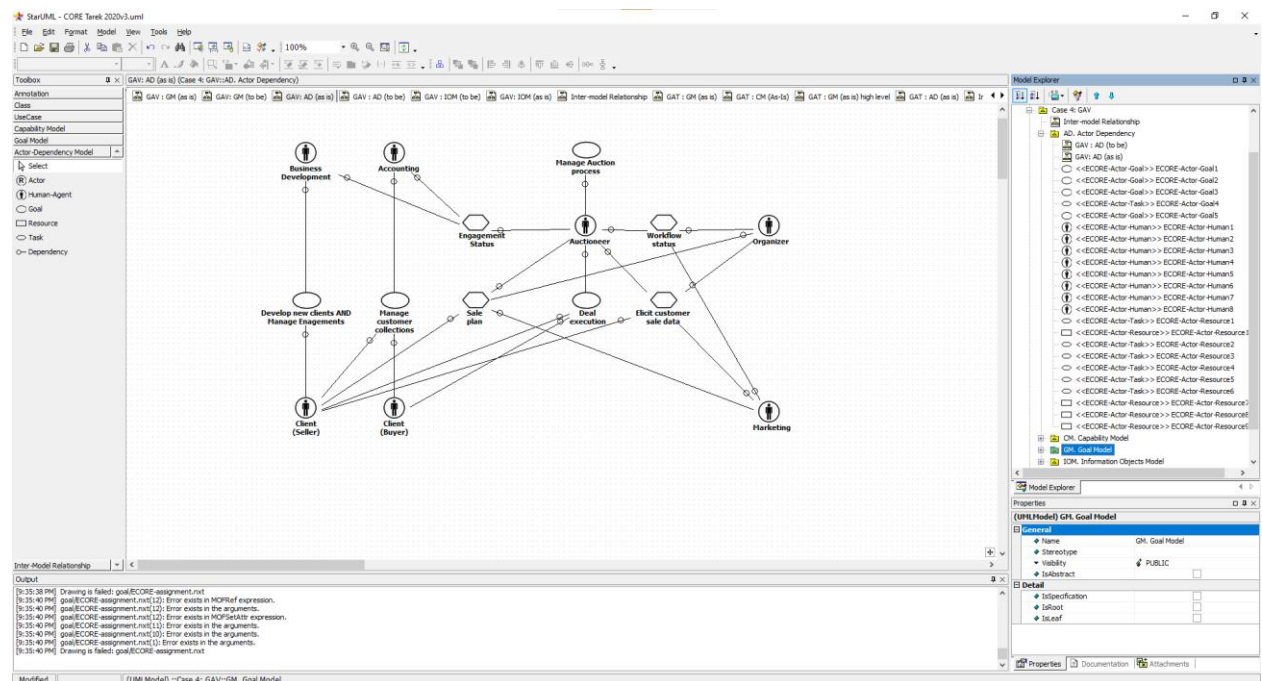
### 3.1 AS-IS Capability Model



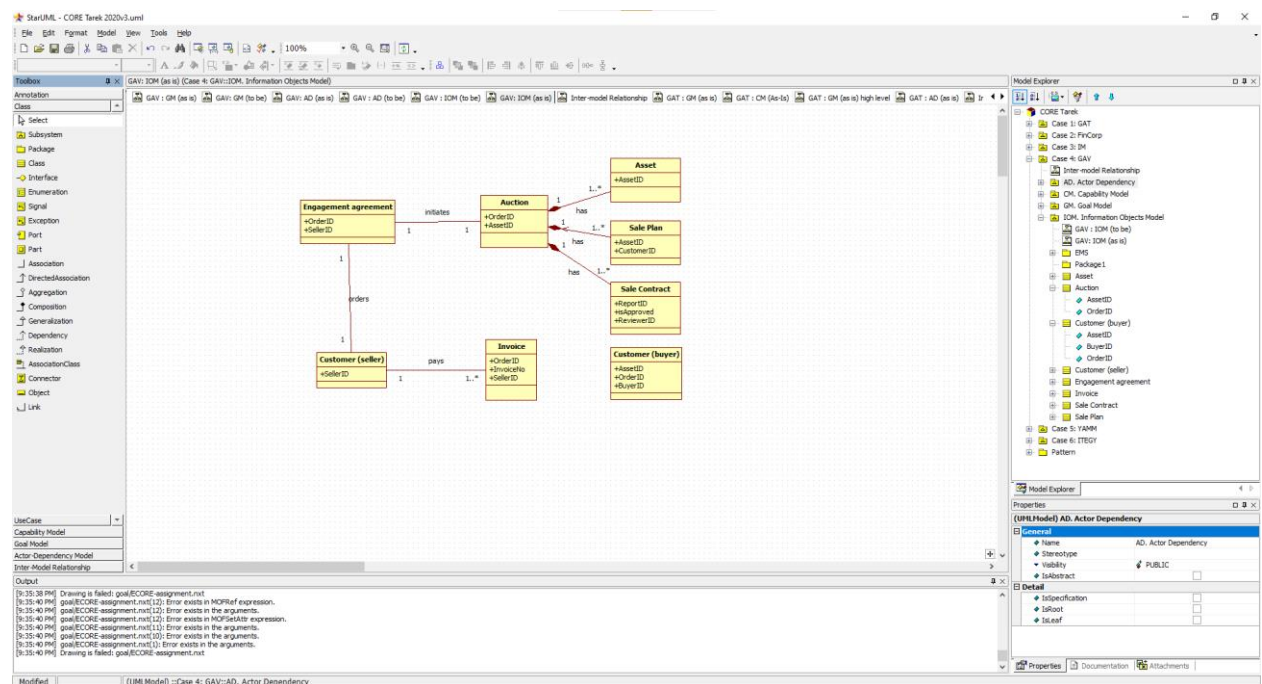


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### 3.3 AS-IS Actor Dependency Model



### 3.4 AS-IS Information Objects



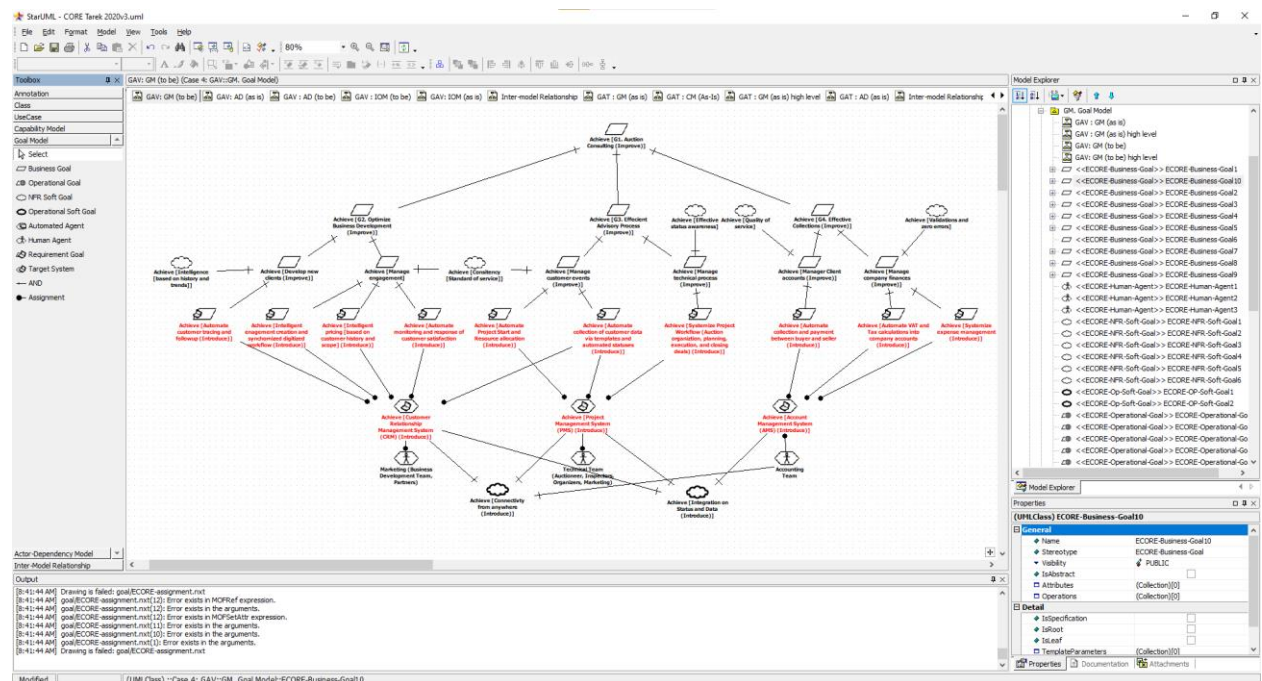




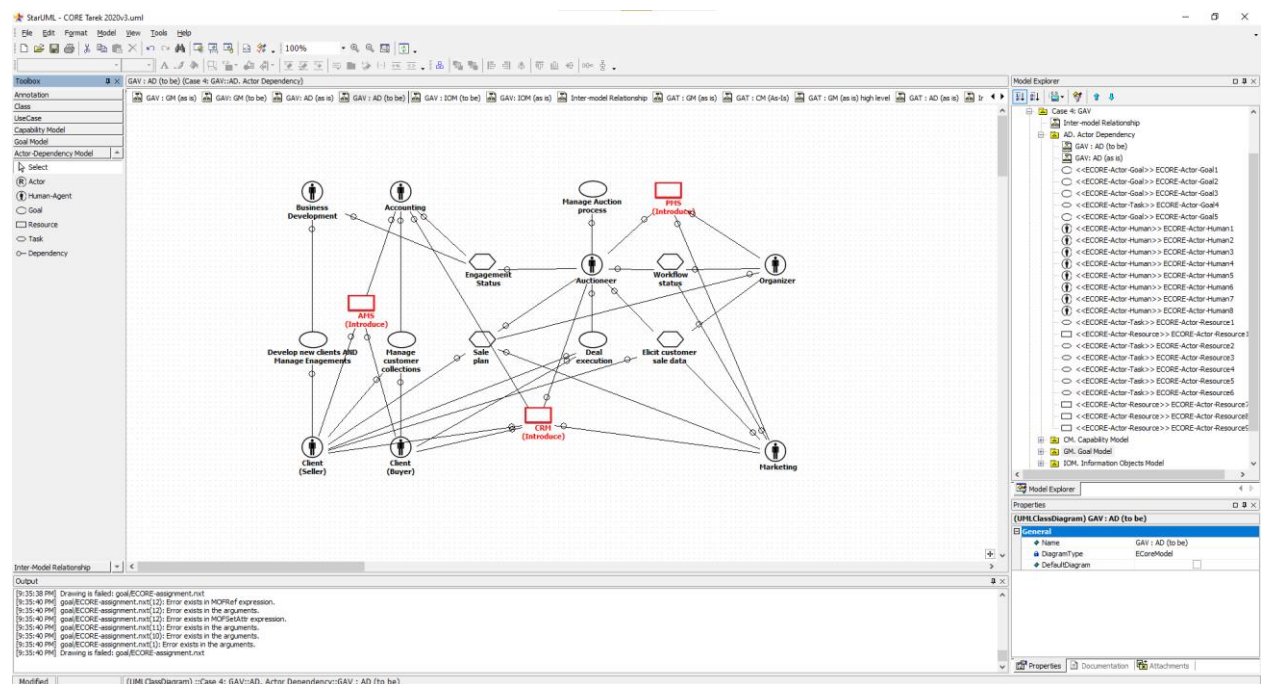


## Appendix 4: Case Study 4: GAV

### 4.2 To-be Goal Model



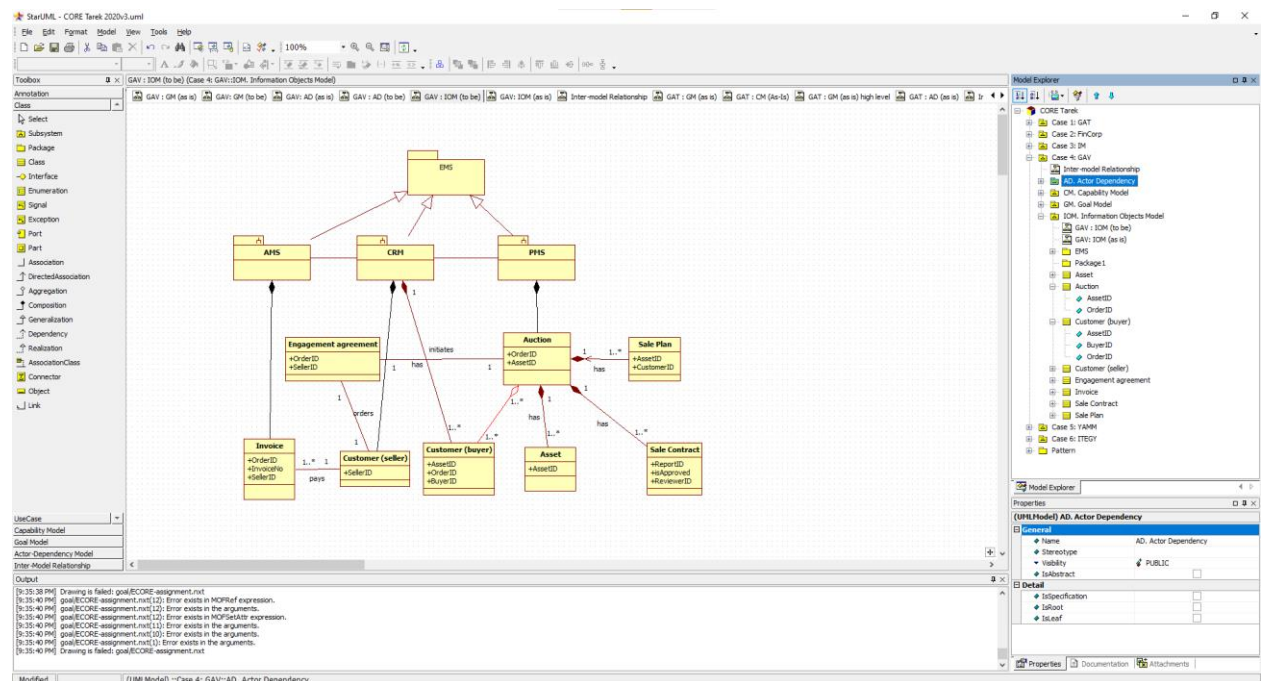
### 4.3 To-be Actor Dependency Model



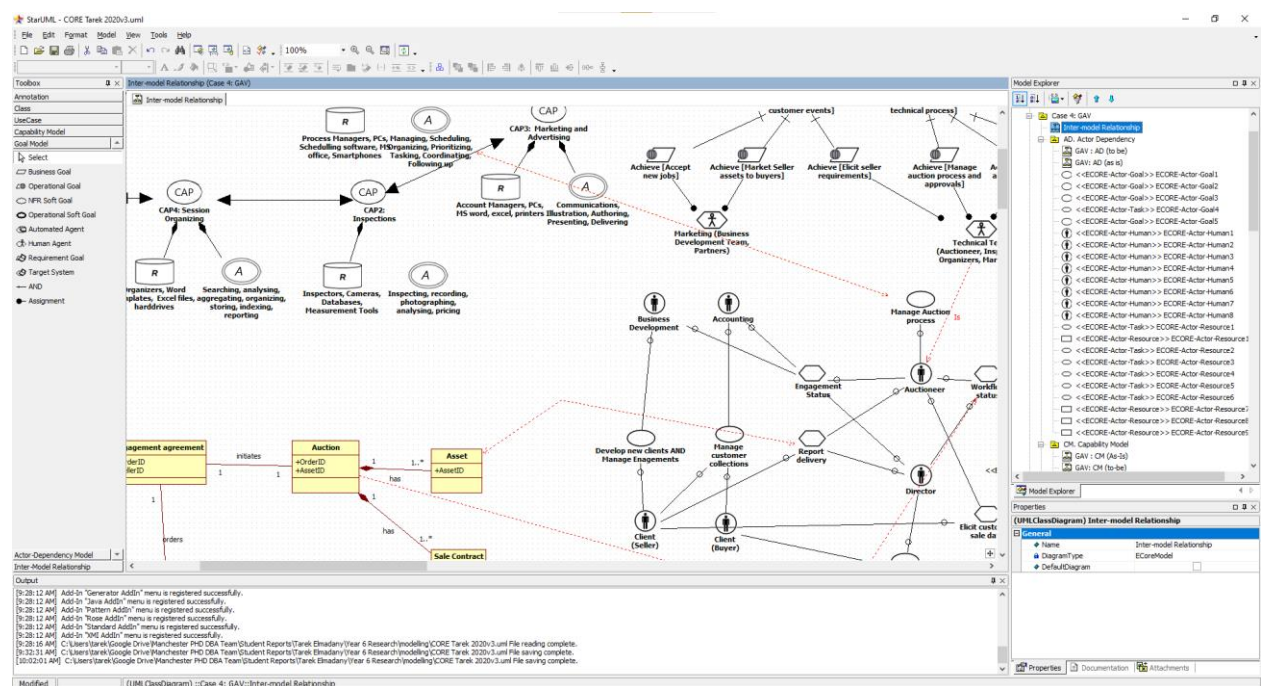


## Appendix 4: Case Study 4: GAV

### 4.4 To-be Information Objects Model



### 4.5 To-be Intermodel correlation





## 5 Digital Transformation Requirement List

### 5.1 Technology Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the technology component resulting from the modelling exercise.

Operation 1. Auctioneering Consulting	
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office (Word &amp; Excel)</li> <li>• Desktop harddrives, flash drives, emails</li> <li>• Paperwork</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Contracts, briefs and ads using typical PC software (Word, Powerpoint, Illustrator, and typical Graphical desktop software).</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Higher quality artefacts (templates and spell checkers)</li> <li>• Improved productivity</li> <li>• For easy recycling of artefacts</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Version conflicts when electronic documents are passed around.</li> <li>• Hard to search since the content is not indexed from Operating System.</li> <li>• Most electronic artefacts are archived on the company server with no easy data mining or reusability capability.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Need for the ability to recycle artefacts more efficiently and consistently.</li> <li>• Need for more collaborative formats and modes of work.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Content Searchability.</li> <li>• Accessibility (Connectivity).</li> </ul>



<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Document Control in a Knowledge Management System (KMS)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Convert to cloud-based collaboration tools such as Microsoft 365 or Google Docs.</li> <li>• Use a document control system to check-in and check-out documents to avoid conflicts.</li> <li>• Cloud artefacts are content searchable.</li> <li>• Paperless (sustainability)</li> <li>• Standardisation of artefacts and templates.</li> </ul>
<b>Operation</b>	2. Data Collection and Management
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office, Adobe tools and several graphics software.</li> <li>• Emails.</li> <li>• Local computer drives</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, contracts, and graphics are all stored in electronic documents inside the project folder.</li> <li>• Data stored on local folders on company server.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation.</li> <li>• Recyclability of artefacts.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Data is not indexed, which makes it hard to search and hard to reuse for future projects.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More integration across data assets.</li> <li>• Accessibility (Connectivity)</li> <li>• Content Searchability.</li> </ul>



#### Appendix 4: Case Study 4: GAV

	<ul style="list-style-type: none"> <li>• Synchronisation and conflict avoidance.</li> <li>• Easier reusability of data assets.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Document Control and Knowledge Management System (KMS)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Data could be stored on a cloud-based DB which enables collaboration, easy search by date and reusability of data.</li> <li>• Modify data collection process to request electronic formats</li> <li>• Storage of data in an index Knowledge database such as a cloud wiki for ease of data recyclability.</li> </ul>
<b>Operation</b>	3. Resource planning, Workflow and Task Management
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Emails</li> <li>• In-person</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Resource planning is conducted in person and tracked by each individual</li> <li>• Workflow management in email communication with the client and other staff.</li> <li>• Follow-up on tasks and assignments.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Responsibility.</li> <li>• Personalization.</li> <li>• Localization.</li> <li>• Standard of service.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Status and updates are kept in threads in staff inboxes.</li> <li>• Data is unorganised and often lost.</li> <li>• Inefficient Resource Planning in person.</li> </ul>



#### Appendix 4: Case Study 4: GAV

	<ul style="list-style-type: none"> <li>• Centralised to the Auctioneer and dependent on each person's style and discipline and not transparent to the rest of the team.</li> <li>• Causes the Auctioneer to be the bottleneck in communicating project goals and status.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Transparency (Status accessibility by everyone in the organisation).</li> <li>• Accessibility (connectivity).</li> <li>• Higher efficiency through faster status awareness and more synchrony.</li> <li>• Maintainability (outsourcing the burden of technology upkeep).</li> <li>• Integration across all company resources and assets.</li> </ul>
<b>To-Be Technol-ogy</b>	<ul style="list-style-type: none"> <li>• Project Management System (PMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Resources, tasks and projects are all connected.</li> <li>• Members of the team have access via cloud portal and can follow up on their tasks and understand their assigned tasks.</li> <li>• Workflow is transparent, and status is clear.</li> <li>• System offers threads for comments, history, attachments.</li> <li>• Integrates with other systems such as ticketing from the client, document control, and reports artefacts (KMS).</li> </ul>
<b>Operation</b>	4. Engagement
<b>As-Is Technol-ogy</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Customers communicate with the firm via emails, and engagement is kept in email threads.</li> <li>• Customers informally communicate with staff offering valuable data via social media, messaging apps and phone calls.</li> </ul>



#### Appendix 4: Case Study 4: GAV

	<ul style="list-style-type: none"> <li>• Contracts are all created in word and printed for signing and stamping.</li> <li>• Scanned documents are stored on PC, and backed up on external drives.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Personalization.</li> <li>• Responsibility.</li> <li>• Localization.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Does not offer accessibility from outside the office.</li> <li>• Slow process and labour intensive.</li> <li>• Hard to track and search emails for customer history.</li> <li>• Hard to centralise communication across alternative messaging apps and social media.</li> <li>• No meta-data is stored on the customer from previous engagements. As a result, they often have to rely on memory.</li> <li>• Difficult to relate the engagement to the project once transferred to Re-searcher.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use of a cloud-based CRM that would integrate with Task management system and Accounting systems.</li> <li>• CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp.</li> <li>• Paperless (sustainability)</li> </ul>



	<ul style="list-style-type: none"> <li>• Standardisation of artefacts and templates.</li> </ul>
<b>Operation</b>	<b>5. Accounting</b>
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp (Social media)</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients (buyers and sellers) via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>• Scheduling and reminders are scheduled on Google Calendar.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the project. Accounting requires Business Development to request a deposit invoice to be sent to the Client (Seller), and the Auctioneer to clear the requests from Accounting to submit a final invoice. This process is highly dependent on memory and personal responsibility.</li> <li>• Similarly, the Accounting depends on the Auctioneer to inform them about the details of the outcome to process the payments between the Client (Seller) and the Client (Buyer).</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> </ul>



	<ul style="list-style-type: none"> <li>• Higher quality of customer service.</li> <li>• Automated collections and payments.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM, to offer traceability and event-driven automation and reminders.</li> </ul>

## 5.2 Process Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the process component resulting from the modelling exercise

<b>Operation 1. Auction Consultancy (The core service of the consulting practice)</b>	
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Starting with templates and artefacts used during historical projects, prepared and formatted in Word, Powerpoint, Adobe products and other graphical software.</li> <li>• Assigning both the Auctioneer and Organizer the responsibility of setting up the right strategy and plan.</li> <li>• Manual tracking of progress through weekly meetings and email chains.</li> <li>• Storage on PCs, company servers and sharing of files through email chains and USB flash drives</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Process is not coded but based on peer training and on-the-hand experience.</li> <li>• Auctioneers track the progress and status of jobs with their different phases manually.</li> <li>• Follow-up of the process and workflow of this phase is the responsibility of the Organizer, and follow up for status and compliance is the responsibility of the Auctioneer.</li> </ul>



	<ul style="list-style-type: none"> <li>• Synchronization of status and updates are communicated through meetings and electronic channels such as emails, direct messaging, or phone calls.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Personalization</li> <li>• Responsibility.</li> <li>• Process leanness and quick response to customer communication.</li> <li>• Efficiency.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of codified training hinders the on-loading of new employees.</li> <li>• Process leanness is often applied as poor process adherence.</li> <li>• The knowledge of status and stage inside the workflow is only kept with certain individuals.</li> <li>• Compliance with regulations is highly reliant on the individual's compliance.</li> <li>• Most of the institutional history, knowledge and experiences are implicitly known by the individual (personal memory) with minimal explicit knowledge recording in files or documents, making the transfer of knowledge and experience highly reliant on employee retainment.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More transparency and accessibility of status and workflow statuses and stages.</li> <li>• More standardization of process compliance across teams.</li> <li>• Better synchronisation between different actors and conflict avoidance.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• [Introduce] Workflow scheme coded inside a collaborative online Project Management System (PMS). The system allows for assigned responsibilities, updates of status workflows, automated monitoring of deadlines and reminders.</li> <li>• [Introduce] A new check-in and check-out document control process using a Cloud Document Control System.</li> </ul>



	<ul style="list-style-type: none"> <li>• [Introduce] A process of reliance on recycling data in a properly indexed Knowledge Management System (KMS)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• More visibility into document status and workflow status.</li> <li>• More control over document standardization and version control.</li> <li>• Automatic storage of institutional knowledge and history.</li> <li>• More standardization of process workflow can allow substitution easier.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Data is collected by multiple roles from multiple sources.</li> <li>• Multiple individuals solicit the client for project data.</li> <li>• After the project is complete, the entire project folder gets archived on the company server in a central archive.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, pictures and marketing artefacts are all stored in soft format inside the project folder on the company server.</li> <li>• Hard-format data is digitized by scanning, then stored in a project paper folder in the archive room.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Centralization and Compartmentalization.</li> <li>• Responsibility and Personalization.</li> <li>• Efficiency.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The process of collecting data and storing it is manual and not standardized.</li> <li>• Checklists and templates are often always out of date.</li> <li>• Data sources are non-traceable, and accountability is non-measurable due to the lack of a tracing or sign-in/out process.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Streamline the process across different roles.</li> <li>• Accessibility (Connectivity)</li> <li>• Knowledge searchability and reusability.</li> </ul>



	<ul style="list-style-type: none"> <li>• Synchronisation and conflict avoidance.</li> <li>• Traceability by allowing check-in/check-out process.</li> <li>• Quicker reusability.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• A technology-enabled Knowledge Management System (KMS) with check-in/check-out accountable and traceable process using an accessible Cloud Document Control system (DCS).</li> <li>• Integration between the two PMS and Cloud DCS for seamless searching, locating and accessing of data.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Updated process for data collection, consumption, and storage is integrated within the intuitive usage of the cloud-based Document Control System (DCS), enabling accountability, traceability, collaboration, easy search by location, and reusability of data and knowledge.</li> <li>• More efficient reusability of previously mined data.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Template offers, contracts and engagement letters are created in Microsoft Office / Adobe PDF and communicated via emails or snail mail (printed)</li> <li>• Negotiations and agreements are achieved via personal meetings, phone conversations, and emails.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• The process is manual and reliant on the personal quality and consistency of the Business Development personnel.</li> <li>• The process involves omnichannel presence via emails threads, WhatsApp threads, and social media threads and all connected in the business development personnel's head.</li> </ul>
<b>Why was it</b>	<ul style="list-style-type: none"> <li>• Standardisation of artefacts and templates.</li> </ul>



<b>managed that way?</b>	<ul style="list-style-type: none"> <li>• Customer satisfaction (Omni-channel communication, friendly human interaction, and quick personal response by lowering bureaucracy).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Manual process is inefficient, inconsistent and labour intensive.</li> <li>• Process is non-traceable, often hard to hold individuals accountable, and causes many missed opportunity due to lack of tools for automated follow-up.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Consistency and automated reminders, status updates and effective workflow management.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• Software Task-oriented programmed workflow designed in a Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Technology-enabled processes using the cloud-based CRM would force a consistent and quality engagement experience, follow-up and reminders.</li> <li>• CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp to allow for a single point of process follow-up and management.</li> <li>• Updates to online templates and improvements in checklists on the CRM automatically persists into the future without remembering to change it manually every time, hence less risk to human error.</li> </ul>
<b>Operation</b>	4. Accounting
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> </ul>



#### Appendix 4: Case Study 4: GAV

	<ul style="list-style-type: none"> <li>• Phone</li> <li>• Whatsapp</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>• Scheduling and reminders are scheduled on Microsoft Outlook Calendar.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Efficiency</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the customer, and Auctioneers requests from Accounting to submit a final invoice. This process is highly dependent on personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM to offer traceability and event-driven automation and reminders.</li> <li>• More efficient use of time and resources.</li> </ul>



### 5.3 People Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the people component resulting from the modelling exercise.

Operation	1. Auctioneering Consultancy (The core service of the consulting practice)
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Auctioneer</li> <li>• Organizer</li> <li>• Marketing</li> <li>• Support staff (Secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• The central leader is the Auctioneer, who has to coordinate the entire process, starting with assigning roles, coordinating schedules, maintaining the pace of the progress, ensuring status update, follow-up and quality control.</li> <li>• Organizers and Marketing carry the technical grunt work of the strategy execution, feed it to the Auctioneer, analyse the data, complete appropriate forms, contracts, agreements, advertisement deals, and all the approvals along the way.</li> <li>• Organizers implement the sale strategy, review their alignment with the Auction goals, and arrange review meetings with the Auctioneer.</li> <li>• Continuous communication between the Auctioneer and the Client involves iterating over the sale plan and status.</li> <li>• Support staff help with printing, delivery and non-technical support work.</li> </ul>
<b>Why was it setup that way?</b>	<ul style="list-style-type: none"> <li>• Specialization and personalization.</li> <li>• Teamwork effort to arrive at the desired customer outcome.</li> <li>• Focus on efficiency, effectiveness and completeness during execution of tasks.</li> </ul>



<b>Problems</b>	<ul style="list-style-type: none"> <li>• The Auctioneer is the sole responsible person to drive the process; his/her role is to manage the plan to completion, which means that he/she is the primary person aware of the status and could pose a risk if absent or on leave.</li> <li>• Communication and synchronization are slow and inconsistent.</li> <li>• Consistency and Quality are often forgone for speed and delivery.</li> <li>• Process and Workflow are People dependent. While everyone knew what needs to be delivered, every team had their way of achieving it, which mainly relied on people skills and experience and less on standardized systems.</li> <li>• People used varying non-standardized enabling technologies with no centralized technology strategy, which often caused multiple synchronizations and quality problems.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Achieve decoupling of the dependency on people and shift to the dependency on systems and technology.</li> <li>• Achieve higher efficiency from people who are distracted by context switching and repetitive non-productive synchronizing and admin work.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Current roles to train on the usage of enabling new technology and integrated system processes and workflows.</li> <li>• [Introduce] IT systems admin, Process compliance admin.</li> <li>• [Introduce] Automated workflows and processes, including standardized scheduling, automating assignment based on workflow stages, automatic reminders, integrated centralized communication and document repository that is auto-synchronized and status aware.</li> <li>• [Cease] Manual communication support roles and replace with technology.</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Improves people's productivity by eliminating much of the manual work.</li> <li>• Reduces errors and improves quality by shifting some standardization onto systems and technology previously used to suffer from people error.</li> <li>• Enhances people value since technological enhancements free up people's wasted attention and time and instead shift the focus on improving their core consulting competency and skills.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Auctioneer</li> <li>• Organizer</li> <li>• Marketing (Sales)</li> <li>• Marketing (Business development)</li> <li>• Support staff (secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Data of different types and scopes are collected by each specialists depending on their needs. For example, an Organizer will collect pictures and contracts, while an Auctioneer will interview the client to gain insights into his/her needs.</li> <li>• Data is collected and stored with each person on their devices. At the end of the project, the Auctioneer tries to gather all the files and artefacts in one archived folder on the company server.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Specialization</li> <li>• Responsibility</li> <li>• Quickness</li> <li>• Reusability</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Inconsistent data collection procedures that depend on the quality of each team, it is not clear who is collecting and keeping the data.</li> </ul>



	<ul style="list-style-type: none"> <li>• No central owner or responsible person for data management and archiving.</li> <li>• Ineffective data reusability and mining since it depends on people's memories.</li> <li>• Highly reliant on individual due diligence and personal capability.</li> <li>• Clients complain that many people reach out to them from the firm asking for data all the time.</li> <li>• Many concerns on data privacy and security control.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• To improve the quality and comprehensiveness of data collection.</li> <li>• To centralize control of data for security, liability, compliance, traceability, and responsibility purposes.</li> <li>• For better indexing, searching, and reusability of data which is the foundation of the knowledge base.</li> <li>• Adherence to paperless data collection (sustainability)</li> </ul>
<b>To-Be People improve-ments</b>	<ul style="list-style-type: none"> <li>• [Introduce] KM admin: responsible for data management using technology-enabled cloud-controlled data-traceable data and knowledge management systems (including cloud drives and indexable data-bases).</li> <li>• [Improve] The roles of Auctioneers, Organizers, Marketing (Business Development) and Marketing (Sales) to train on the new technologies and processes for data collection, control and storage.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Maintains specialization.</li> <li>• Introduces control and standardization.</li> <li>• Introduces Knowledge reuse capabilities.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Auctioneers</li> <li>• Marketing (Business development) specialists</li> </ul>



	<ul style="list-style-type: none"> <li>• Support staff (secretaries, couriers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Auctoineers and Marketing specialists use their connections to solicit past clients, current clients and future clients (client acquisition) to procure new jobs.</li> <li>• Once a request for proposal is made, engagement agreements are prepared and signed.</li> <li>• Procedures for communicating, signing and exchanging documents are handled by the Marketing (Business development) staff.</li> <li>• Contracts and agreements are stored on company computers under the responsibility of the business development staff.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide high customer personal care.</li> <li>• Focus on personal responsibility.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of standardized agreements resulting in many missed opportunities and errors.</li> <li>• Followup is reliant on individuals diligence in setting up personal reminders and memory.</li> <li>• Tracing of engagement status is reliant on individual memory.</li> <li>• Customer care level is reliant on individual skills and experience.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Personnel want more standardized artefacts, including offer documents, engagement agreements and data collection criteria.</li> <li>• The need to decouple customer service level from relying on individual skills to relying on a system of service standards that could be quickly followed and trained by any individual.</li> </ul>
<b>To-Be People improve-ments</b>	<ul style="list-style-type: none"> <li>• [Improve] Train marketing staff on Customer Relation Management (CRM) system, including a new standardized process.</li> </ul>



	<ul style="list-style-type: none"> <li>• [Improve] Train marketing staff on the new Cloud-based Document Control System (DCS) to store the artefacts and understand how it is integrated with the CRM and the Accounts Management System (AMS)</li> <li>• [Introduce] Automation in the customer follow-up and engagement workflow to add reminders, automatic assignment of roles, automated status updates, and automatic linkages of previous engagements and knowledge.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Personnel offer a more consistent and higher quality of client experience.</li> <li>• Personnel have more robust traceability, status awareness and workflow management capability.</li> <li>• Personnel can more accurately price and generate higher revenues due to better client knowledge and historical understanding.</li> <li>• Paperless procedures.</li> </ul>
<b>Operation</b>	<b>4. Collections</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Accounting and finance personnel.</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, security, couriers, drivers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Accounting depends on Marketing to obtain status updates on contract and engagement agreements and stages in the workflow.</li> <li>• Accounting liaises directly with the clients and vendors to process payments, settle invoices and taxation requirements.</li> <li>• Accounting liaises with Auctioneers to give the signal to release the start of progress (in the case of fulfilment of down-payment) or to release the final report once the Client fulfils the final payment.</li> </ul>



<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide a high level of customer care.</li> <li>• Protect and fulfil business financial rights and obligations effectively.</li> <li>• Privacy and security of financial dealings from the rest of the organization and the competitors.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The reliance on individuals can sometimes act as a bottleneck and hinders progress.</li> <li>• Non-standardized or integrated system to communicate status efficiently leads to mistakes, lost revenues and angry customers.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Better synergy with the workflow of the core business.</li> <li>• Faster response times.</li> <li>• Higher status awareness and synchronization.</li> <li>• Higher collection and effective customer handling in alignment with Marketing and Auctioneers.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] A new dependency between Accounting and the CRM system via integrating the newly introduced Account Management System (AMS).</li> <li>• [Improve] Train the accounting personnel to use the newly introduced Account Management System (AMS) that automates communication, provides seamless status synchronization across systems, and leads to real-time status awareness.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Provides a more consistent customer experience.</li> <li>• Maintains the primary business goals of privacy, specialization, protection of business financial interest while eliminating the ineffective communications problem.</li> <li>• Paperless (sustainability)</li> </ul>



## 6 Post-Transformation Feedback

### 6.1 Analysis of the transformation

A round of interviews was conducted after a while (as per interview dates above) to assess the feedback and progress of the digital transformation. The following summarizes the findings:

Operation	1. Auction Consulting (The core service of the consulting practice)
How was transformation implemented?	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• A new cloud-based customized Sale Management System was installed, whereby all the advisory assignments were inputted as a trackable unit named “<i>sale</i>”. It resembles a typical Project Management System (PMS), but it had more features resembling a Customer Relationship Management System (CMS) and had a Graphical Information System (GIS)</li> <li>• A <i>sale</i> task stored all the data involved, including asset information, customer information, attachments, either filled out at the beginning or throughout the workflow.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• A new workflow was codified, where the sale would pass through several process steps, including inspection, data collection, brief and contract preparation, valuation, marketing, approving and finally closing.</li> <li>• As soon as Marketing creates the <i>sale</i> in the system, they pass it on to the <i>Auction Consultant</i> by assigning the <i>sale</i>. The system would notify the <i>Auction Consultant</i>, who would then assign the <i>Agent</i> working via the system. The <i>Agent</i> is notified about their roles, deadlines, and statuses in the workflow by viewing the <i>sale</i> on the</li> </ul>



	<p>system dashboard, and they get access to all their workflow tasks via their system dashboard.</p> <ul style="list-style-type: none"> <li>Team members, including <i>Auction Consultants</i>, <i>Agents</i> and <i>Legal</i>, finish their tasks and sign off; the system automates the workflow by assigning the next in line and updating the status. The system has features and can be programmed to send notifications, alerts, status updates and reminders at specific programmable triggers and events.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>Employees were re-trained to use the system and adapt their pre-transformed workflow to the new technology and process.</li> <li>Employees were assigned to the different <i>tasks</i> in the new system and could find all their relevant data, update artefacts, trace the history of all their work and other peoples' work from their dashboard.</li> <li>Management hired an in-house IT employee to oversee and maintain the smooth integration of the system and created training videos and manuals to train the new employees on how to use it.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>Almost all of the workflow was transformed to the new digital technology and process, including the document repository, which allowed efficient check-in and check-out, sharing security, and traceability and conflict avoidance.</li> <li>There are still elements of manual workflow, specifically with the heavy interaction with the clients in face-to-face meetings and phone calls.</li> <li>A lot of the auction event planning as well is handled by a custom sub-feature of the system whereby all the event checklist requirements are tracked and organized.</li> </ul>



<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>For the system to be efficient and reliable in the workflow, every phone conversation, personal meeting, and customer interaction needs to be documented into the new system so that the next employee down the line can get up to speed and commence with their task effectively. However, many employees find it an overburden above their usual stressful work, and many forget or add incomplete comprehensive data, which causes teams to subside the system sometimes when under pressure from deadlines.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>Management wanted more features in the system to transform the organization of the auction session itself, which they were exploring in the context of digital transformation.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The models were a good start, and the feedback loop helped refine and crystallize the overarching goals and resulting relationships. Moreover, the core of the business (the technical component of the model) was further expanded by management by increasing more goals and transformation points after the first round of interviews.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>The same system above was used in the data gathering and management, which was a one-stop shop for all the operations of the consulting firm. The integrated Sale Management System that included features from a Project Management System (PMS), a Customer Relationship Management (CMS) system, and a Graphical Information System (GIS) encapsulated all of the data in their fields. Additionally, they were integrated with a Cloud Document Repository (DRS) that stores extra documents (scans of contracts, working documents, etc)</li> </ul>



	<ul style="list-style-type: none"> <li>• The <i>Auction Consultant</i> used the New System to address the client and collect the data using template forms and data collection check-lists. The client replied to the forms and uploaded documents to the System. The System generated the forms, and the data and documents were auto-associated with that sale in the System.</li> <li>• The <i>Auction Consultant</i> can track the status of the data and check its integrity and all that information was accessible and seamlessly available from the job in the system. The result is that all the knowledge in the job was well connected, indexed and reusable.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• The new workflow was codified in the System, whereby the Auction Consultant and the Agents team would have complete visibility into the data collection status and the next steps.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>• Employees were re-trained to use the new data collection and usage system and adapt their pre-transformed workflow to the new technology and process.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• A complete transformation from previously depending on manual emails, phone calls, USB drives, and hard copies to an entirely digitally integrated data collection, management and storage system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• Data collected informally via conversations in person or on the phone are still an issue, and IT continues to update fields in the system to record important information.</li> <li>• Management expressed concern about privacy and data integrity.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Managed wanted to explore more digital transformation opportunities for managing informally collected data.</li> </ul>



	<ul style="list-style-type: none"> <li>• More can be done to integrate external digital sources seamlessly into the system, such as news about an area, government data, and external market reports.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>• The model sufficiently scoped and outlined the high-level goals, dependencies and relationships necessary for this use case.</li> </ul>
<b>Operation</b>	<b>Engagement</b>
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• The new fully integrated system has Customer Relationship Management (CRM) features that store all the client information, contact data, roles, and history.</li> <li>• With the new system, Marketing can communicate with the client via the portal, submit quotations, follow up on the engagement procedures, track the client history with previous jobs, payment track record, and rating.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• When a client sends a Request for Proposal (RFP) to the company official email, the new CRM picks it up and creates a new Sale Request. The Marketing team can then categorize it as a new sale or an existing sale.</li> <li>• Marketing then proceeds to process the request. If it is a new request for quotation, then Marketing prepares a quotation and submits it to the Client for negotiations and approval.</li> <li>• If the request belongs to an existing sale, then it is rerouted to the correct task in the system. If it is requested in the offer phase, then Marketing handles it; if it is a work in progress, then it gets tagged with the sale-ID and gets re-routed to the Auction Consultant; otherwise, if it is a payment issue, then it is handled after re-routing to</li> </ul>



	<p>the Accountants for handling. All system components are in sync with one another and are fully integrated.</p> <ul style="list-style-type: none"> <li>• People:</li> <li>• Marketing specialists were trained to operate the new system, no new hires were required.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• Near-complete digital transformation of all Business Development tasks and operations except for a few functions such as mailing, printing, scanning and courier delivery of artefacts that still require manual processing and adapting to the digitally transformed work process.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Some employees complained about the limited capabilities of the phone app version of the system.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>• Although initially, the model seemed to suggest separate systems were needed, the one-stop-shop integrated system was sufficient for as long as it met the requirements to achieve the desired goals. Therefore, the compartmentalization of the requirements on Abstraction level 3 helped decide the needed requirements for the one-stop-shop system.</li> </ul>
<b>Operation</b>	3. Collections
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• A complete transformation from manual accounting operations into the new fully integrated system with Account Management features</li> </ul>



	<p>embedded into the Customer Relationship Management (CRM) system.</p> <ul style="list-style-type: none"> <li>The system had features for costing, billable hours, and status of sale commissions and retention payments in the workflow for payment processing.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>The Accounting department, via the central system, handles all the payment handling from the client as per the engagement agreement submitted in the sale by Marketing.</li> <li>Accounting then schedules the invoices to the client and processes them, and the System sends automatic reminders to the Client to follow up on payments.</li> <li>However, the company accounts for taxes and end of year financial books are still conducted manually via a separate desktop application.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>Accounting employees were fully trained to work on the new technology and process.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>An almost complete transformation of the billing and collection functions to the new integrated cloud system.</li> <li>However, the end of year tax handling and financial books are still conducted through the old desktop accounting software.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>The newly integrated system did not have company bookkeeping features that were strong enough for the accounting team to transition into. Moreover, there were no plugins to integrate the desktop taxation and financial reporting software with the newly installed one-stop-shop cloud system. Therefore, it was decided that the</li> </ul>



	team manually insert the total sums from the cloud system to the desktop system during the taxation period.
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>Feature upgrades or integration is needed to incorporate accounting requirements fully in the integrated cloud system.</li> </ul>
<b>Feedback for SC-COST case model</b>	The decision to split off the operational accounting goals of Achieve [Manage client accounts] and Achieve [Manage company finances] was a direct result of this use case. This feedback was helpful to enhance the model further.

## 6.2 Evaluation of SC-COST

Separately, the interviews conducted asked the stakeholders about their opinion on the SC-COST framework as follows:

Evaluation of pre-transformation modelling exercise
The stakeholder found the research involvement helpful in guiding the brainstorming discussion. The level of stakeholder engagement was significant, and the outcome was beneficial for both the firm and the researcher. The insights gained were equally significant for the firm and the SC-COST framework and patterns development.
Evaluation of patterns
The pattern was introduced from the outcomes of the earlier use cases; it was embedded as templates in the eCORE tool, along with a descriptive guide on how to use it. The researcher confirmed its effectiveness in building the AS-IS and the TO-BE eCORE models by observing its utilisation. When the stakeholders were initially presented with the templates, they did not have any objections, reflecting their structure at the abstraction levels presented closely. They found it plausible, and after iterating the eCORE templates to fit their models, they found it feasible to implement. The patterns captured the essence of their modelling and transformation, and they agreed to their ontology and structure. The post-transformation feedback also proved to the research that they are predictive and reliable.



Evaluation of the eCORE tool

The eCORE tool needed many more bug fixes and features; however, it was sufficient in a research setup to achieve its intended outcome.



## Appendix 5: Case Study 5: YAMM

Company Name	YAMM Engineering and Consulting (S.A.E.)
Small Consulting Code	YAMM
Description of services	A small project management firm specialising in construction management.
Interview Date(s)	03/08/2020 05/08/2020 06/08/2020 03/09/2021 (Feedback interview) 04/09/2021 (Feedback interview)
Interview with	Ahmed Saad Fathalla (Director) Mohamed Farghaly (Construction Manager) Mahmoud Ragab (Project Manager)

### 1 Background of the firm

#### 1.1 About YAMM

YAMM is a Small-Consulting-Firm (SCF) specialising in project and construction management. They hold a license from the Syndicate for Professional Engineers in Egypt, Saudi Arabia, and UAE, and a Project Management Professional (PMP) certificate from PMI.org gives them the authority to manage and supervise construction projects.

Typical customers include Corporations, Governments, and Individual investors. The firm usually works on a handful of projects at a time.

#### 1.2 Products and Services offered

The firm provides the following consulting services

1. Construction Management Consulting and Supervision.
2. Project Management Consulting and Supervision.



### 1.3 Workforce & Culture

The firm employs approximately 180 people, including a director, engineers, project managers, accountants, and support staff (HR, Office managers, and clerks). The firm outsources some non-core functions such as facility management, security, human resource functions and courier services. The firm also uses freelance consultants and third party specialised firms depending on the project at hand, and it also outsources the labour to third-party labour providers.

The overall culture reflects the management character; an engineer is usually technically and data-heavy. There is much importance placed on accuracy and efficiency, and the team seems to be constantly working under the stress of time delivery and quality. The organisation is relatively flat with only three levels, with the management typically involved in day-to-day operations. Upper management (One Director), middle management (five managers for five central departments: Project Management, Construction Management, Site Inspection and supervision, Office Management, Finance & Accounting), and all employees are directly managed by those six managers.

### 1.4 Information gathering

In total, five interviews were carried out with the YAMM team. The first three interviews were carried out in August 2020, about two years after the first three case studies. At this point, we had experience conducting the interviews four times and have tested the eCORE tools and patterns. The main goal was to enhance further and tweak the tools and patterns.. The interview durations were shorter than the first four case studies as we already had a better handle on soliciting the structure and processes and better tools to support the solicitation. They were conducted in intensive several-hour online workshops (since COVID-19 restrictions were in place by then). The eCORE framework was introduced up front, and the stakeholders collaborated with these set goals in mind:

61. Verify the central business use cases of their SCF.
62. Test Conceptualize and Model the AS-IS eCORE model of their SCF.
63. Design the elements of their Digital Transformation as they see fit.



64. Conceptualize and Model the TO-BE eCORE model based on that design.
65. Translate their understanding of those transformations into pragmatic requirements for change in their People, Process and Technology components.

The workshops were done in collaboration with the researcher, and the first set of models was contrasted with the previous case studies to see if there were similarities. Repeated themes were confirmed; although the team may have named tasks and processes differently, functions and processes looked very similar. At this point, it was clear that the patterns were consistent and valid even with the different business models.

Those models were further enhanced in the second round of interviews in September of 2021, more than a year later. The second round was intended to obtain feedback on the transformation project and revise the model in hindsight. Those interviews benefited from the evolution in the tool and the process as a result of researching the other five case studies, and a more precise and consistent ontology and framework were gauged for feedback.

The outcome of that exercise is outlined in the following five sections:

## 2 Use Cases

Although many use cases could be generated for **Digital-Transformation (DT)**, the following use cases represent the core structured activities of the firm and encompass the main areas in need of digital transformation.

### 2.1 UC\_SCF5\_1: Supervising a construction project

Use Case ID	<UC_SCF5_1>
Goal	Supervising a construction project
Actor(s)	<ol style="list-style-type: none"><li>1. Client</li><li>2. Contractors</li><li>3. Project Manager</li><li>4. Construction Managers</li><li>5. Supervisory Site Engineers</li><li>6. Legal</li></ol>



	<p>7. Marketing (Business Development)</p> <p>8. Director</p>
<b>Use Case Overview</b>	<p>When a project starts, the Project Manager assigned to the task allocates the proper resources based on the size and complexity of the project at hand. The Client is contacted to collect the asset data and paperwork, followed by a kick-off meeting to agree on the scope and limits of work. The paperwork is drafted, and the Director signs off a devised supervision agreement. The Project Manager then commences with the execution, typically supervising the construction teams (or contractors) until the project is complete.</p>
<b>Trigger(s)</b>	<p>Marketing (Business Development) assigns a new project to a Project Manager.</p>
<b>Precondition(s)</b>	<p>The engagement letter signed, and the project is set to go from the business development department.</p>
<b>Basic Flow</b>	<p>Description: This scenario describes the project flow</p> <ol style="list-style-type: none"> <li>1. The Project Manager is assigned a project for construction supervision.</li> <li>2. The Project Manager conducts regular meetings with the Client (or owner representative), the construction management teams and contractors (typically selected by the Client)</li> <li>3. The Project Manager involves the Supervisory Site Engineers to plan the supervision components and timelines.</li> <li>4. The Supervisory Site Engineers conduct regular meetings and inspections to report on construction progress, quality of implementation, and any deviations or faults that may emerge.</li> <li>5. The Project Manager prepares weekly status updates based on the feedback from the Construction Management and the Supervisory Site Engineers and submits them regularly to the Client.</li> </ol>



	<ol style="list-style-type: none"> <li>6. The Project Manager meets with the Client once a month to discuss any variations or issues that may arise and give the Client the necessary feedback to take the appropriate actions with the Contractors.</li> <li>7. The Project Manager submits the weekly logged hours to the Accounting for billing to the Client.</li> <li>8. At the end of the project, the Project Manager writes a project completion report delivered to the Client, signalling the end of the project supervisory process and completion of the project.</li> </ol>
<b>Termination outcome</b>	Complete of project.
<b>Alternative outcome</b>	1. Refusal to commence with the job (at any stage) and halting the project.

## 2.2 UC\_SCF5\_2: Engaging a new project

Use Case ID	<UC_SCF5_2>
<b>Goal</b>	Engaging in a new project
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> <li>3. Director</li> <li>4. Project Manager</li> <li>5. Legal</li> </ol>
<b>Use Case Overview</b>	<p>When a Client approaches the firm for a Construction Supervision job, they first ask for a Request for Proposal (RFP), Marketing (Business Development) sends them a technical and financial offer, which they typically negotiate until approved, after which they sign an engagement letter.</p> <p>Alternatively, through personal connections, a Director requests that Marketing send a Proposal to a specific Client.</p>



	Alternatively, governments or public entities announce RFPs or Request for Vendors publically. Marketing subscribes to newsletters of vendor lists and applies with a proposal or application when a job is posted.
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Client emails the firm with an RFP.</li> <li>• A Project Manager or Director develops a client and asks the firm to prepare a proposal.</li> <li>• The marketing applies for open tenders.</li> </ul>
<b>Precondition(s)</b>	None
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. An email is received from a Client or a Project Manager requesting a quotation or proposal.</li> <li>2. Business Development opens a new case and sends the project details to a Project Manager for the technical offer, effort and cost estimation.</li> <li>3. Business Development prepares financial offer outlining the retainer fees and hourly rates. The offer is calculated based on operation costs, the project size, the client's history, and the competitiveness of the job in the market.</li> <li>4. Business Development reviews the proposal with the Director and obtains approvals.</li> <li>5. Business Development submits the proposal to the Client.</li> <li>6. The Client responds with a counter-offer, negotiates cost, time or terms.</li> <li>7. Business Development adjusts the proposal after negotiations and resubmits.</li> <li>8. The client approves the proposal, signs it, and issues a work order.</li> <li>9. Business Development assigns the assignment to a Project Manager.</li> </ol>



<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• An engagement is signed, and the assignment commences to a Project Manager.</li> <li>• Alternatively: Cancelled, whereby the engagement fails and goes to a competitor.</li> </ul>
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## 2.3 UC\_SCF5\_3: Collections

Use Case ID	<UC_SCF5_3>
<b>Goal</b>	Collections
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> <li>3. Project Manager</li> <li>4. Accounting</li> </ol>
<b>Use Case Overview</b>	<p>When a Client signed the engagement, they have to pay a retainer, which triggers the start of the execution of the project.</p> <p>Or, when a project is concluded, they have to pay the balance of payment.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Marketing approves an engagement.</li> <li>• Project Manager submits a final bill of costs and fees.</li> </ul>
<b>Precondition(s)</b>	Approved Engagement Or Approved final bill.
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. Marketing pings Accounting to issue a proforma invoice for the advance retainer before the start of work.</li> <li>2. Accounting reviews the terms and engagement and programs the payment schedules into the accounting software.</li> <li>3. Accounting issues the advance retainer proforma and communicates with the Client for collection.</li> </ol>



## Appendix 5: Case Study 5: YAMM

	<ol style="list-style-type: none"><li>4. Once the collection is complete, Accounting approves the commencement of the project to a Project Manager.</li><li>5. The Project Manager submits monthly work logs and hourly rates.</li><li>6. Accounting bills the Client every month and supervises collections.</li></ol>
<b>Alternative Flow</b>	<ol style="list-style-type: none"><li>1. The Project Manager signals to Accounting the completion of the project with the total balance of fees.</li><li>2. Accounting issues the final payment invoice, including any amendments, taxes and additional expenses.</li><li>3. Accounting follows up with the Client until the collection is complete, then marks the assignment finished.</li></ol>
<b>Termination outcome</b>	<ul style="list-style-type: none"><li>• All the payments have been paid following the engagement agreement.</li></ul>

### 2.4 Other use cases:

There are many other functions in the firm, including:

- 1- Accounting and expense tracking: Accounting (Financial controller) allocates hours and costs to projects. They carry their job using excel files and desktop-based accounting software. Could benefit from a cloud-based integrated system with a Task/Job Manager and Customer Relations Management System (CRM).
- 2- Asset tracking: Physical resources such as meeting rooms, company vehicles, laptops and cell phones, are all shared resources that are currently tracked manually by the Office Manager, and require some resource management software and integration with the PMS and CRM if possible.
- 3- Human Resource Management: Employees billable hours, attendance, vacations, sick leaves, benefits, contract renewals, and more are managed manually via excel files by the Office Manager and reviewed and approved by a Partner. A Human Resource Management (HRM) system could be implemented that integrates with an automated access control device (fingerprints or cards) to calculate hours automatically, and also allows employees to enter their vacation times and leave and track



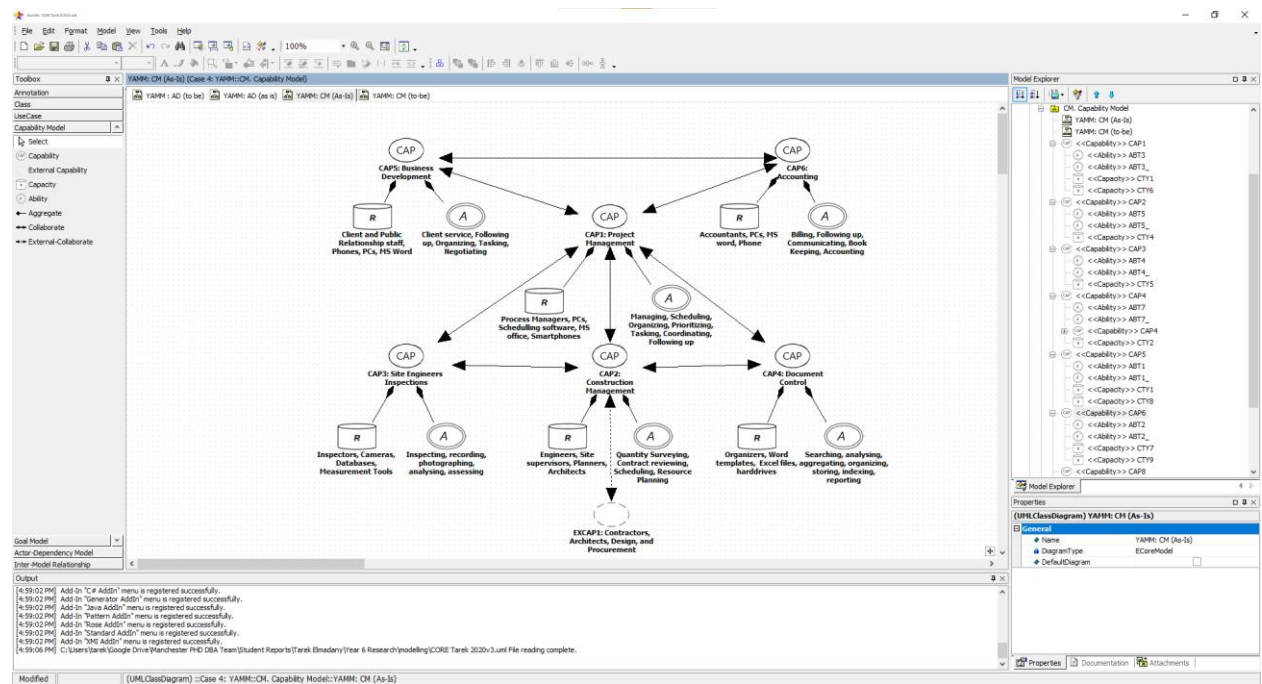
## Appendix 5: Case Study 5: YAMM

their pay, bonuses, sick days and more via an online programmed portal. Possibly also integrate with the PMS to calculate billable hours automatically.

66.

### 3 ECORE AS-IS Modelling components

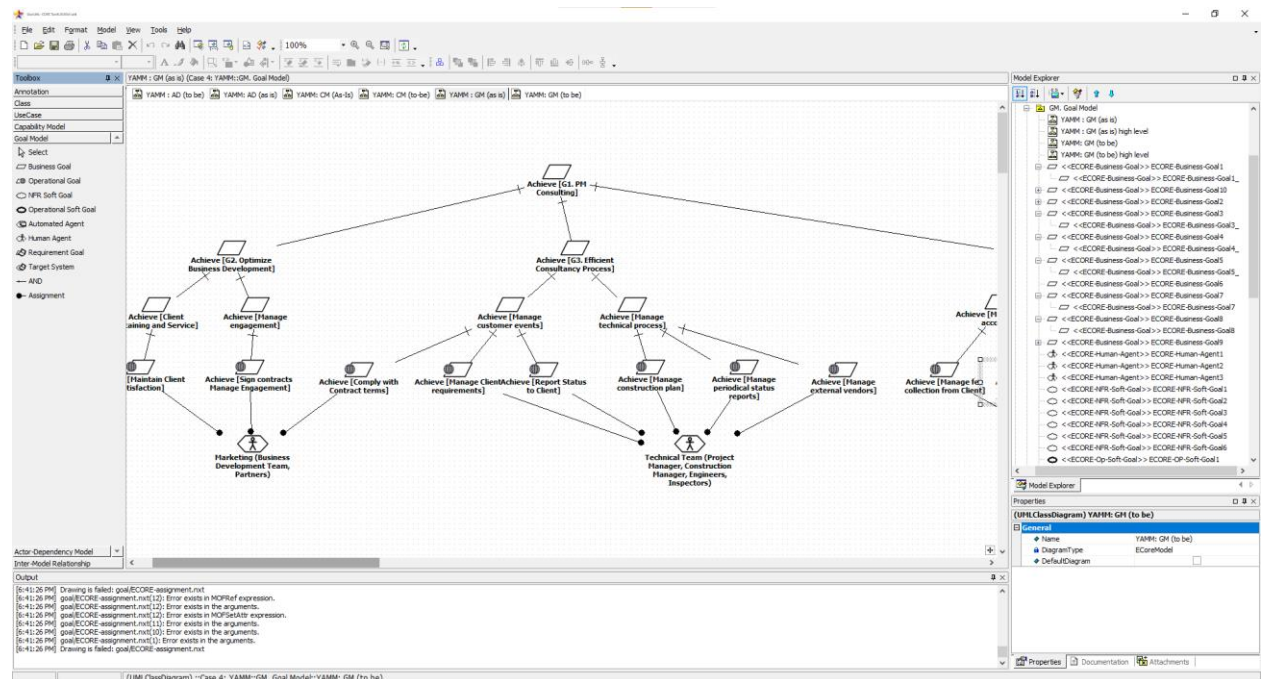
#### 3.1 AS-IS Capability Model



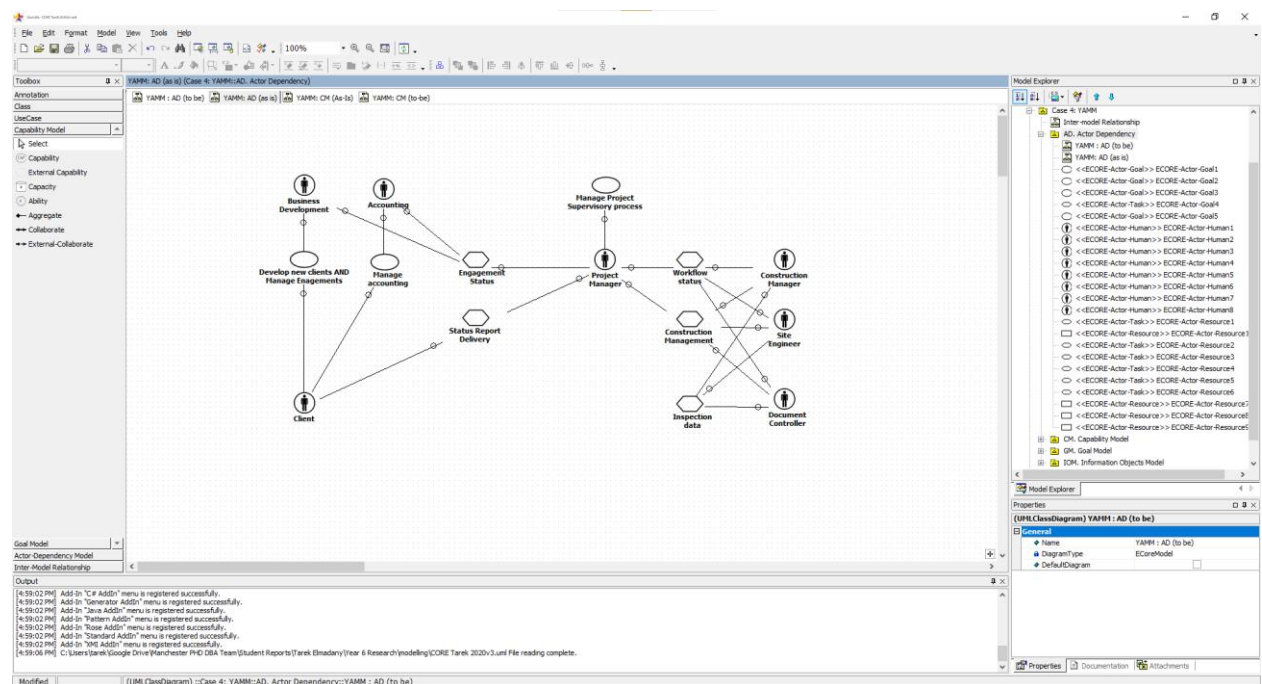


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### 3.2 AS-IS Goal Model



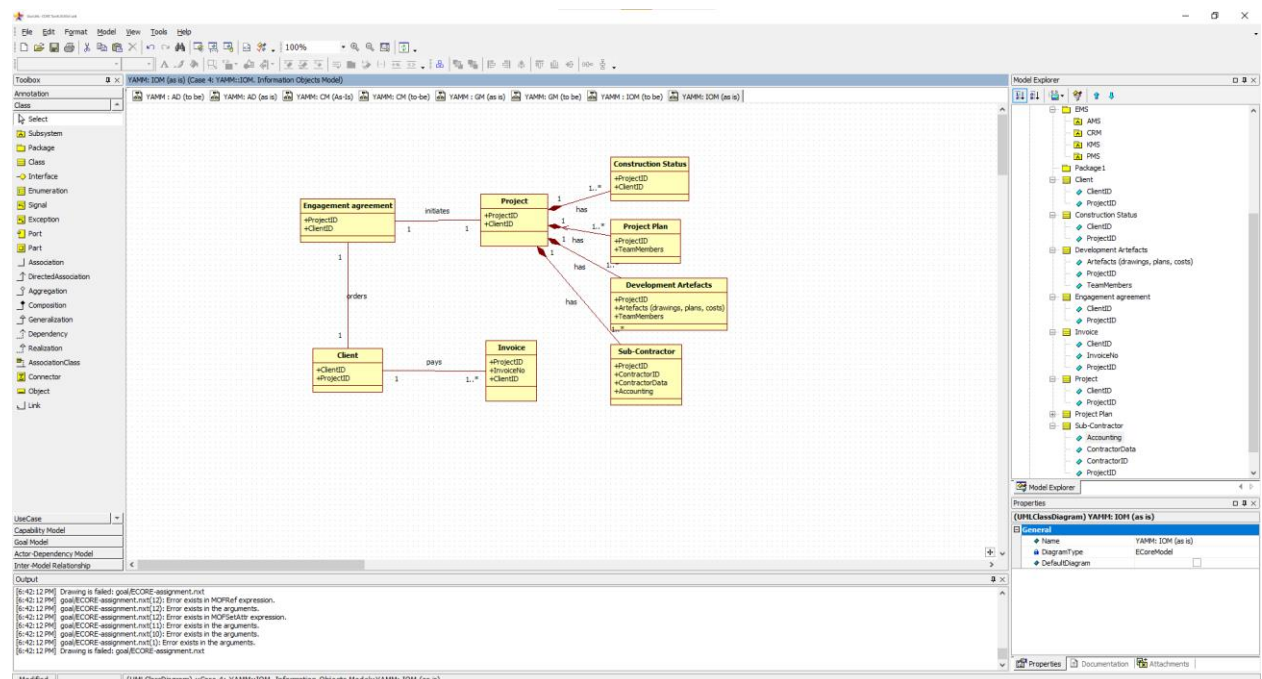
### 3.3 AS-IS Actor Dependency Model





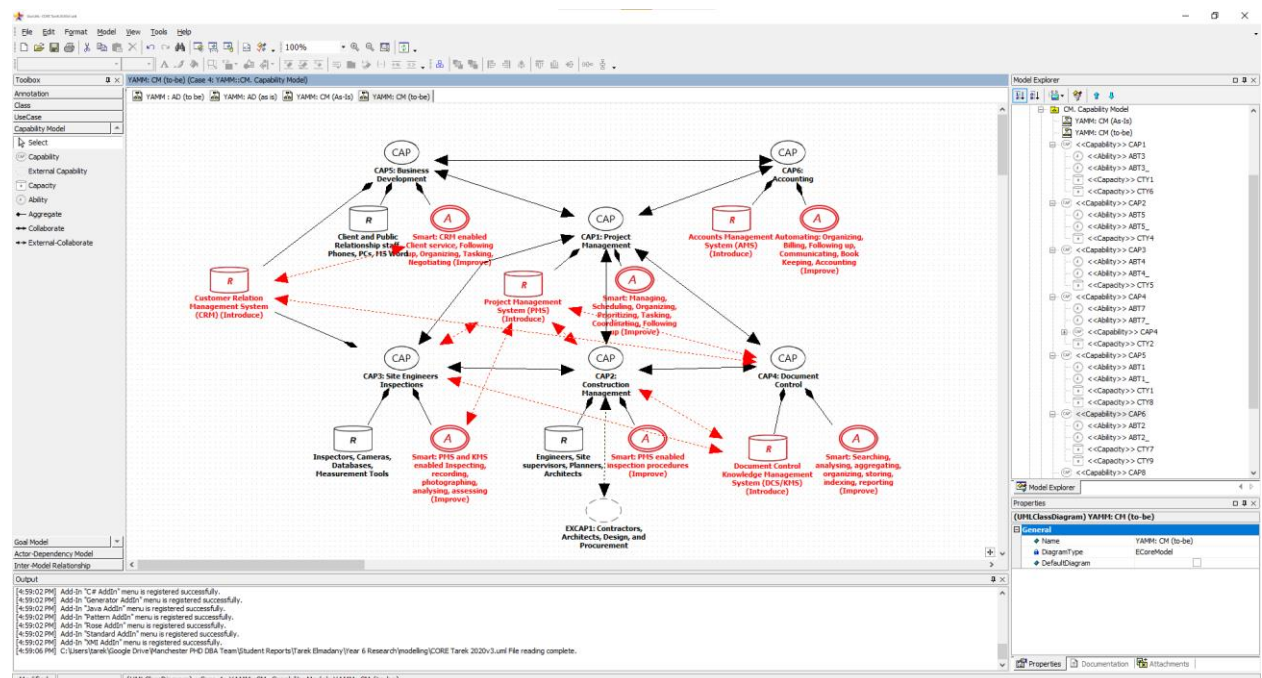
## Appendix 5: Case Study 5: YAMM

### 3.4 AS-IS Information Objects



## 4 ECORE TO-BE Modelling components

### 4.1 To-be Capability Model



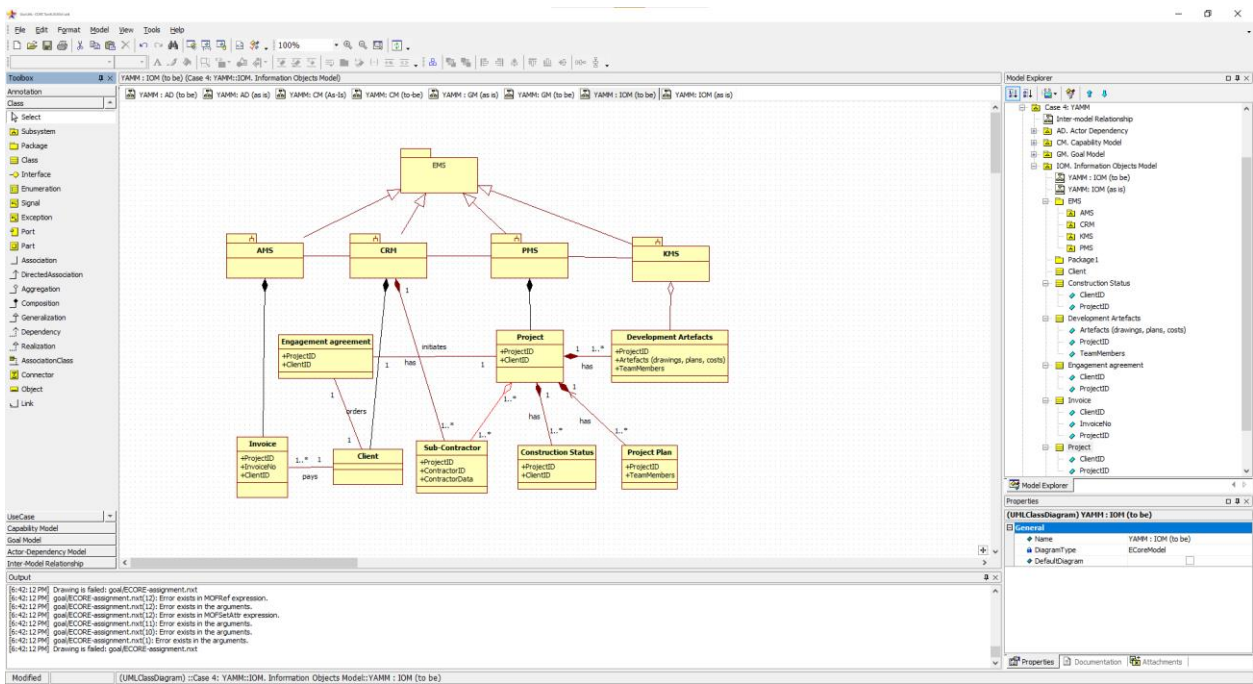






Appendix 5: Case Study 5: YAMM

4.4 To-be Information Objects Model



5 Digital Transformation Requirement List

5.1 Technology Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the technology component resulting from the modelling exercise.

Operation 1. Project & construction management Consulting	
As-Is	<ul style="list-style-type: none"><li>• Microsoft Office (Word &amp; Excel)</li></ul>
Technology	<ul style="list-style-type: none"><li>• Specialized software: Autocad for drawings and plans &amp; Primavera (Construction Resource Planning Software by Oracle)</li><li>• Desktop hard drives, flash drives, emails</li><li>• Paperwork</li></ul>
How it is used	<ul style="list-style-type: none"><li>• Documents, Contracts, briefs and reports are in typical PC authoring software (Word, Powerpoint, Excel).</li></ul>



	<ul style="list-style-type: none"> <li>• Technical drawings, resource planning and analysis (Gantt charts, etc.) in specialized construction software such as Autocad and Primavera</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Higher quality artefacts (templates and spell checkers)</li> <li>• Improved productivity</li> <li>• For easy recycling of artefacts</li> <li>• To comply with industry norms.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Version conflicts when electronic documents are passed around.</li> <li>• Hard to search since the content is not indexed from Operating System.</li> <li>• Most electronic artefacts are archived on the company server with no easy data mining or reusability capability.</li> <li>• Specialized software is old and Desktop centric, with lots of backups taken for securing the data causing clutter and data loss.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Need to secure the data from loss and overwriting.</li> <li>• Need for the ability to recycle artefacts more efficiently and consistently.</li> <li>• Need for more collaborative formats and modes of work.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Content Searchability.</li> <li>• Accessibility (Connectivity).</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Project Management Software typically used in construction projects (including planning, assigning, billing, costing, workflow, Gantt chart, critical path analysis, etc)</li> <li>• Cloud Document Control in a Knowledge Management System (KMS)</li> <li>• Cloud enable measurement equipment (and the use of Smart Phones) that are integrated with the central PMS.</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Convert to cloud-based collaboration tools such as Microsoft 365 or Google Docs eases collaboration.</li> <li>• Convert to cloud-based productivity tools such as Atlassian, Primavera Cloud, or otherwise eases security and productivity.</li> <li>• Cloud artefacts are content searchable with a document control system to check-in and check-out documents to avoid conflicts.</li> <li>• Paperless (sustainability)</li> <li>• Standardisation of artefacts and templates.</li> <li>• Integrated and automated.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office and Adobe software</li> <li>• Emails.</li> <li>• Local computer drives</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, contracts, and graphics are all stored in electronic documents inside the project folder.</li> <li>• Data scattered across emails, cloud drives, local folders on PCs or on company server.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation.</li> <li>• Recyclability of artefacts.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Desktop-based and does not allow simultaneous collaboration.</li> <li>• Data is not indexed, which makes it hard to search and hard to reuse for future projects.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More integration across data assets.</li> <li>• Accessibility (Connectivity)</li> <li>• Content Searchability.</li> </ul>



## Appendix 5: Case Study 5: YAMM

	<ul style="list-style-type: none"> <li>• Synchronisation and conflict avoidance.</li> <li>• Easier reusability of data assets.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Document Control and Knowledge Management System (KMS)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Data could be stored on a cloud-based DB which enables collaboration, easy search by date and reusability of data.</li> <li>• Modify data collection process to request electronic formats</li> <li>• Modify data collection policies to use embedded integrations with the cloud tools, which in turn reduces clutter and mishandling of data.</li> </ul>
<b>Operation</b>	3. Resource planning, Workflow and Task Management
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Emails</li> <li>• In-person</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Resource planning is conducted in person and tracked by each individual</li> <li>• Workflow management in email communication with the client and other staff.</li> <li>• Follow-up on tasks and assignments.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Responsibility.</li> <li>• Personalization.</li> <li>• Localization.</li> <li>• Standard of service.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Status and updates are kept in threads in staff inboxes.</li> <li>• Data is unorganised and often lost.</li> <li>• Inefficient Resource Planning in person.</li> </ul>



	<ul style="list-style-type: none"> <li>Centralised to the Project Manager and dependent on each person's style and discipline and not transparent to the rest of the team.</li> <li>Causes the Project Manager to be the bottleneck in communicating project goals and status.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>Transparency (Status accessibility by everyone in the organisation).</li> <li>Accessibility (connectivity).</li> <li>Higher efficiency through faster status awareness and more synchrony.</li> <li>Maintainability (outsourcing the burden of technology upkeep).</li> <li>Integration across all company resources and assets.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>Project Management System (PMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Resources, tasks and projects are all connected.</li> <li>Members of the team have access via cloud portal and can follow up on their tasks and understand their assigned tasks.</li> <li>Workflow is transparent, and status is clear.</li> <li>System offers threads for comments, history, attachments.</li> <li>Integrates with other systems such as ticketing from the client, document control, and reports artefacts (KMS).</li> </ul>
<b>Operation</b>	4. Engagement
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>Microsoft Office / Adobe PDF</li> <li>Emails</li> <li>Phone</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>Customers communicate with the firm via emails, and engagement is kept in email threads.</li> <li>Customers informally communicate with staff offering valuable data via social media, messaging apps and phone calls.</li> </ul>



	<ul style="list-style-type: none"> <li>• Contracts are all created in word and printed for signing and stamping.</li> <li>• Scanned documents are stored on PC, and backed up on external drives.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Personalization.</li> <li>• Responsibility.</li> <li>• Localization.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Does not offer accessibility from outside the office.</li> <li>• Slow process and labour intensive.</li> <li>• Hard to track and search emails for customer history.</li> <li>• Hard to centralise communication across alternative messaging apps and social media.</li> <li>• No meta-data is stored on the customer from previous engagements. As a result, they often have to rely on memory.</li> <li>• Difficult to relate the engagement to the project once transferred to Re-searcher.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use of a cloud-based CRM that would integrate with Task management system and Accounting systems.</li> <li>• CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp.</li> <li>• Paperless (sustainability)</li> </ul>



	<ul style="list-style-type: none"> <li>Standardisation of artefacts and templates.</li> </ul>
<b>Operation</b>	<b>5. Accounting</b>
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>Microsoft Office / Adobe PDF</li> <li>Emails</li> <li>Phone</li> <li>Whatsapp (Social media)</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>Accounting communicates with the stakeholders (client or contractors) via email, sending invoices created in excel and word.</li> <li>Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>Scheduling and reminders are scheduled on Google Calendar.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>Productivity.</li> <li>Standardisation of artefacts and templates.</li> <li>Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>Poor tracing between Calendar entries, invoices, and emails.</li> <li>Little to no visibility into the status of the project. Accounting requires Business Development to request a deposit invoice to be sent to the Client, and the Project Manager to clear the requests from Accounting to submit a final invoice. This process is highly dependent on memory and personal responsibility.</li> <li>Similarly, the Project Manager depends on Accounting to inform them about the details of the outcome to process the payments between the Client and the Contractor.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>Accessibility (connectivity).</li> <li>Faster and more accurate response to customer status.</li> <li>Integration with the project management system for a more efficient status update.</li> </ul>



	<ul style="list-style-type: none"> <li>• Higher quality of customer service.</li> <li>• Automated collections and payments.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM, to offer traceability and event-driven automation and reminders.</li> </ul>

## 5.2 Process Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the process component resulting from the modelling exercise

<b>Operation 1. Project Management Consultancy (The core service of the consulting practice)</b>	
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Starting with client requirements and templates for construction plans, project plans, and supervision artefacts, the Project Manager prepares a full plan with the Construction Management team, the Client, and the Site Engineers.</li> <li>• The Project Manager delegates the approved execution plan tasks for each of the Teams and the allocation of resources.</li> <li>• Manual tracking of progress through weekly meetings and email chains.</li> <li>• Storage on PCs, company servers and sharing of files through email chains and USB flash drives</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Process is not coded but based on peer training and on-the-hand experience.</li> <li>• Project Managers track the progress and status of jobs with their different phases manually.</li> </ul>



	<ul style="list-style-type: none"> <li>• Follow-up of the process and workflow of this phase is the responsibility of the Project Manager.</li> <li>• Synchronization of status and updates are communicated through meetings and electronic channels such as emails, direct messaging, or phone calls.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Personalization</li> <li>• Responsibility.</li> <li>• Process standardization.</li> <li>• Efficiency.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of codified training hinders the on-loading of new employees.</li> <li>• Process leanness is often applied as poor process adherence.</li> <li>• The knowledge of status and stage inside the workflow is only kept with certain individuals.</li> <li>• Compliance with regulations is highly reliant on the individual's compliance.</li> <li>• Most of the institutional history, knowledge and experiences are implicitly known by the individual (personal memory) with minimal explicit knowledge recording in files or documents, making the transfer of knowledge and experience highly reliant on employee retainment.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More transparency and accessibility of status and workflow statuses and stages.</li> <li>• More standardization of process compliance across teams.</li> <li>• Better synchronisation between different actors and conflict avoidance.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• [Introduce] Workflow scheme coded inside a collaborative online Project Management System (PMS). The system allows for assigned responsibilities, updates of status workflows, automated monitoring of deadlines and reminders.</li> </ul>



	<ul style="list-style-type: none"> <li>• [Introduce] A new check-in and check-out document control process using a Cloud Document Control System.</li> <li>• [Introduce] A process of reliance on recycling data in a properly indexed Knowledge Management System (KMS)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• More visibility into document status and workflow status.</li> <li>• More control over document standardization and version control.</li> <li>• Automatic storage of institutional knowledge and history.</li> <li>• More standardization of process workflow can allow substitution easier.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Data is collected by multiple roles from multiple sources.</li> <li>• Multiple individuals solicit the client for project data.</li> <li>• After the project is complete, the entire project folder gets archived on the company server in a central archive.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Data such as figures, prices, pictures and marketing artefacts are all stored in soft format inside the project folder on the company server.</li> <li>• Hard-format data is digitized by scanning, then stored in a project paper folder in the archive room.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Centralization and Compartmentalization.</li> <li>• Responsibility and Personalization.</li> <li>• Efficiency.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The process of collecting data and storing it is manual and not standardized.</li> <li>• Checklists and templates are often always out of date.</li> <li>• Data sources are non-traceable, and accountability is non-measurable due to the lack of a tracing or sign-in/out process.</li> </ul>



<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Streamline the process across different roles.</li> <li>• Accessibility (Connectivity)</li> <li>• Knowledge searchability and reusability.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Traceability by allowing check-in/check-out process.</li> <li>• Quicker reusability.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• A technology-enabled Knowledge Management System (KMS) with check-in/check-out accountable and traceable process using an accessible Cloud Document Control system (DCS).</li> <li>• Integration between the two PMS and Cloud DCS for seamless searching, locating and accessing of data.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Updated process for data collection, consumption, and storage is integrated within the intuitive usage of the cloud-based Document Control System (DCS), enabling accountability, traceability, collaboration, easy search by location, and reusability of data and knowledge.</li> <li>• More efficient reusability of previously mined data.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Template offers, contracts and engagement letters are created in Microsoft Office / Adobe PDF and communicated via emails or snail mail (printed)</li> <li>• Negotiations and agreements are achieved via personal meetings, phone conversations, and emails.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• The process is manual and reliant on the personal quality and consistency of the Business Development personnel.</li> </ul>



	<ul style="list-style-type: none"> <li>The process involves omnichannel presence via emails threads, WhatsApp threads, and social media threads and all connected in the business development personnel's head.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>Standardisation of artefacts and templates.</li> <li>Client satisfaction (Omni-channel communication, friendly human interaction, and quick personal response by lowering bureaucracy).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>Manual process is inefficient, inconsistent and labour intensive.</li> <li>Process is non-traceable, often hard to hold individuals accountable, and causes many missed opportunity due to lack of tools for automated follow-up.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>Accessibility (connectivity).</li> <li>Faster and more accurate response to customer status.</li> <li>Integration with the project management system for a more efficient status update.</li> <li>Higher quality of customer service.</li> <li>Consistency and automated reminders, status updates and effective workflow management.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>Software Task-oriented programmed workflow designed in a Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Technology-enabled processes using the cloud-based CRM would force a consistent and quality engagement experience, follow-up and reminders.</li> <li>CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp to allow for a single point of process follow-up and management.</li> </ul>



	<ul style="list-style-type: none"> <li>• Updates to online templates and improvements in checklists on the CRM automatically persists into the future without remembering to change it manually every time, hence less risk to human error.</li> </ul>
<b>Operation</b>	<b>4. Accounting</b>
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>• Scheduling and reminders are scheduled on Microsoft Outlook Calendar.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Efficiency</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the client, and Auctioneers requests from Project Manager to submit a final invoice. This process is highly dependent on personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> </ul>



	<ul style="list-style-type: none"> <li>Automated collections.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Use a cloud-based AMS that would integrate with PMS and CRM to offer traceability and event-driven automation and reminders.</li> <li>More efficient use of time and resources.</li> </ul>

### 5.3 People Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the people component resulting from the modelling exercise.

Operation	1. Project Management Consultancy (The core service of the consulting practice)
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>Project Manager</li> <li>Construction Manager</li> <li>Site Engineers</li> <li>Document Controller</li> <li>Support staff (Secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>The central leader is the Project Manager, who has to coordinate the entire process, starting with assigning roles, coordinating schedules, maintaining the pace of the progress, ensuring status update, follow-up and quality control.</li> <li>Construction Managers and Engineers carry the technical grunt work of the strategy execution, feed it to the Auctioneer, analyse the data, complete appropriate forms, plans, resources, supervisory KPIs, and all the approvals along the way.</li> </ul>



	<ul style="list-style-type: none"> <li>• Construction Managers implement, the supervision strategy, review their alignment with the Client project goals and arrange review meetings with the Project Manager.</li> <li>• Continuous communication between the Project Manager and the Client involves iterating over the project plan and status.</li> <li>• Support staff help with printing, delivery and non-technical support work.</li> </ul>
<b>Why was it setup that way?</b>	<ul style="list-style-type: none"> <li>• Specialization and personalization.</li> <li>• Teamwork effort to arrive at the desired customer outcome.</li> <li>• Focus on efficiency, effectiveness and completeness during the execution of tasks.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The Project Manager is the sole responsible person to drive the process; his/her role is to manage the plan to completion, which means that he/she is the primary person aware of the status and could pose a risk if absent or on leave.</li> <li>• Communication and synchronization are slow and inconsistent.</li> <li>• Consistency and Quality are often forgone for speed and delivery.</li> <li>• Process and Workflow are People dependent. While everyone knew what needs to be delivered, every team had their way of achieving it, which mainly relied on people skills and experience and less on standardized systems.</li> <li>• People used varying non-standardized enabling technologies with no centralized technology strategy, which often caused multiple synchronizations and quality problems.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Achieve decoupling of the dependency on people and shift to the dependency on systems and technology.</li> </ul>



	<ul style="list-style-type: none"> <li>• Achieve higher efficiency from people who are distracted by context switching and repetitive non-productive synchronizing and admin work.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Current roles to train on the usage of enabling new technology and integrated system processes and workflows.</li> <li>• [Introduce] IT systems admin, Process compliance admin.</li> <li>• [Introduce] Automated workflows and processes, including standardized scheduling, automating assignment based on workflow stages, automatic reminders, integrated centralized communication and document repository that is auto-synchronized and status aware.</li> <li>• [Cease] Manual communication support roles and replace with technology.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Improves people's productivity by eliminating much of the manual work.</li> <li>• Reduces errors and improves quality by shifting some standardization onto systems and technology previously used to suffer from people error.</li> <li>• Enhances people value since technological enhancements free up people's wasted attention and time and instead shift the focus on improving their core consulting competency and skills.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Project Manager</li> <li>• Document Controller</li> <li>• Marketing (Sales)</li> <li>• Marketing (Business development)</li> <li>• Support staff (secretaries)</li> </ul>



<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Data of different types and scopes are collected by each specialists depending on their needs. For example, an Organizer will collect pictures and contracts, while a Project Manager will interview the client to gain insights into his/her needs.</li> <li>• Data is collected and stored with each person on their devices. At the end of the project, the Project Manager tries to gather all the files and artefacts in one archived folder on the company server.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Specialization</li> <li>• Responsibility</li> <li>• Quickness</li> <li>• Reusability</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Inconsistent data collection procedures that depend on the quality of each team, it is not clear who is collecting and keeping the data.</li> <li>• No central owner or responsible person for data management and archiving.</li> <li>• Ineffective data reusability and mining since it depends on people's memories.</li> <li>• Highly reliant on individual due diligence and personal capability.</li> <li>• Clients complain that many people reach out to them from the firm asking for data all the time.</li> <li>• Many concerns about data privacy and security control.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• To improve the quality and comprehensiveness of data collection.</li> <li>• To centralize control of data for security, liability, compliance, traceability, and responsibility purposes.</li> <li>• For better indexing, searching, and reusability of data which is the foundation of the knowledge base.</li> <li>• Adherence to paperless data collection (sustainability)</li> </ul>



<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] KM admin: responsible for data management using technology-enabled cloud-controlled data-traceable data and knowledge management systems (including cloud drives and indexable databases).</li> <li>• [Improve] The roles of Project Manager, Construction Managers, Site Engineers, Data Controllers and Marketing (Business Development) to train on the new technologies and processes for data collection, control and storage.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Maintains specialization.</li> <li>• Introduces control and standardization.</li> <li>• Introduces Knowledge reuse capabilities.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Project Manager</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, couriers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Project Manager and Marketing specialists use their connections to solicit past clients, current clients and future clients (client acquisition) to procure new jobs.</li> <li>• Once a request for proposal is made, engagement agreements are prepared and signed.</li> <li>• Procedures for communicating, signing and exchanging documents are handled by the Marketing (Business development) staff.</li> <li>• Contracts and agreements are stored on company computers under the responsibility of the business development staff.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide high customer personal care.</li> <li>• Focus on personal responsibility.</li> </ul>



<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of standardized agreements resulting in many missed opportunities and errors.</li> <li>• Followup is reliant on individuals diligence in setting up personal reminders and memory.</li> <li>• Tracing of engagement status is reliant on individual memory.</li> <li>• Customer care level is reliant on individual skills and experience.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Personnel want more standardized artefacts, including offer documents, engagement agreements and data collection criteria.</li> <li>• The need to decouple customer service level from relying on individual skills to relying on a system of service standards that could be quickly followed and trained by any individual.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Train marketing staff on Customer Relation Management (CRM) system, including a new standardized process.</li> <li>• [Improve] Train marketing staff on the new Cloud-based Document Control System (DCS) to store the artefacts and understand how it is integrated with the CRM and the Accounts Management System (AMS)</li> <li>• [Introduce] Automation in the customer follow-up and engagement workflow to add reminders, automatic assignment of roles, automated status updates, and automatic linkages of previous engagements and knowledge.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Personnel offer a more consistent and higher quality of client experience.</li> <li>• Personnel have more robust traceability, status awareness and workflow management capability.</li> <li>• Personnel can more accurately price and generate higher revenues due to better client knowledge and historical understanding.</li> <li>• Paperless procedures.</li> </ul>



Operation	4. Collections
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Accounting and finance personnel.</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, security, couriers, drivers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Accounting depends on Marketing to obtain status updates on contract and engagement agreements and stages in the workflow.</li> <li>• Accounting liaises directly with the clients and vendors to process payments, settle invoices and taxation requirements.</li> <li>• Accounting liaises with Project Managers to give the signal to release the start of progress (in the case of fulfilment of down-payment) or to release the final report once the Client fulfils the final payment.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide a high level of customer care.</li> <li>• Protect and fulfil business financial rights and obligations effectively.</li> <li>• Privacy and security of financial dealings from the rest of the organization and the competitors.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The reliance on individuals can sometimes act as a bottleneck and hinders progress.</li> <li>• Non-standardized or integrated system to communicate status efficiently leads to mistakes, lost revenues and angry customers.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Better synergy with the workflow of the core business.</li> <li>• Faster response times.</li> <li>• Higher status awareness and synchronization.</li> <li>• Higher collection and effective customer handling in alignment with Marketing and Project Managers.</li> </ul>



<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] A new dependency between Accounting and the CRM system via integrating the newly introduced Account Management System (AMS).</li> <li>• [Improve] Train the accounting personnel to use the newly introduced Account Management System (AMS) that automates communication, provides seamless status synchronization across systems, and leads to real-time status awareness.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Provides a more consistent customer experience.</li> <li>• Maintains the primary business goals of privacy, specialization, protection of business financial interest while eliminating the ineffective communications problem.</li> <li>• Paperless (sustainability)</li> </ul>

## 6 Post-Transformation Feedback

### 6.1 Analysis of the transformation

A round of interviews was conducted after a while (as per interview dates above) to assess the feedback and progress of the digital transformation. The following summarizes the findings:

<b>Operation</b>	<b>1. Project &amp; construction management Consulting (The core service of the consulting practice)</b>
<b>How was transformation implemented?</b>	<b>Technology:</b> <ul style="list-style-type: none"> <li>• A new cloud-based Project Management System (PMS) was installed. It was tailored for construction projects and has standardized industry features such as Gantt charts, resource planning, time scheduling, tracking, and more.</li> <li>• Projects were broken into their tasks. Tasks stored information about the start and end times, data, resource allocation, hours,</li> </ul>



	<p>status and dependencies. The system provided planning, resource allocation, and critical path analysis tools.</p> <ul style="list-style-type: none"> <li>• A phone app provided ease of tracking, assigned tasks, reminders, and the ability to input new data and update on site.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• The <i>Project Manager</i> tracked the project and communicated requirements and scheduling via the system. At the same time, individual engineers assigned to the tasks communicated their progress and status updates back. The system dashboard reflected the updates, progress, alerts, and recent commentary from individuals on a news stream.</li> <li>• As soon as Business Development creates the <i>project</i> in the system, they pass it on to the Project Manager (PM) by selecting the right field. The system would notify the PM, assigning the team working on it by filling out the appropriate fields. The team members are all notified about their roles, deadlines, and statuses in the workflow by viewing the project on the system, and they get access to all their tasks via their system dashboard.</li> <li>• Team members finish their tasks and sign off on the PMS; the PMS automates the workflow by passing it on to the subsequent assignee and is programmed to utilize all the necessary notifications, alerts, status updates and reminders.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>• Employees were re-trained to use the system and adapt their pre-transformed workflow to the new technology and process.</li> <li>• Employees were assigned to the different tasks in the PMS system and could find all their relevant data, update artefacts, trace the history of all their work and other peoples' work from their dashboard.</li> </ul>
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<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>Almost all the workflow was transformed to the new digital technology and process, including the document repository, which allowed efficient check-in and check-out, sharing security, traceability, and conflict avoidance.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>Minimal, since the system was easy to transform because it was the same technology provider switching from an old desktop-based application to a newer online cloud application with the benefit of new enhanced features and internet accessibility. Additionally, there was no backlog involved since they only started using the new system on new projects, while the old ones naturally closed.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>The system suffered from the need to be continuously connected to the internet since site engineers may sometimes work from low connectivity sites. There seems to be a need to allow the system to work offline until the computer connects to the internet again.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The transformation models were sufficient in defining and sizing the transformation requirements and effort, and they were high-level enough to organize the effort in the right direction without stringent constraints on implementing or choosing a particular solution.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>The PMS system installed represents the company's main knowledge system, especially when complemented with a Cloud Document Repository (DRS).</li> <li>The PMS stored all the interaction data, costing analysis, schedule, budget vs actual costs and a wealth of behavioural data. All that data serves as benchmarks and baselines for the new projects building upon the previous organizational knowledge and experience. Since</li> </ul>



	<p>the system is accessible online and a wealth of analysis data, averages, trends, and lessons are aggregated, new projects benefit by providing better planning, more reasonable expectations, and fewer mistakes and misses.</p> <ul style="list-style-type: none"> <li>• Process:</li> <li>• Project Managers start a new project by applying a best practice template that has been enhanced over time by the experience of previous projects in the organization. The technical team would have complete visibility into the work breakdown structure, timeline and resource allocation, status and the next steps that need to be taken to complete their responsibility in filling out their component of the project, whether it involves construction documents, plans, budgets, etc. and to manage the growth and evolution of that data throughout the project.</li> <li>• People:</li> <li>• Employees were re-trained to use the new data collection and usage system and adapt their pre-transformed workflow to the new technology and process.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• A complete transformation from the previously desktop application to the cloud system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• The transition was seamless, as the technology was familiar except for the online and mobile work modes.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Add more data intelligence systems to draw more insights from the knowledge base.</li> </ul>



<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The transformation models were sufficient in <b>defining</b> and <b>sizing</b> the transformation <b>requirements</b> and <b>effort</b>, and they were high-level enough to organize the effort in the right direction without stringent constraints on implementing or choosing a particular solution.</li> </ul>
<b>Operation</b>	3. Engagement
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>The Project Management System (PMS), had an extension with Customer Relationship Management (CRM) features. It enabled management and communications with all the external people working on a particular project. Those external people ranged from client owner reps, sub-contractors, suppliers, workers, and government employees. All the client information, contact data, roles, and is integrated with the Project Management System (PMS), and the Accounting Management System (AMS)</li> <li>With the new system, Business Development can communicate with the client via the portal, submit quotations, follow up on the engagement procedures, track the client requests and communicate them to the Project Manager and staff.</li> <li>Process:</li> <li>When a client sends a Request for Proposal (RFP) to the company official email, the new CRM picks it up and creates a new Client Request. The Business Development team can then categorize it as a new request or belonging to an existing request.</li> <li>Business Development then proceeds to process the request. If it is a new request for quotation, then Business Development assigns a Project Management the sub-task of <i>scoping and sizing</i>. Once complete, Business development proceeds to finalize the offer and send it back to the Client for negotiations and approval.</li> </ul>



	<ul style="list-style-type: none"> <li>• If the request belongs to an existing request, then it is rerouted to the correct system. If it is requested in the offer phase, then Business Development handles it, if it is a work in progress, then it gets tagged with the project-ID and gets re-routed to the PMS for processing; otherwise, if it is a payment issue, then it is handled after re-routing to the AMS system for handling. All systems communicate with one another and are fully integrated.</li> <li>• People: <ul style="list-style-type: none"> <li>• Business Development specialists were trained to operate the new CRM, no new hires were required.</li> </ul> </li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• Near-complete digital transformation of all Business Development tasks and operations except for a few functions such as mailing, printing, scanning and courier delivery of artefacts that still require manual processing and adapting to the digitally transformed work process.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• This SCF does not manage more than half a dozen projects at a time, with multi-year durations. Business development does not usually experience a new project that often, making it difficult to quickly adapt from the old ways to the new technology at work.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• The interfaces for the CRM was not as well as friendly as the mainstream CRM systems in the market. Business development complained that it took them a while to handle.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>• The model was sufficient at this abstraction level of analyzing and driving the main requirements for transformation. Most of the hurdles were at the implementation layer.</li> </ul>
<b>Operation</b>	4. Collections



<p><b>How was transformation implemented?</b></p>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• A complete transformation to a cloud-based Account Management System (AMS), that integrated with the Customer Relationship Management System (CRM) and the Project Management System (PMS).</li> <li>• The AMS is integrated with the CRM concerning invoicing and payment follow-up.</li> <li>• The AMS is integrated with the PMS regarding costing, billable hours, and progress in the workflow for payment processing.</li> <li>• Additionally, the team had a Human-Resource-Management (HRM) and an Asset Resource Management System (ARMS), which were also integrated for payroll, leave, asset management and expenses related to them.</li> <li>• Process:</li> <li>• The accounting department is pinged via the system once a recurring payment or invoice is submitted from the PMS to the AMS.</li> <li>• Accounting then schedules the invoices to the client and processes them via the new system.</li> <li>• The System sends automatic reminders to the Client and the Accounting team to follow up on payments.</li> <li>• The AMS also handles the company accounting for costs incurred, billable hours, and taxes.</li> <li>• People:</li> <li>• Accounting and Finance individuals were fully trained to work on the new technology and process.</li> </ul>
<p><b>Extent of Transformation</b></p>	<ul style="list-style-type: none"> <li>• An almost complete transformation from the old manual system to the new integrated cloud system.</li> </ul>



	<ul style="list-style-type: none"> <li>Physical handling of paper invoicing and courier services are still the same except that they are getting printed and processed from a new system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>Although the transition from desktop software to online cloud software was almost seamless, the new integration features with the CRM and PMS significantly departed from the old ways of day-to-day operations for the team. They switched from phone calls and manual follow-up to checking system status, program reminders, and automated next steps. There was a struggle, in the beginning, to get everything right.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>Like the CRM, the AMS interface and usability are sub-par, with much room for improvement.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The team expanded on their transformation model to include the Human Resources use case of managing employee attendance, payroll and taxes, and they also expanded on the Resource Management to manage company vehicles, computers, measurement equipment, etc.</li> <li>Management wished the analysis to expand to include the scope of scope</li> <li>In principle, those were purposefully not in our initial analysis for the thesis purposes, but the SC-COST framework and eCORE tool enabled them to take it a step further on their own.</li> </ul>

## 6.2 Evaluation of SC-COST

Separately, the interviews conducted asked the stakeholders about their opinion on the SC-COST framework as follows:



Evaluation of pre-transformation modelling exercise
The stakeholder found the research involvement helpful in guiding the brainstorming discussion. The level of stakeholder engagement was significant, and the outcome was beneficial for both the firm and the researcher. The insights gained were equally significant for the firm and the SC-COST framework and patterns development.
Evaluation of patterns
The pattern was introduced from the outcomes of the earlier use cases; it was embedded as templates in the eCORE tool, along with a descriptive guide on how to use it. The researcher confirmed its effectiveness in building the AS-IS and the TO-BE eCORE models by observing its utilisation. When the stakeholders were initially presented with the templates, they found it different than their understanding of how their firm operates, however after understanding the conceptual breakdown of the different functions of Marketing, Project Management and Accounting, they were able to reflect back to their structure at the abstraction levels presented closely. They found it plausible, and a useful interpretations of their organization and after iterating the eCORE templates to fit their models, they found it feasible to implement. The patterns captured the essence of their modelling and transformation, and they agreed to their ontology and structure. The post-transformation feedback also proved to the research that they are predictive and reliable.
Evaluation of the eCORE tool
The eCORE tool needed many more bug fixes and features; however, it was sufficient in a research setup to achieve its intended outcome.



## Appendix 6: Case Study 6: ITEGY

Company Name	Information Technology Egypt Incorporated (S.A.E.)
Small Consulting Code	ITEGY
Description of services	A small IT consulting firm specialised in IT services
Interview Date(s)	09/09/2020 10/09/2020 15/09/2021 (Feedback interview)
Interview with	Emil Ebid (CEO) Abanob Ebid (General Manager)

### 1 Background of the firm

#### 1.1 About ITEGY

ITEGY is a Small-Consulting-Firm (SCF) specialising in IT Strategy and Services. They operate in the GCC and North Africa.

Typical customers include Corporations, Governments, and Individual clients. The firm usually works on a handful of projects at a time.

#### 1.2 Products and Services offered

The firm provides the following consulting services

1. IT Strategy and Solutions: typically setting up new IT projects or upgrading current IT infrastructure.
2. IT Maintenance: typically ongoing maintenance contracts for the upkeep of a Client IT infrastructure.



### 1.3 Workforce & Culture

The firm employs approximately 40 people, including the CEO, Managers, IT consultants, IT engineers, Trainers and support staff (Office managers and clerks). The firm outsources some non-core functions such as facility management, security, human resource, and courier services. Depending on the project, the firm also uses freelance consultants and third-party specialised firms as subcontractors.

The overall culture runs as a family business, with a loose structure and customer care. The organisation is flat with only three levels, with the management typically involved in day-to-day operations. Upper management (One CEO and one General Manager) are siblings, beneath which there are three division managers: Deployment, Training and Support; all other employees are directly managed by one of those five people.

### 1.4 Information gathering

In total, three interviews were carried out with the ITEGY team. The first two interviews were carried out in September 2020, two years after the first three case studies. Similar to all the previous case studies, the main goal was to enhance further and tweak the tools and patterns. The interview durations were shorter than the first five case studies as we already had a better handle on soliciting the structure and processes and better tools to support the solicitation. They were conducted in intensive several-hour online workshops (since COVID-19 restrictions were in place). The eCORE framework was introduced up front, and the stakeholders collaborated with these set goals in mind:

67. Verify the central business use cases of their SCF.
68. Test Conceptualize and Model the AS-IS eCORE model of their SCF.
69. Design the elements of their Digital Transformation as they see fit.
70. Conceptualize and Model the TO-BE eCORE model based on that design.
71. Translate their understanding of those transformations into pragmatic requirements for change in their People, Process and Technology components.

The workshops were done in collaboration with the researcher, and the first set of models was contrasted with the previous case studies to see if there were similarities. Repeated



themes were confirmed; although the team may have named tasks and processes differently, functions and processes looked very similar. It was clear that the patterns were consistent and valid even with the different business models.

Those models were further enhanced in the second round of interviews a year later, in September of 2021. The second round was intended to obtain feedback on the transformation project and revise the model in hindsight. Those interviews benefited from the evolution in the tool and the process as a result of researching the other five case studies, and a more precise and consistent ontology and framework were gauged for feedback.

The outcome of that exercise is outlined in the following five sections:

## 2 Use Cases

Although many use cases could be generated for **Digital-Transformation (DT)**, the following use cases represent the core structured activities of the firm and encompass the main areas in need of digital transformation.

### 2.1 UC\_SCF6\_1: IT Consulting Account Management

Use Case ID <UC_SCF6_1>	
<b>Goal</b>	IT Consulting Account Management
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Account Manager</li> <li>3. IT Consultant</li> <li>4. Trainer</li> <li>5. Marketing</li> </ol>
<b>Use Case Overview</b>	When an account is opened, the Account Manager assigned to the task allocates the proper resources based on the size and complexity of the project at hand. The Client is contacted to provide the project requirements, followed by a kick-off meeting to agree on the scope and limits of work. The paperwork is drafted, and the CEO signs off a devised agreement. The Account Manager then commences with the execution,



	typically supervising the IT Consultants, IT support and Trainers (including any sub-contractors) until the project is complete.
<b>Trigger(s)</b>	Marketing (Business Development) assigns a new project to a Consultant.
<b>Precondition(s)</b>	The engagement letter is signed, and the project is set to go from the business development department.
<b>Basic Flow</b>	<p>Description: This scenario describes the project flow</p> <ol style="list-style-type: none"> <li>1. The Account Manager is assigned a project for IT Strategy and Solutions.</li> <li>2. The Account Manager conducts initial meetings with the Client to elicit the IT requirements.</li> <li>3. The Account Manager involves the IT Consultants to devise the appropriate IT solutions for the requirements at hand.</li> <li>4. The plan, including timeline and cost for implementation, is communicated and agreed upon with the Client.</li> <li>5. The Account Manager prepares progress updates based on the feedback from the IT Consultant.</li> <li>6. The Account Manager meets with the Client to discuss any variations or issues that may arise and to give the Client the feedback necessary to take the appropriate corrective actions.</li> <li>7. At the end of the project, the IT Consultant writes a project completion report delivered to the Account Manager, signalling the end of the IT deployment phase.</li> <li>8. The Account Manager assigns the next phase of Training and Onboarding to the Trainer.</li> <li>9. The Trainer familiarizes him/herself with the deployed solutions through transition meetings with the IT Consultant.</li> <li>10. The Trainer devices a training program and executes it with the Client.</li> </ol>



	<p>11. At the end of the training period, the Trainer writes a training completion report delivered to the Account Manager, signalling the end of the training phase.</p> <p>12. The Account Manager assigns the Long-Term-Support-Agreement contract to the IT Support team to commence with the regular maintenance and support.</p> <p>13. The IT support provides their support to the Client via a Ticketing system, which schedules regular maintenance checkpoints, automatic notifications from system down-time and status alerts, and client complaints.</p> <p>14. The IT support team handles each request according to and logs the process and outcome in reports delivered to the Account Manager for keeping and billing if outside of the terms of the Long Term Support Contract (LTSC).</p>
<b>Termination outcome</b>	Complete of project and signal to accounting for collections.
<b>Alternative outcome</b>	1. Refusal to commence with the job (at any stage) and halting the project.

## 2.2 UC\_SCF6\_2: Engaging a new project

Use Case ID	<UC_SCF6_2>
<b>Goal</b>	Engaging in a new project
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Account Manager</li> <li>3. Marketing</li> <li>4. Legal</li> </ol>
<b>Use Case Overview</b>	<ul style="list-style-type: none"> <li>• When a Client approaches the firm for an IT Project Solution, they first ask for a Request for Proposal (RFP), Marketing (Business</li> </ul>



	<p>Development) sends them a technical and financial offer, which they typically negotiate until approved, after which they sign an engagement letter.</p> <ul style="list-style-type: none"> <li>• Alternatively, through personal connections, the Account Manager requests that Marketing send a proposal to a specific Client.</li> <li>• Alternatively, governments or public entities announce RFPs or Request for Vendors publically. Marketing subscribes to newsletters of vendor lists and applies with a proposal or application when a job is posted.</li> </ul>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Client emails the firm with an RFP.</li> <li>• An Account Manager develops a client and asks the firm to prepare a proposal.</li> <li>• Marketing applies for open tenders.</li> </ul>
<b>Precondition(s)</b>	None
<b>Basic Flow</b>	<p>Description: This scenario describes the typical valuation flow</p> <ol style="list-style-type: none"> <li>1. An email is received from a Client or an Account Manager requesting a quotation or proposal.</li> <li>2. Business Development opens a new case and sends the project details to an Account Manager for the technical offer, effort and cost estimation.</li> <li>3. Business Development prepares financial offer outlining the scope of work and turn-key project fee. The offer is calculated based on IT requirements, the project size, the client's history, and competitiveness of the job in the market.</li> <li>4. Business Development reviews the proposal with the CEO and obtains approvals.</li> <li>5. Business Development submits the proposal to the Client.</li> </ol>



	<ol style="list-style-type: none"> <li>6. The Client responds with a counter-offer, negotiates cost, time or terms.</li> <li>7. Business Development adjusts the proposal after negotiations and resubmits.</li> <li>8. Client approves the proposal, signs, and issues a work order.</li> <li>9. Business Development assigns the assignment to an Account Manager.</li> </ol>
<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• An engagement is signed, and the assignment commences to an Account Manager.</li> <li>• Alternatively: Cancelled, whereby the engagement fails and goes to a competitor.</li> </ul>

## 2.3 UC\_SCF6\_3: Collections

Use Case ID	<UC_SCF6_3>
<b>Goal</b>	Collections
<b>Actor(s)</b>	<ol style="list-style-type: none"> <li>1. Client</li> <li>2. Marketing (Business Development)</li> <li>3. Account Manager</li> <li>5. Accounting</li> </ol>
<b>Use Case Overview</b>	<p>When a Client signed the engagement, they have to pay a retainer, which triggers the start of the execution of the project.</p> <p>Or when a project is concluded, they have to pay the balance of payment.</p>
<b>Trigger(s)</b>	<ul style="list-style-type: none"> <li>• Marketing approves an engagement.</li> <li>• Account Manager submits a final bill of costs and fees.</li> </ul>
<b>Precondition(s)</b>	Approved Engagement Or Approved final bill.
<b>Basic Flow</b>	Description: This scenario describes the typical valuation flow



	<ol style="list-style-type: none"> <li>1. Marketing pings Accounting to issue a proforma invoice for the advance retainer before the start of work.</li> <li>2. Accounting reviews the terms and engagement and programs the payment schedules into the accounting software.</li> <li>3. Accounting issues the advance retainer proforma and communicates with the Client for collection.</li> <li>4. Once the collection is complete, Accounting approves the commencement of the project to an Account Manager.</li> </ol>
<b>Alternative Flow</b>	<ol style="list-style-type: none"> <li>1. The Account Manager signals to Accounting the completion of the project with the total balance of fees.</li> <li>2. Accounting issues the final payment invoice, including any amendments, taxes and additional expenses.</li> <li>3. Accounting follows up with the Client until the collection is complete, then marks the assignment finished.</li> </ol>
<b>Termination outcome</b>	<ul style="list-style-type: none"> <li>• All the payments have been paid in accordance with the engagement agreement.</li> </ul>

#### 2.4 Other use cases:

There are many other functions in the firm, including:

- 1- Accounting and expense tracking: Accounting (Financial controller) allocates hours and costs to projects. They carry their job using excel files and desktop-based accounting software. Could benefit from a cloud-based integrated system with a Task/Job Manager and Customer Relations Management System (CRM).
- 2- Asset tracking: Physical resources such as meeting rooms, company vehicles, laptops and cell phones, are all shared resources that are currently tracked manually by the Office Manager, and require some resource management software and integration with the PMS and CRM if possible.
- 3- Human Resource Management: Employees billable hours, attendance, vacations, sick leaves, benefits, contract renewals, and more are managed manually via excel

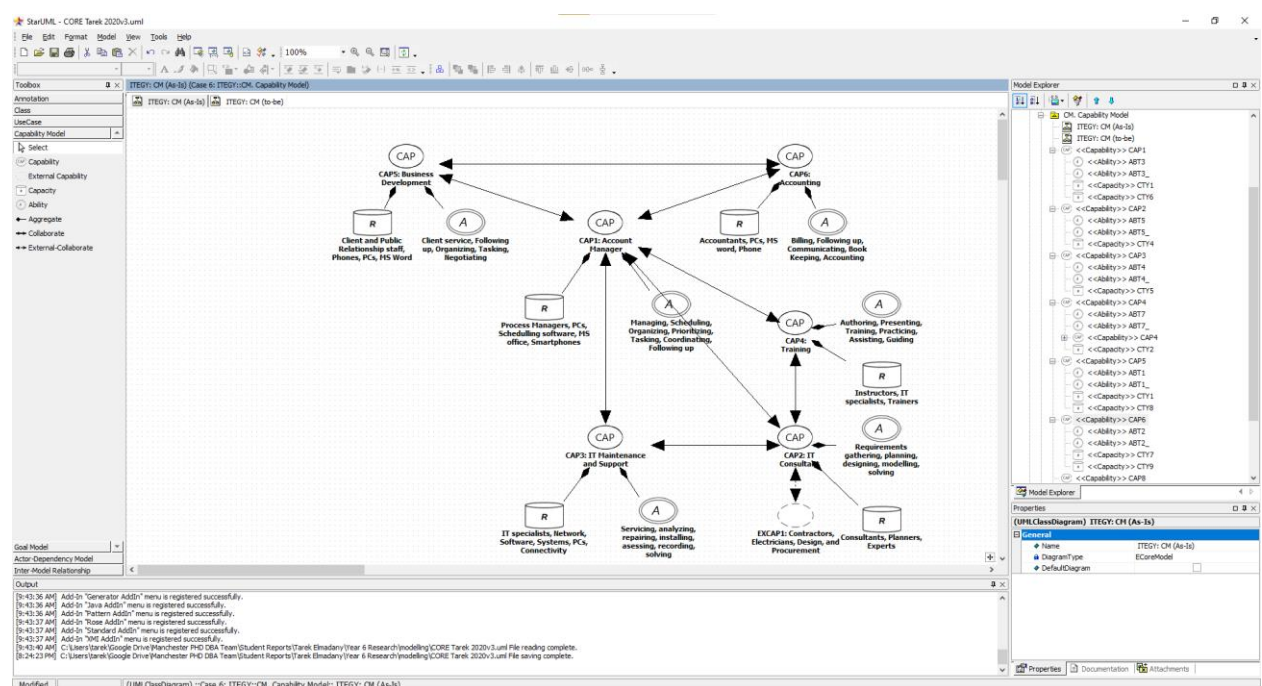


## Appendix 6: Case Study 6: ITEGY

files by the Office Manager and reviewed and approved by a Partner. A Human Resource Management (HRM) system could be implemented that integrates with an automated access control device (fingerprints or cards) to calculate hours automatically, and also allows employees to enter their vacation times and leave and track their pay, bonuses, sick days and more via an online programmed portal. Possibly also integrate with the PMS to calculate billable hours automatically.

### 3 ECORE AS-IS Modelling components

#### 3.1 AS-IS Capability Model



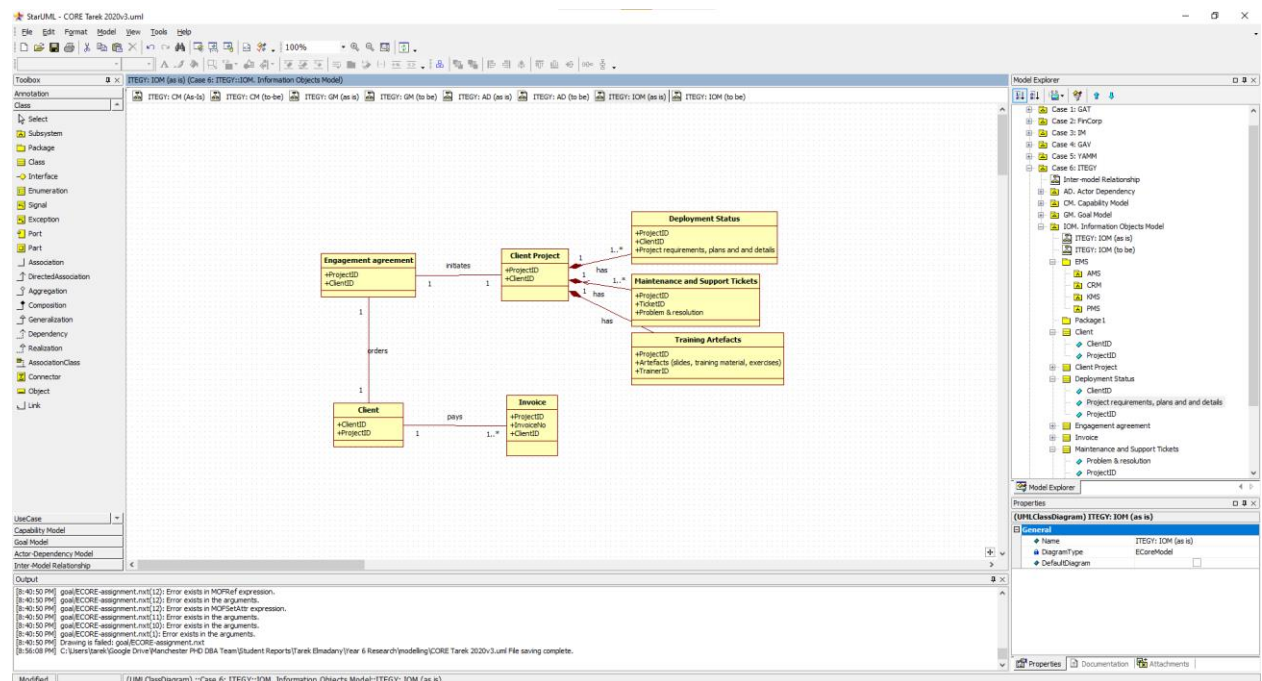




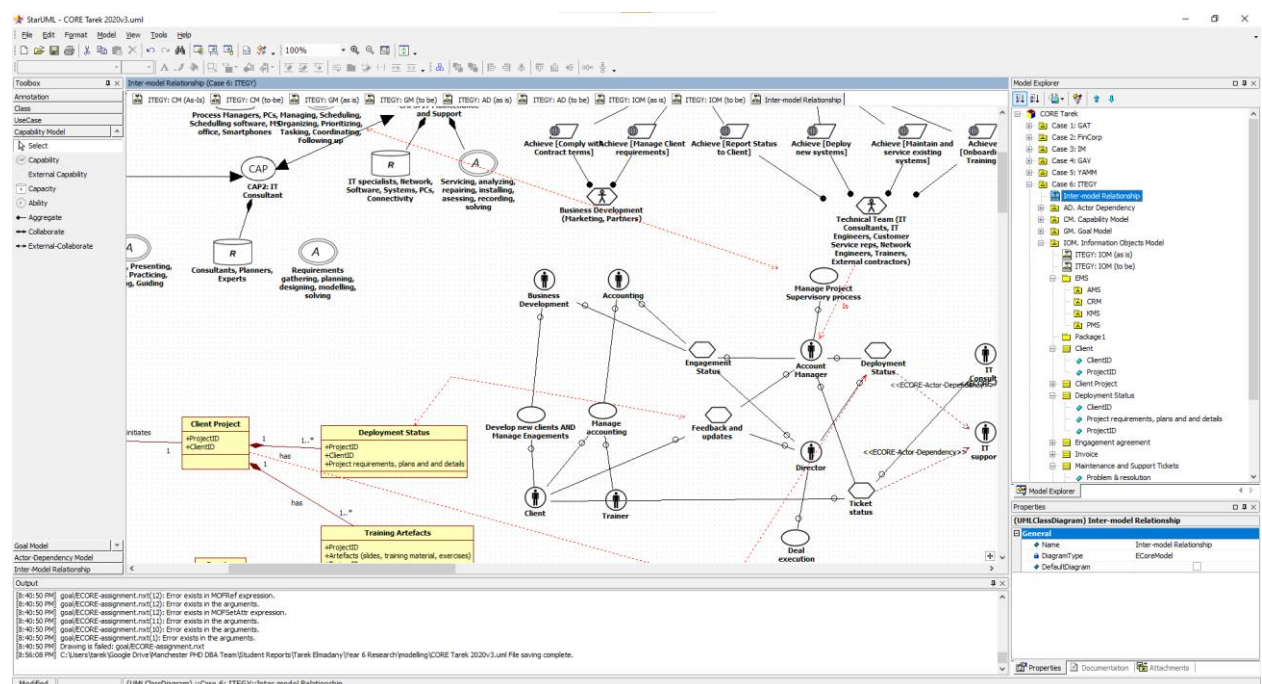


## Appendix 6: Case Study 6: ITEGY

### 3.4 AS-IS Information Objects



### 3.5 AS-IS Intermodel correlation

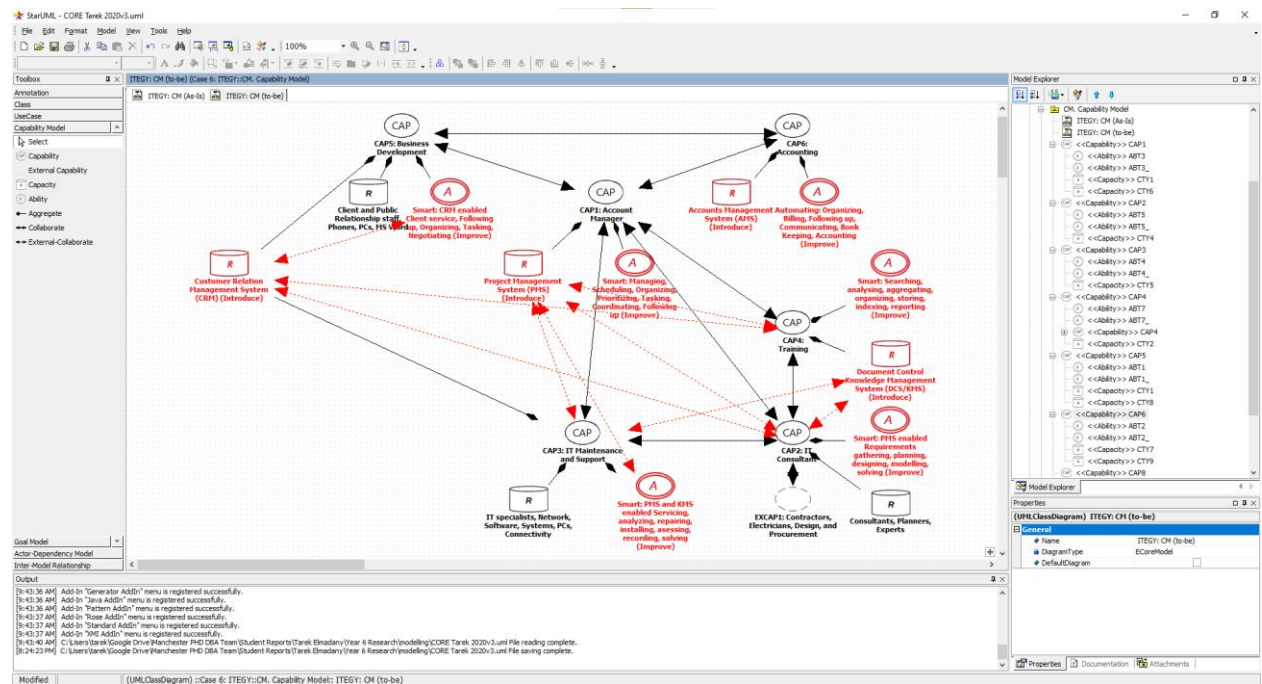




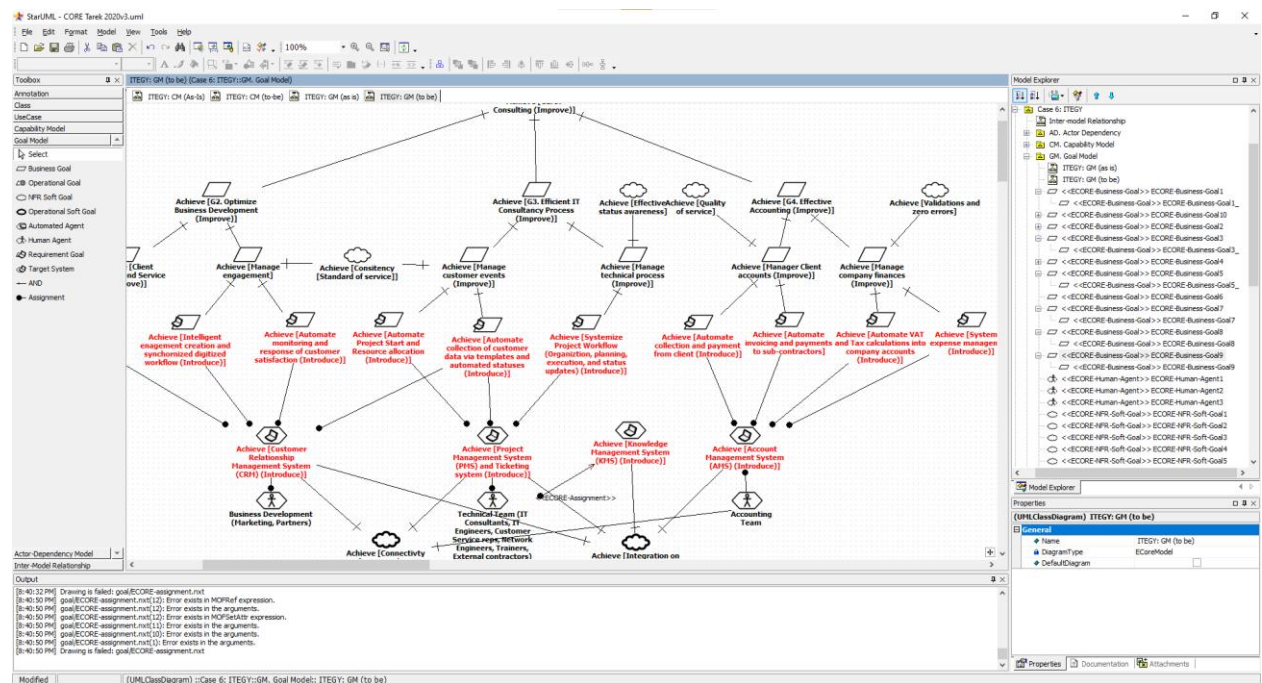
## Appendix 6: Case Study 6: ITEGY

### 4 ECORE TO-BE Modelling components

#### 4.1 To-be Capability Model



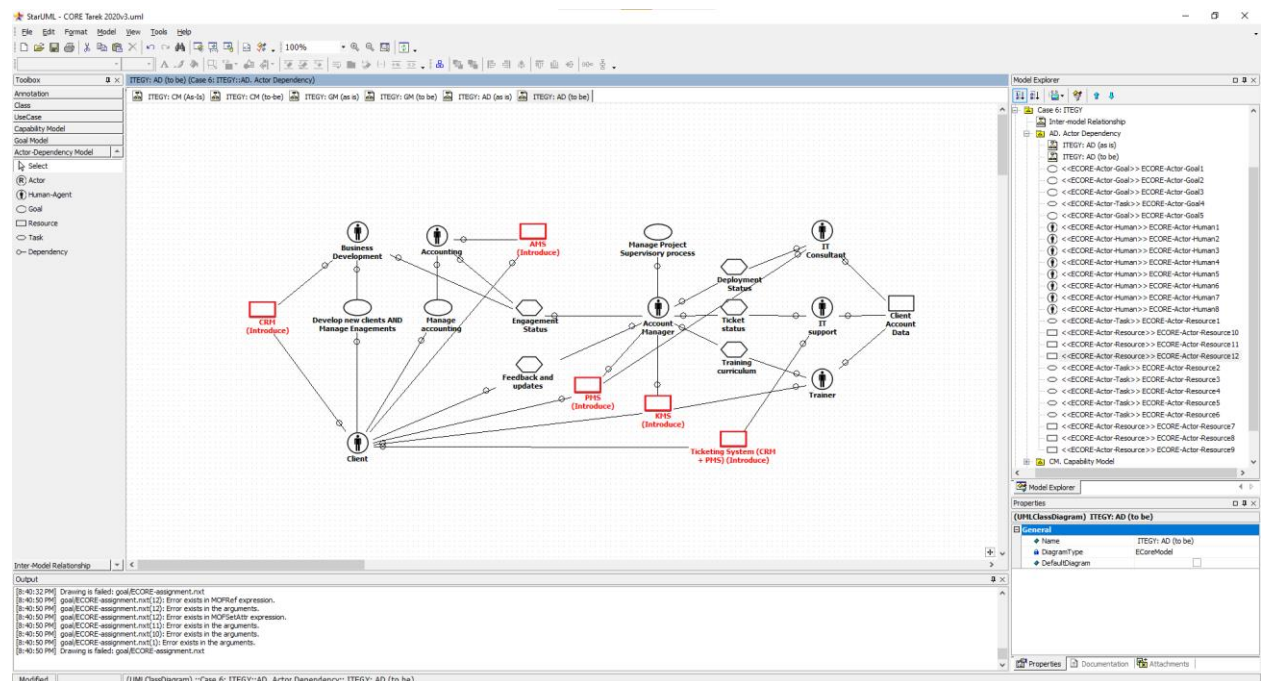
#### 4.2 To-be Goal Model



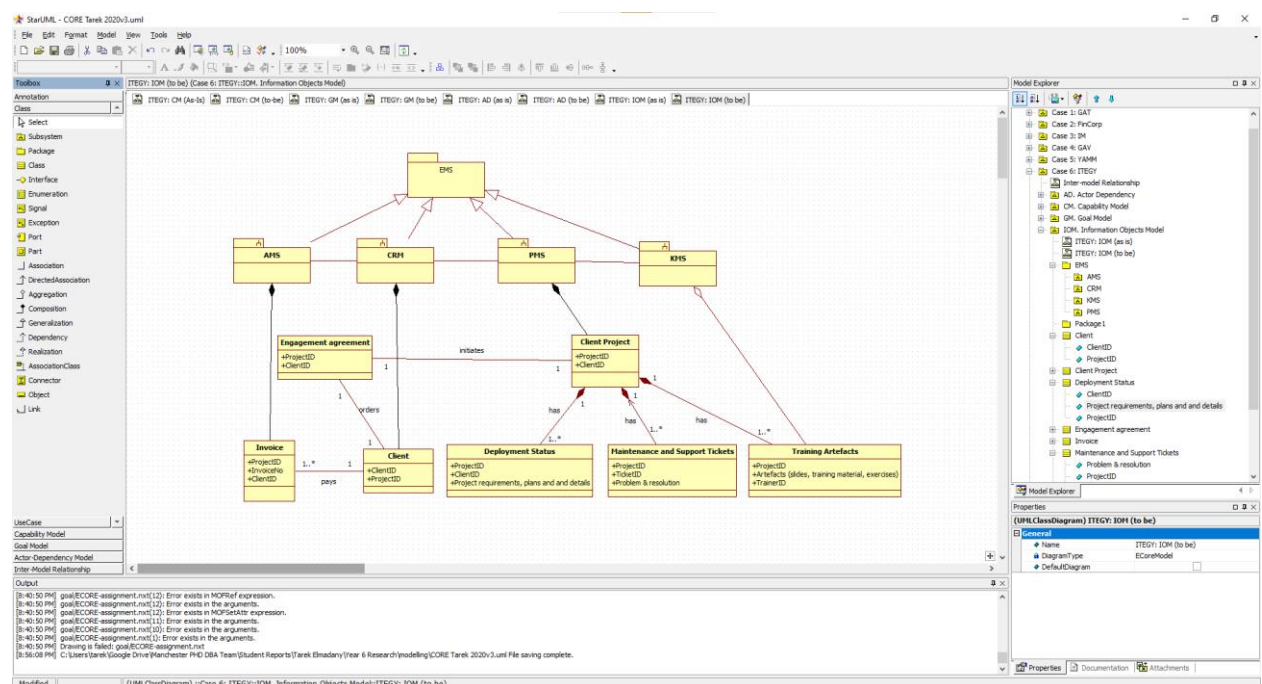


## Appendix 6: Case Study 6: ITEGY

### 4.3 To-be Actor Dependency Model



### 4.4 To-be Information Objects Model





## 5 Digital Transformation Requirement List

### 5.1 Technology Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the technology component resulting from the modelling exercise.

Operation 1. IT Consulting	
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office (Word &amp; Excel)</li> <li>• Desktop harddrives, flash drives, emails</li> <li>• Paperwork</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• To deliver prepackaged solutions, plans, designs and product lists.</li> <li>• To author new contracts, training material, reports via typical PC software (Word, Powerpoint, Illustrator, and typical Graphical desktop software).</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Higher quality artefacts (templates and spell checkers)</li> <li>• Productivity as most of the solutions are pre-packaged and templates pre-filled.</li> <li>• Improved productivity</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Vital communication knowledge is tracked in email threads, and can get easily lost or tangled in the noise.</li> <li>• Solution softwares and design artefacts are stored on harddrives and flashdrives which causes version conflicts when passed around.</li> <li>• Hard to search since the content is not indexed from Operating System.</li> <li>• Most electronic artefacts are archived on the company server or in email threads with no easy data mining or reusability capability.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Need for the ability to recycle artefacts more efficiently and consistently (Contracts, training materials, deployment plans and more)</li> </ul>



	<ul style="list-style-type: none"> <li>• Need for more collaborative formats and modes of work between different teams.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Content Searchability.</li> <li>• Accessibility from outside the office and via smart devices (Connectivity).</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Comprehensive integrated Project Management System (PMS) and Ticketing system</li> <li>• Integrated with a Customer Relationship Management (CRM) System</li> <li>• Tied with a Cloud Document Control in a Knowledge Management System (KMS)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Convert to cloud-based collaboration tools such as Atlassian solutions that enable an integrated IT support infrastructure system with multiple modules that can be integrated.</li> <li>• Use a document control system to check-in and check-out documents to avoid conflicts.</li> <li>• Cloud artefacts are content searchable.</li> <li>• Paperless (sustainability)</li> <li>• Standardisation of artefacts and templates.</li> </ul>
<b>Operation</b>	2. Data Collection and Management
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office, Adobe tools and several graphics software.</li> <li>• Emails, and cloud drives.</li> <li>• Flash drives and local computer drives</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Project artefacts such as software packages, plans, templates, training docs and more are all stored in electronic documents inside a Client Account project folder.</li> </ul>



	<ul style="list-style-type: none"> <li>• Data scattered across emails, cloud drives, local folders on PCs or on company server.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation.</li> <li>• Recyclability of artefacts.</li> <li>• Mobility</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Multiple storage formats that are non-centralized and inaccessible cause synchronization problems resulting in conflicts and mistakes during collaboration.</li> <li>• Data is not indexed, which makes it hard to search and hard to reuse for future projects.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More integration across data assets.</li> <li>• Accessibility (Connectivity)</li> <li>• Content Searchability.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Easier reusability of data assets.</li> <li>• Status awareness</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Cloud Document Control and Knowledge Management System (KMS)</li> <li>• Integrated with a Customer Relationship Management (CMS) System</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Data could be stored on a KMS enabled cloud-based DB which enables collaboration, easy search by date and reusability of data.</li> <li>• Storage of data in an index Knowledge database such as a cloud wiki for ease of data recyclability.</li> <li>• Connectivity with overall workflow of the account for status awareness</li> </ul>
<b>Operation</b>	3. Resource planning, Workflow and Task Management



<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office</li> <li>• Emails</li> <li>• In-person</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Resource planning is conducted in person and tracked by each individual</li> <li>• Workflow management in email communication with the client and other staff.</li> <li>• Follow-up on tasks and assignments.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Responsibility.</li> <li>• Personalization.</li> <li>• Localization.</li> <li>• Standard of service.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Status and updates are kept in threads in staff inboxes.</li> <li>• Data is unorganised and often lost.</li> <li>• Inefficient Resource Planning in person.</li> <li>• Centralised to the Account Manager and dependent on each person's style and discipline and not transparent to the rest of the team.</li> <li>• Causes the Account Manager to be the bottleneck in communicating project goals and status.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Transparency (Status accessibility by everyone in the organisation).</li> <li>• Accessibility (connectivity).</li> <li>• Higher efficiency through faster status awareness and more synchrony.</li> <li>• Maintainability (outsourcing the burden of technology upkeep).</li> <li>• Integration across all company resources and assets.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• Project Management System (PMS) (Cloud-based)</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Resources, tasks and projects are all connected.</li> <li>• Members of the team have access via cloud portal and can follow up on their tasks and understand their assigned tasks.</li> <li>• Workflow is transparent, and status is clear.</li> <li>• System offers threads for comments, history, attachments.</li> <li>• Integrates with other systems such as ticketing from the client, document control, and reports artefacts (KMS).</li> </ul>
<b>Operation</b>	4. Engagement
<b>As-Is Technology</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Customers communicate with the firm via emails, and engagement is kept in email threads.</li> <li>• Customers informally communicate with staff offering valuable data via social media, messaging apps and phone calls.</li> <li>• Contracts are all created in word and printed for signing and stamping.</li> <li>• Scanned documents are stored on PC, and backed up on external drives.</li> </ul>
<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Personalization.</li> <li>• Responsibility.</li> <li>• Localization.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Does not offer accessibility from outside the office.</li> <li>• Slow process and labour intensive.</li> <li>• Hard to track and search emails for customer history.</li> <li>• Hard to centralise communication across alternative messaging apps and social media.</li> <li>• No meta-data is stored on the customer from previous engagements. As a result, they often have to rely on memory.</li> </ul>



	<ul style="list-style-type: none"> <li>• Difficult to relate the engagement to the project once transferred to Re-searcher.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient sta-tus update.</li> <li>• Higher quality of customer service.</li> </ul>
<b>To-Be Technol-ogy</b>	<ul style="list-style-type: none"> <li>• Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use of a cloud-based CRM that would integrate with Task management systems and Accounting systems.</li> <li>• CRM would also integrate with email, a ticketing system, social media and alternative messaging tools such as WhatsApp.</li> <li>• Paperless (sustainability)</li> <li>• Standardisation of artefacts and templates.</li> </ul>
<b>Operation</b>	5. Accounting
<b>As-Is Technol-ogy</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp (Social media)</li> </ul>
<b>How it is used</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices cre-ated in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>• Scheduling and reminders are scheduled on local calendars.</li> </ul>



<b>Why was it used that way?</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> <li>• Paperless (sustainability).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the project. Accounting requires Business Development to request a deposit invoice to be sent to the Client), and the Account Manager to clear the requests from Accounting to submit a final invoice. This process is highly dependent on memory and personal responsibility.</li> <li>• Similarly, Accounting depends on the Account Manager to inform them about the details of the outcome to process the payments from the Client.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections and payments.</li> </ul>
<b>To-Be Technology</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based) integrated the PMS.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM, to offer traceability and event-driven automation and reminders.</li> </ul>

## 5.2 Process Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the process component resulting from the modelling exercise



Operation 1. IT Consultancy (The core service of the consulting practice)	
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Starting with templates and prepacked solutions and artefacts used during historical projects, prepared and formatted in Word, Powerpoint, Adobe products and other software.</li> <li>• Assigning both the Account Manager and IT consultant the responsibility of setting up the right strategy and plan.</li> <li>• Manual tracking of progress through weekly meetings and email chains.</li> <li>• Storage on PCs, company servers and sharing of files through email chains and USB flash drives.</li> <li>• Manual transition from deployment phase to Training phase through the Account Manager approvals.</li> <li>• Manual transition from Training to Long Term Support Contract (LTSC)</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Process is not coded but based on peer training and on-the-hand experience.</li> <li>• Account Managers track the progress and status of jobs with their different phases manually.</li> <li>• Follow-up of the process and workflow of this phase is the responsibility of the Account Manager.</li> <li>• Synchronization of status and updates are communicated through meetings and electronic channels such as emails, direct messaging, or phone calls.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Personalization</li> <li>• Responsibility.</li> <li>• Process leanness and quick response to customer communication.</li> <li>• Efficiency.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of codified training hinders the on-loading of new employees.</li> <li>• Process leanness is often applied as poor process adherence.</li> </ul>



	<ul style="list-style-type: none"> <li>• The knowledge of status and stage is synchronized over emails and weekly meetings with hinders growth since the workflow is out of synch across team members and often chaotic.</li> <li>• Adherence to quality is highly reliant on the individual's compliance.</li> <li>• Most of the institutional history, knowledge and experiences are implicitly known by the individual (personal memory) with minimal explicit knowledge recording in files or documents, making the transfer of knowledge and experience highly reliant on employee retainment.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• More transparency and accessibility of status and workflow statuses and stages.</li> <li>• More standardization of process compliance across teams.</li> <li>• Better synchronisation between different actors and conflict avoidance.</li> <li>• More access to information, data and work artefacts.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• [Introduce] Workflow scheme coded inside a collaborative online Project Management System (PMS). The system allows for assigned responsibilities, updates of status workflows, automated monitoring of deadlines and reminders.</li> <li>• [Introduce] A new check-in and check-out document control process using a Cloud Document Control System.</li> <li>• [Introduce] A process of reliance on recycling data in a properly indexed Knowledge Management System (KMS)</li> <li>• [Introduce] Automations for transitions across Client account phases and statuses.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• More visibility into client account status and workflow status.</li> <li>• More control over process standardization and document control.</li> <li>• Automatic storage of institutional knowledge and history.</li> <li>• More standardization of process workflow can allow substitution easier.</li> </ul>
<b>Operation</b>	2. Data Collection and Management



<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Data is collected by multiple roles from multiple sources.</li> <li>• Multiple individuals solicit the client for data.</li> <li>• Statuses are manually communicated across different teams.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• The process is managed by the Account Manager manually.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>• Centralization and Compartmentalization.</li> <li>• Responsibility and Personalization.</li> <li>• Control and reducing chaos.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The process of collecting data and storing it is manual and not standardized.</li> <li>• Checklists and templates are often always out of date.</li> <li>• Data sources are non-traceable, and accountability is non-measurable due to the lack of a tracing or sign-in/out process.</li> <li>• Data is often lost or repeated due to bad management resulting in repeated effort and frustrations.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Streamline the process across different roles.</li> <li>• Accessibility (Connectivity)</li> <li>• Knowledge searchability and reusability.</li> <li>• Synchronisation and conflict avoidance.</li> <li>• Traceability by allowing check-in/check-out process.</li> <li>• Quicker reusability.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• A technology-enabled Knowledge Management System (KMS) with check-in/check-out accountable and traceable process using an accessible Cloud Document Control system (DCS).</li> <li>• Integration between the two PMS and Cloud DCS for seamless searching, locating and accessing of data.</li> </ul>



<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>Updated process for data collection, consumption, and storage is integrated within the intuitive usage of the cloud-based Document Control System (DCS), enabling accountability, traceability, collaboration, easy search by location, and reusability of data and knowledge.</li> <li>More efficient reusability of previously mined data.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>Template offers, contracts and engagement letters are created in Microsoft Office / Adobe PDF and communicated via emails or snail mail (printed)</li> <li>Negotiations and agreements are achieved via personal meetings, phone conversations, and emails.</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>The process is manual and reliant on the personal quality and consistency of the Business Development personnel.</li> <li>The process involves omnichannel presence via emails threads, WhatsApp threads, and social media threads and all connected in the business development personnel's head.</li> </ul>
<b>Why was it managed that way?</b>	<ul style="list-style-type: none"> <li>Standardisation of artefacts and templates.</li> <li>Customer satisfaction (Omni-channel communication, friendly human interaction, and quick personal response by lowering bureaucracy).</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>Manual process is inefficient, inconsistent and labour intensive.</li> <li>Process is non-traceable, often hard to hold individuals accountable, and causes many missed opportunities due to lack of tools for automated follow-up.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>Accessibility (connectivity).</li> <li>Faster and more accurate response to customer status.</li> </ul>



	<ul style="list-style-type: none"> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Consistency and automated reminders, status updates and effective workflow management.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• Software Task-oriented programmed workflow designed in a Customer Relation Management System (CRM) (Cloud-based).</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Technology-enabled processes using the cloud-based CRM would force a consistent and quality engagement experience, follow-up and reminders.</li> <li>• CRM would also integrate with email, a ticketing system, and social media and alternative messaging tools such as WhatsApp to allow for a single point of process follow-up and management.</li> <li>• Updates to online templates and improvements in checklists on the CRM automatically persists into the future without remembering to change it manually every time, hence less risk to human error.</li> </ul>
<b>Operation</b>	4. Accounting
<b>As-Is Process</b>	<ul style="list-style-type: none"> <li>• Microsoft Office / Adobe PDF</li> <li>• Emails</li> <li>• Phone</li> <li>• Whatsapp</li> </ul>
<b>How it is managed</b>	<ul style="list-style-type: none"> <li>• Accounting communicates with clients via email, sending invoices created in excel and word.</li> <li>• Revenue and Expense Tracking is on desktop-based accounting software.</li> <li>• Scheduling and reminders are scheduled on Microsoft Outlook Calendar.</li> </ul>
<b>Why was it</b>	<ul style="list-style-type: none"> <li>• Productivity.</li> <li>• Standardisation of artefacts and templates.</li> </ul>



<b>managed that way?</b>	<ul style="list-style-type: none"> <li>• Efficiency</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Poor tracing between Calendar entries, invoices, and emails.</li> <li>• Little to no visibility into the status of the assignment. Accounting requires Business Development to request a deposit invoice to be sent to the customer, and Account Manager requests from Accounting to submit a final invoice. This process is highly dependent on personal responsibility.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Accessibility (connectivity).</li> <li>• Faster and more accurate response to customer status.</li> <li>• Integration with the project management system for a more efficient status update.</li> <li>• Higher quality of customer service.</li> <li>• Automated collections.</li> </ul>
<b>To-Be Process</b>	<ul style="list-style-type: none"> <li>• An Account Management Solution (AMS) (Cloud-based)</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Use a cloud-based AMS that would integrate with PMS and CRM to offer traceability and event-driven automation and reminders.</li> <li>• More efficient use of time and resources.</li> </ul>

### 5.3 People Component Digital Transformation

The following table describes the operational level Digital Transformation requirements for the people component resulting from the modelling exercise.

<b>Operation</b>	<b>1. IT Consultancy (The core service of the consulting practice)</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Account Manager</li> <li>• IT consultant</li> <li>• Trainer</li> </ul>



	<ul style="list-style-type: none"> <li>• IT Support Engineer</li> <li>• Marketing</li> <li>• Support staff (Secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• The central leader is the Account Manager, who has to coordinate the entire process, starting with assigning roles, coordinating schedules, maintaining the pace of the progress, ensuring status updates, follow-up and quality control.</li> <li>• It consultants and Marketing carry the technical grunt work of the strategy execution, feed it to the Account Manager, analyse the data, complete appropriate forms, contracts, agreements, advertisement deals, and all the approvals along the way.</li> <li>• IT Consultants implement the deployment plan, review their alignment with the Client goals, and arrange review meetings with the Account Manager.</li> <li>• Continuous communication between the Account Manager and the Client involves iterating over the IT deployment plan and status.</li> <li>• Trainers are handed over to the Client after the deployment phase is complete.</li> <li>• Trainers are responsible for implementing the training phase and communicating the status to the Account Manager.</li> <li>• Upon completion of the training phase, the Account Manager changes the account's status to "under a support contract."</li> <li>• Tickets are created either via automatic reminders for periodical maintenance checkups or via complaints or requests by the Client.</li> <li>• Tickets are triaged and handled by the IT Support Engineers.</li> <li>• Support staff help with printing, delivery and non-technical support work.</li> </ul>



<b>Why was it setup that way?</b>	<ul style="list-style-type: none"> <li>• Specialization and personalization.</li> <li>• Teamwork effort to arrive at the desired customer outcome.</li> <li>• Focus on efficiency, effectiveness and completeness during the execution of tasks.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The Account Manager is the sole responsible person to drive the process; his/her role is to manage the plan to completion, which means that he/she is the primary person aware of the status and could pose a risk if absent or on leave.</li> <li>• Communication and synchronization are slow and inconsistent.</li> <li>• Consistency and Quality are often forgone for speed and delivery.</li> <li>• Process and Workflow are People dependent. While everyone knew what needs to be delivered, every team had their way of achieving it, which mainly relied on people skills and experience and less on standardized systems.</li> <li>• People used varying non-standardized enabling technologies with no centralized technology strategy, which often caused multiple synchronizations and quality problems.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Achieve decoupling of the dependency on people and shift to the dependency on systems and technology.</li> <li>• Achieve higher efficiency from people who are distracted by context switching and repetitive non-productive synchronizing and admin work.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Current roles to train on the usage of enabling new technology and integrated system processes and workflows.</li> <li>• [Introduce] IT systems admin, Process compliance admin.</li> <li>• [Introduce] Automated workflows and processes, including standardized scheduling, automating assignment based on workflow stages,</li> </ul>



	<p>automatic reminders, integrated centralized communication and document repository that is auto-synchronized and status aware.</p> <ul style="list-style-type: none"> <li>• [Cease] Manual communication support roles and replace with technology.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Improves people's productivity by eliminating much of the manual work.</li> <li>• Reduces errors and improves quality by shifting some standardization onto systems and technology previously used to suffer from people error.</li> <li>• Enhances people value since technological enhancements free up people's wasted attention and time and instead shift the focus on improving their core consulting competency and skills.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Account Manager</li> <li>• IT consultant</li> <li>• Trainer</li> <li>• IT Support Engineer</li> <li>• Marketing</li> <li>• Support staff (secretaries)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Data of different types and scopes are collected by each specialist depending on their needs. For example, an IT Consultant will collect requirements, while a Trainer will interview the client to gain insights into his/her skills.</li> <li>• Data is collected and stored with each person on their devices. At the end of the project, the Account Manager tries to gather all the files and artefacts in one archived folder on the company server and maintain records and reports.</li> </ul>



<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Specialization</li> <li>• Responsibility</li> <li>• Quickness</li> <li>• Reusability</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Inconsistent data collection procedures that depend on the quality of each team, it is not clear who is collecting and keeping the data.</li> <li>• No central owner or responsible person for data management and archiving.</li> <li>• Ineffective data reusability and mining since it depends on people's memories.</li> <li>• Highly reliant on individual due diligence and personal capability.</li> <li>• Clients complain that many people reach out to them from the firm asking for data all the time.</li> <li>• Many concerns over data privacy and security control.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• To improve the quality and comprehensiveness of data collection.</li> <li>• To centralize control of data for security, liability, compliance, traceability, and responsibility purposes.</li> <li>• For better indexing, searching, and reusability of data which is the foundation of the knowledge base.</li> <li>• Adherence to paperless data collection (sustainability)</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] KM admin: responsible for data management using technology-enabled cloud-controlled data-traceable data and knowledge management systems (including cloud drives and indexable data-bases).</li> <li>• [Improve] The roles of Account Managers, IT Consultants, IT Support staff, Trainers and Marketing (Business Development) to train on the</li> </ul>



	new technologies and processes for data collection, control and storage.
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Maintains specialization.</li> <li>• Introduces control and standardization.</li> <li>• Introduces Knowledge reuse capabilities.</li> </ul>
<b>Operation</b>	3. Engagement
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Account Managers</li> <li>• Marketing (Business development) specialists</li> <li>• Support staff (secretaries, couriers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Account Managers and Marketing specialists use their connections to solicit past clients, current clients and future clients (client acquisition) to procure new jobs.</li> <li>• Once a request for proposal is made, engagement agreements are prepared and signed.</li> <li>• Procedures for communicating, signing and exchanging documents are handled by the Marketing (Business development) staff.</li> <li>• Contracts and agreements are stored on company computers under the responsibility of the business development staff.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide high customer personal care.</li> <li>• Focus on personal responsibility.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• Lack of standardized agreements resulting in many missed opportunities and errors.</li> <li>• Followup is reliant on individuals diligence in setting up personal reminders and memory.</li> <li>• Tracing of engagement status is reliant on individual memory.</li> </ul>



	<ul style="list-style-type: none"> <li>• Customer care level is reliant on individual skills and experience.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Personnel want more standardized artefacts, including offer documents, engagement agreements and data collection criteria.</li> <li>• The need to decouple customer service level from relying on individual skills to relying on a system of service standards that could be quickly followed and trained by any individual.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Improve] Train marketing staff on Customer Relation Management (CRM) system, including a new standardized process.</li> <li>• [Improve] Train marketing staff on the new Cloud-based Document Control System (DCS) to store the artefacts and understand how it is integrated with the CRM and the Accounts Management System (AMS)</li> <li>• [Introduce] Automation in the customer follow-up and engagement workflow to add reminders, automatic assignment of roles, automated status updates, and automatic linkages of previous engagements and knowledge.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Personnel offer a more consistent and higher quality of client experience.</li> <li>• Personnel have more robust traceability, status awareness and workflow management capability.</li> <li>• Personnel can more accurately price and generate higher revenues due to better client knowledge and historical understanding.</li> <li>• Paperless procedures.</li> </ul>
<b>Operation</b>	4. Collections
<b>As-Is People</b>	<ul style="list-style-type: none"> <li>• Accounting and finance personnel.</li> <li>• Marketing (Business development) specialists</li> </ul>



	<ul style="list-style-type: none"> <li>• Support staff (secretaries, security, couriers, drivers)</li> </ul>
<b>How roles do their job</b>	<ul style="list-style-type: none"> <li>• Accounting depends on Marketing to obtain status updates on contract and engagement agreements and stages in the workflow.</li> <li>• Accounting liaises directly with the clients and vendors to process payments, settle invoices and taxation requirements.</li> <li>• Accounting liaises with Account Managers to give the signal to release the start of progress (in the case of fulfilment of down-payment) or to release the final report once the Client fulfils the final payment.</li> </ul>
<b>Why was it set up that way?</b>	<ul style="list-style-type: none"> <li>• Maintain Specialization.</li> <li>• Provide a high level of customer care.</li> <li>• Protect and fulfil business financial rights and obligations effectively.</li> <li>• Privacy and security of financial dealings from the rest of the organization and the competitors.</li> </ul>
<b>Problems</b>	<ul style="list-style-type: none"> <li>• The reliance on individuals can sometimes act as a bottleneck and hinders progress.</li> <li>• Non-standardized or integrated system to communicate status efficiently leads to mistakes, lost revenues and angry customers.</li> </ul>
<b>Why change?</b>	<ul style="list-style-type: none"> <li>• Better synergy with the workflow of the core business.</li> <li>• Faster response times.</li> <li>• Higher status awareness and synchronization.</li> <li>• Higher collection and effective customer handling in alignment with Marketing and Auctioneers.</li> </ul>
<b>To-Be People improvements</b>	<ul style="list-style-type: none"> <li>• [Introduce] A new dependency between Accounting and the CRM system via integrating the newly introduced Account Management System (AMS).</li> </ul>



	<ul style="list-style-type: none"> <li>• [Improve] Train the accounting personnel to use the newly introduced Account Management System (AMS) that automates communication, provides seamless status synchronization across systems, and leads to real-time status awareness.</li> </ul>
<b>How it solves the problem</b>	<ul style="list-style-type: none"> <li>• Provides a more consistent customer experience.</li> <li>• Maintains the primary business goals of privacy, specialization, protection of business financial interest while eliminating the ineffective communications problem.</li> <li>• Paperless (sustainability)</li> </ul>

## 6 Post-Transformation Feedback

### 6.1 Analysis of the transformation

A round of interviews was conducted after a while (as per interview dates above) to assess the feedback and progress of the digital transformation. The following summarizes the findings:

Operation	1. IT Consulting (The core service of the consulting practice)
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• A new cloud-based Ticket Management System (TMS) was installed, whereby all the advisory assignments were inputted as a trackable unit named “<i>ticket</i>”. Tickets are part of an <i>Account</i> whereby each account represents a client who is about to start a new project, or is in the Long term support (LTSC) phase.</li> <li>• A <i>ticket</i> stored all the data involved, including attachments, either filled out at the beginning or throughout the workflow (e.g. start date, end date, description, deadlines, client, etc.)</li> </ul> <p><b>Process:</b></p>



- A new *workflow* was codified, where the *ticket* would pass through several standardized steps, including *start, issue diagnosis, design solution, implementation, reviewing, and closing*.
- As soon as the client creates a new *ticket* in the system, the system alerts the Account Manager by assigning the *ticket*. The system would notify the Account Management System (AMS) to track billing hours. The Account Manager then diagnosis the request and reassigns it to the appropriate resource. If it is a new project, feature or request, it is assigned to the appropriate IT Consultant for project implementing or servicing or to the Trainer for training and support. Each person is notified about their roles, deadlines, and statuses in the workflow by viewing the *ticket* on the system, and they get access to all their tickets via their system dashboard.
- Team members, including the Account Manager, IT Consultant and Trainer, finish their tasks and sign off; the system automates the workflow by assigning the next in line and updating the status. The system has features and can be programmed to send notifications, alerts, status updates and reminders at specific programmable triggers and events.
- The system produces a completion report at every stage that is then reviewed and modified by the appropriate IT Consultant.

**People:**

- Employees were re-trained to use the system and adapt their pre-transformed workflow to the new technology and process.
- Employees were assigned to the different *tickets* in the TMS system and could find all their relevant data, update artefacts, trace the history of all their work and other peoples' work from their dashboard.



<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>Almost all of the workflow was transformed to the new digital technology and process, including the communication with the client.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>There are still quality struggles in generating automated reports, requiring human intervention for manual editing.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>In the Long Term Support Contracts (LTSC), a lot of “noise” comes from the client through this ticketing process. For example, a client could ask the question again while their colleague just asked it a week ago. The answer is often on the project knowledge base, but the client is lazy to search it. Therefore, management has suggested integrating an Artificial Intelligence (AI) system to help the client with common and frequently asked questions and requests before qualifying to an IT consultant.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The models were a good start, and the feedback loop helped refine and crystallize the overarching goals and resulting relationships.</li> </ul>
<b>Operation</b>	<b>2. Data Collection and Management</b>
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>Three technologies were integrated to enable the Knowledge Management Meta-System of the firm: The Ticket Management System (TMS), a Cloud Document Repository (DRS), and a Customer Relationship Management System (CRM).</li> <li>During the LTSC phase, the Account Manager used the TMS as the source of the Knowledge for common and frequently asked questions.</li> <li>During the design and implementation phase, the TMS is also used to collect data from the client directly either through online</li> </ul>



	<p>template forms and data collection checklists or through recordings and screenshots. The data and documents get auto-associated with the appropriate project in the TMS.</p> <ul style="list-style-type: none"> <li>• The Account Manager can track the status of the data and check its integrity and all that information was accessible and seamlessly available from the ticket in the TMS. The result is that all the knowledge in the account was well connected, indexed and reusable across the account, and other accounts.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• The new workflow was codified in the TMS, whereby the Account Manager and IT consultant team would have complete visibility into the data and project status and the next steps.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>• Employees were re-trained to use the new data collection and usage system and adapt their pre-transformed workflow to the new technology and process.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>• A complete transformation from previously depending on manual emails, phone calls, USB drives, and remote sessions to an entirely digitally integrated data collection, management and storage system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• There is sometimes little to no similarity between projects, requiring the IT consultant to custom review the data collection forms to fit the project at hand.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• Management expressed the desired use of AI to data-mine and automated helping the client for common and frequent requests.</li> </ul>



<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>The model sufficiently scoped and outlined the high-level goals, dependencies and relationships necessary for this use case.</li> </ul>
<b>Operation</b>	3. Engagement
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>The Ticket Management System (TMS) has a separate plugin for Customer Relationship Management (CMS) and the Accounting Management System (AMS)</li> <li>With the plugin, Marketing can communicate with the client via the portal, submit quotations, follow up on the engagement procedures, track the client history with previous tickets, payment track record, and rating.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>When a client sends a Request for Proposal (RFP) to the company official email, the new TMS picks it up initially, but the Account Manager then assigns it to the Marketing team to process as a new Requested Project.</li> <li>Marketing then proceeds to prepare a quotation and submits it to the Client for negotiations and approval.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>Marketing specialists were trained to operate the new TMS and the plugin CRM, no new hires were required.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>Complete digital transformation of all Business Development tasks and operations.</li> </ul>



<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>• The client often does not differentiate between the Account Manager and the Business Development when requesting a feature or new project. So there is still much noise in sending tickets across multiple potential people.</li> <li>• Similarly, many misdiagnosed tickets should end up as new projects later discovered by the IT Consultants. A problem the firm is still trying to figure out how to improve.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>• A better diagnosis process could declutter the requests without slowing down response times.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>• The model would most likely need to take a revamp pending the solution from management on the roles and responsibilities of the Account Manager vs Business Development in solving the conflict of new projects vs regular tickets.</li> </ul>
<b>Operation</b>	4. Collections
<b>How was transformation implemented?</b>	<p><b>Technology:</b></p> <ul style="list-style-type: none"> <li>• A complete transformation to a cloud-based Account Management System (AMS), that integrated with the Customer Relationship Management System (CRM) and the Ticket Management System (TMS).</li> <li>• The AMS is integrated with the CRM with regard to invoicing and payment follow-up.</li> <li>• The AMS is integrated with the TMS regarding costing, billable hours, and status of tickets in the workflow for payment processing.</li> </ul> <p><b>Process:</b></p> <ul style="list-style-type: none"> <li>• Accounting department, via the integrated system, handles all the payment handling from the client as per the contract.</li> </ul>



	<ul style="list-style-type: none"> <li>Accounting then schedules the invoices to the client and processes them, and the System sends automatic reminders to the Client to follow up on payments.</li> <li>The AMS also handles the company accounting for costs incurred, billable hours, and taxes.</li> </ul> <p><b>People:</b></p> <ul style="list-style-type: none"> <li>Accounting employees were fully trained to work on the new technology and process.</li> </ul>
<b>Extent of Transformation</b>	<ul style="list-style-type: none"> <li>An almost complete transformation from the old desktop system to the new integrated cloud system.</li> <li>Physical handling of paper invoicing and courier services are still the same except that they are getting printed and processed from a new system.</li> </ul>
<b>Difficulties in Transformation</b>	<ul style="list-style-type: none"> <li>There is still confusion about ticketing billing, especially on the issue of a new project vs existing project support.</li> </ul>
<b>Opportunities for improvement</b>	<ul style="list-style-type: none"> <li>The process could be improved as there is a difficulty in the diagnosis phase of the workflow.</li> </ul>
<b>Feedback for SC-COST case model</b>	<ul style="list-style-type: none"> <li>More soft goals were added to reflect the quality of diagnosis required.</li> </ul>

## 6.2 Evaluation of SC-COST

Separately, the interviews conducted asked the stakeholders about their opinion on the SC-COST framework as follows:

Evaluation of pre-transformation modelling exercise



The stakeholder found the research involvement helpful in guiding the brainstorming discussion. The level of stakeholder engagement was significant, and the outcome was beneficial for both the firm and the researcher. The insights gained were equally significant for the firm and the SC-COST framework and patterns development.

#### Evaluation of patterns

The pattern was introduced from the outcomes of the earlier use cases; it was embedded as templates in the eCORE tool, along with a descriptive guide on how to use it. The researcher confirmed its effectiveness in building the AS-IS and the TO-BE eCORE models by observing its utilisation. When the stakeholders were initially presented with the templates, they did not have any objections, reflecting their structure at the abstraction levels presented closely. They found it plausible, and after iterating the eCORE templates to fit their models, they found it feasible to implement. The patterns captured the essence of their modelling and transformation, and they agreed to their ontology and structure. The post-transformation feedback also proved to the research that they are predictive and reliable.

#### Evaluation of the eCORE tool

The eCORE tool needed many more bug fixes and features; however, it was sufficient in a research setup to achieve its intended outcome.



## Appendix 7: Patterns

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### 1 SC-COST eCORE Tool Patterns

#### 1.1 Structure & Process Patterns (SPP)

The first set of patterns, named Structure & Process patterns, is intended to kick off the modelling exercise. The structure of the model starts with a template file, and the process to fill it up is systematic. The following tables describe the patterns in the pattern language selected.

**Table 26: Structure and Process Patterns (SPP)**

Pattern Name
SC-COST AS-IS Structure & Process Pattern
Problem
Establishing the baseline situation (the AS-IS case) for your consulting firm before the transformation.
Context
You are an experienced practitioner in your Small Consulting Firm (SCF). The goal is to break down the problem by first understanding the current state of the matter. You are using the eCORE tool to model the AS-IS case of your firm as a starting point.
Forces
<ul style="list-style-type: none"> <li>• Use the eCORE Tool for building the model</li> <li>• Start with the template for Structure</li> <li>• Follow the process of filling in the template</li> </ul>
Solution
Include the Mandatory Elements in the model. The exact names of these elements vary from one company to the other, and the exact order in which they appear is not crucial as ensuring that they are all present. They are presented here in an order chosen to facilitate



understanding of their relationships. The nature of the relationships between the elements is illustrated in the following figures:

**Goal Model:**

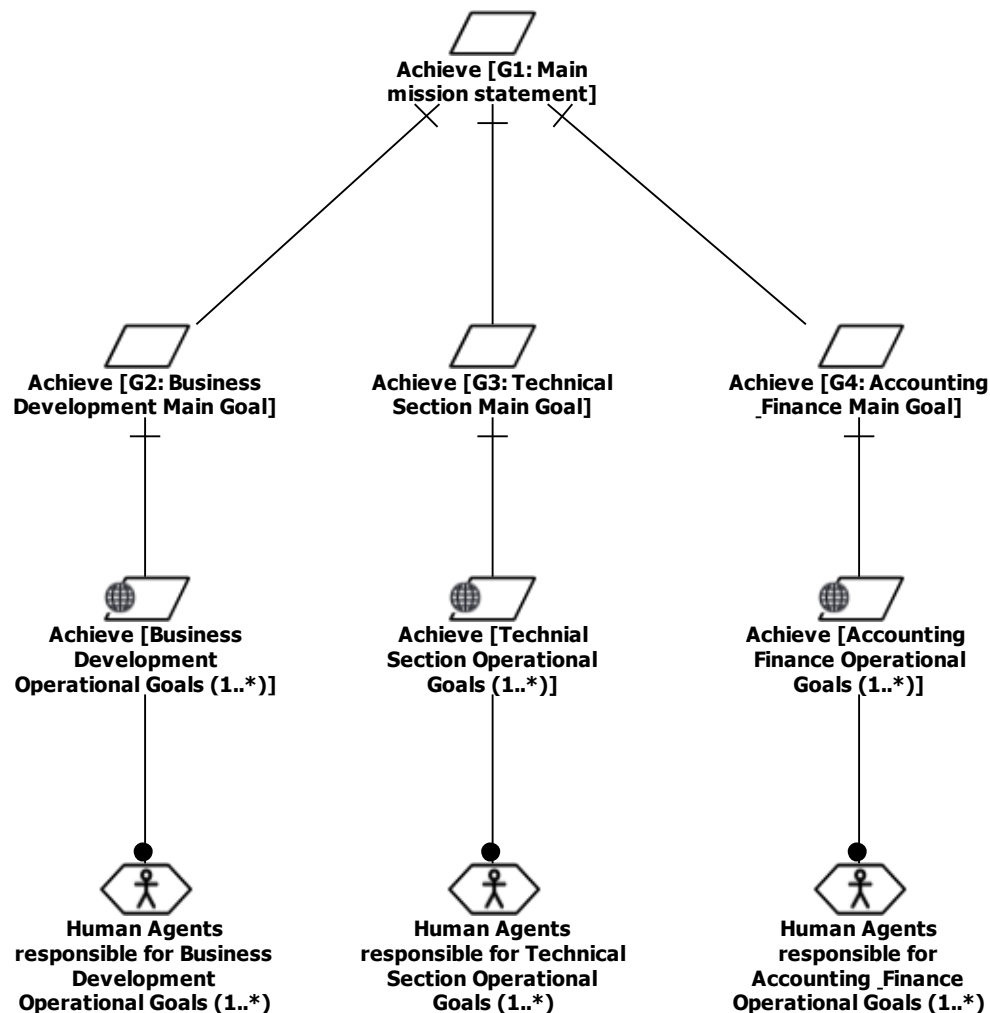


Figure 80: AS-IS Goal Model - Structure Pattern

On the first level, you need to define the following in your organization:

- Achieve [G1: Main mission statement]
- Achieve [G2: Business Development Main Goal]
- Achieve [G3: Technical Section Main Goal]
- Achieve [G4: Accounting Finance Main Goal]



Followed by the second level:

- Achieve [Business Development Operational Goals (1..\*)]
- Achieve [Technical Section Operational Goals (1..\*)]
- Achieve [Accounting Finance Operational Goals (1..\*)]

Followed by the third level:

- Human Agents responsible for Business Development Operational Goals (1..\*)
- Human Agents responsible for Technical Section Operational Goals (1..\*)
- Human Agents responsible for Accounting Finance Operational Goals (1..\*)

**Capability Model:**

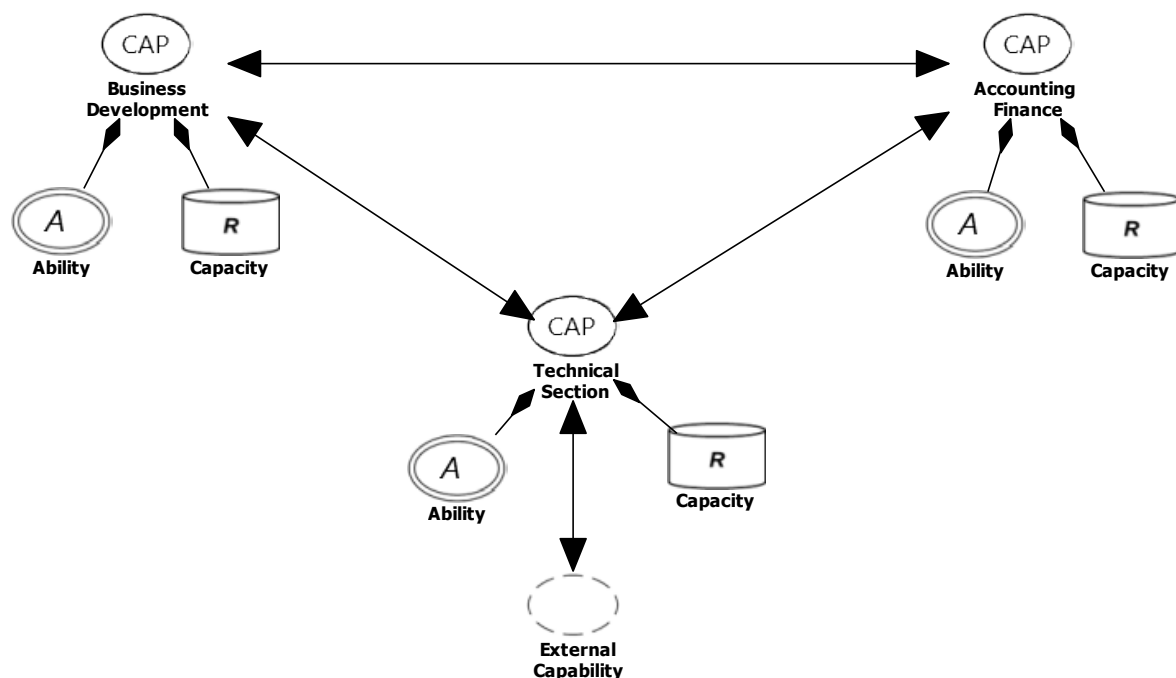


Figure 81: AS-IS Capability Model - Structure Pattern

Divide your Capability model into three main clusters:



- **Business Development:** Your organization's capabilities for business development are outlined with the Ability and Capacity tied to it.
- **Technical Section:** Your organization's technical execution, competencies and planning capabilities, including all the relevant abilities and capacities identified and connected with the appropriate external capabilities if present.
- **Accounting & Finance Section:** Your organization's capabilities for handling accounts, finances, collections, audits, and taxes, including all relevant abilities and capacities associated with those capabilities.

#### Actor-Dependency Model:

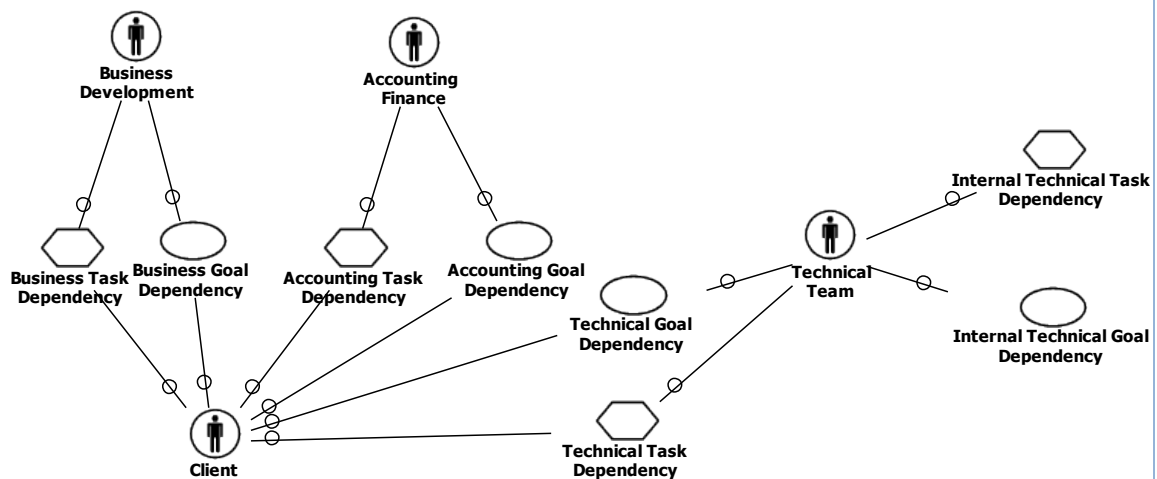


Figure 82: AS-IS Actor-Dependency Model - Structure Pattern

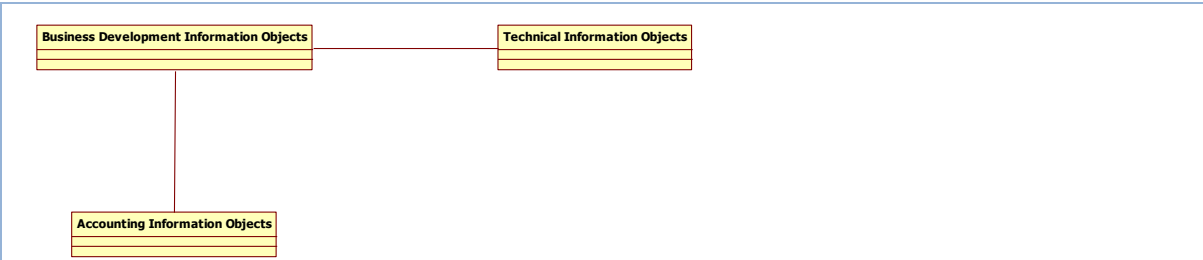
Identify your Actor-Dependency Model revolving around four major clusters:

- Business Development Team
- Technical Team
- Accounting & Finance Team
- Client

And build the dependency between them between Goal Dependency, Task Dependency, and Resource Dependency.

#### Information Object Model:





**Figure 83: AS-IS Information Object Model - Structure Pattern**

Identify your Information Object Models revolving around the three main clusters of information objects:

- Business Development Team
- Technical Team
- Accounting & Finance Team

And build the relationship between the information object using associations (Generalization, Dependency, Aggregation, and Composition)

**Rationale**

Each SCF contains a sub-organization that is represented in one of those three components. The rationale is to identify those departments, their roles and responsibilities and their relationship to establish the correct AS-IS state.

**Examples**

A full AS-IS model is demonstrated in Appendix 1.4, Appendix 2.4, Appendix 3.4, Appendix 4.4, Appendix 5.4 and finally, Appendix 6.4 for six use cases accordingly.

**Related patterns**

The Transformation Patterns (TP) can be used to complement this pattern in implementing the complete transformation model

1.2 Transformation Patterns (TP)

**Table 27: Transformation Patterns (TP)**

Pattern Name
SC-COST AS-IS to TO-BE transformation pattern
Problem



Constructing the TO-BE situation after Digital Transformation based on the current AS-IS situation.

#### **Context**

After completing the previous step in constructing the AS-IS state of the SCF, and are now in the process of brainstorming the desired transformation requirements.

#### **Forces**

- Use the eCORE Tool for building the model
- Start with the template for Transformed outcome
- Follow the process of filling in the template

#### **Solution**

Include the Mandatory Elements in the model. The exact names of these elements vary from one company to the other, and the exact order in which they appear is not crucial as ensuring that they are all present. They are presented here in an order chosen to facilitate understanding of their relationships. The nature of the relationships between the elements is illustrated in the following figures:

**Goal Transformation:**



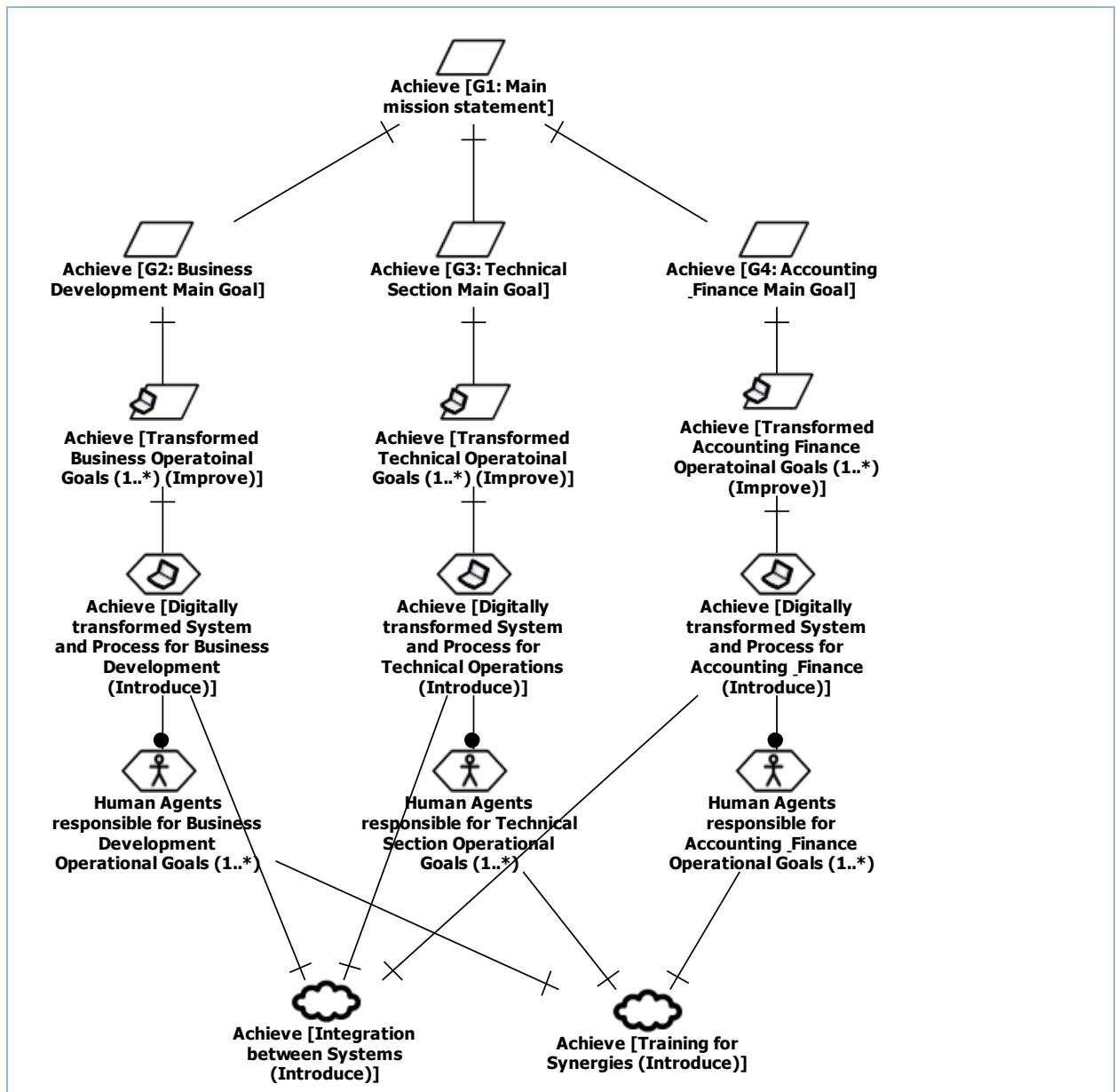


Figure 84: TO-BE Transformation Goal Model

On the first level, define the following in the organization after transformation:

- Achieve [G1: Main mission statement]
- Achieve [G2: Business Development Main Goal]



- Achieve [G3: Technical Section Main Goal]
- Achieve [G4: Accounting Finance Main Goal]

Followed by the second level:

- Achieve **improved** [**Transformed** Business Development Operational Goals (1..\*)]
- Achieve **improved** [**Transformed** Technical Section Operational Goals (1..\*)]
- Achieve **improved** [**Transformed** Accounting Finance Operational Goals (1..\*)]

Followed by the third level:

- Achieve **introduced** [**Transformed** Business Development Operational Goals (1..\*)]
- Achieve **introduced** [**Transformed** Technical Section Operational Goals (1..\*)]
- Achieve **introduced** [**Transformed** Accounting Finance Operational Goals (1..\*)]

By

- Achieve **introduced** Integration for synergies between introduced post-transformation Systems (1..\*)

Followed by the fourth level:

- **Improved** Human Agents responsible for Business Development Operational Goals (1..\*)
- **Improved** Human Agents responsible for Technical Section Operational Goals (1..\*)
- **Improved** Human Agents responsible for Accounting Finance Operational Goals (1..\*)

By

- Achieve **introduced** Training for synergies for Human Agents (1..\*)



### Capability Transformation:

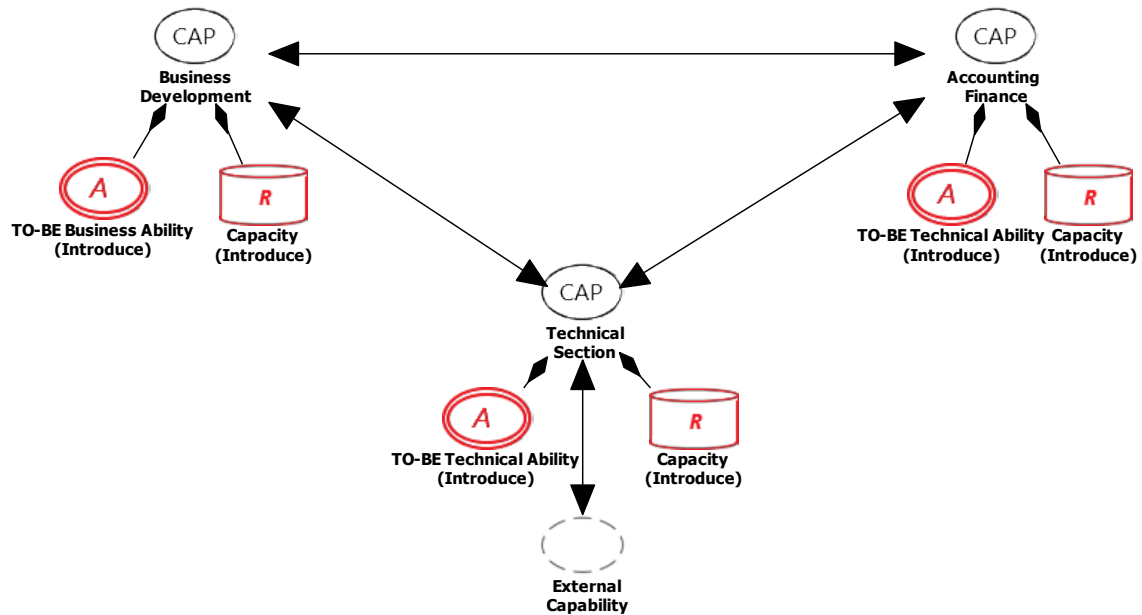


Figure 85: TO-BE Transformation Capability Model

Take the AS-IS Capability model that was divided into three main clusters, and transform it to the TO-BE as follows:

- **Business Development:** Define the transformed organization's capabilities for business development and outline the transformed Ability and transformed Capacity tied to it.
- **Technical Section:** Define the transformed organization's technical execution, competencies and planning capabilities, including all the relevant transformed abilities and capacities identified and connected with the appropriate external capabilities if present.
- **Accounting & Finance Section:** Define the transformed organization's capabilities for handling accounts, finances, collections, audits, and taxes, including all relevant transformed abilities and capacities associated with those capabilities.

### Actor-Dependency Transformation:



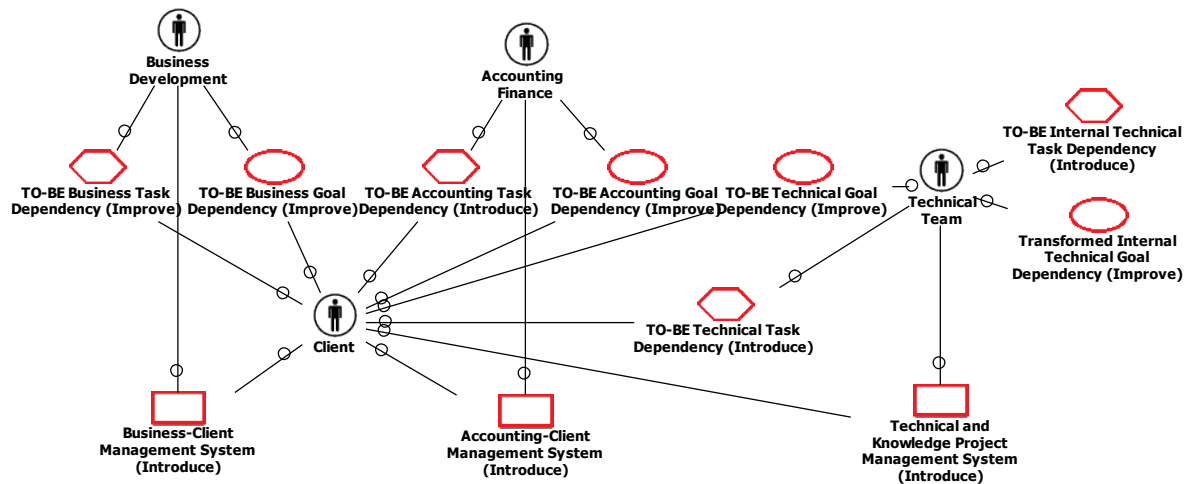


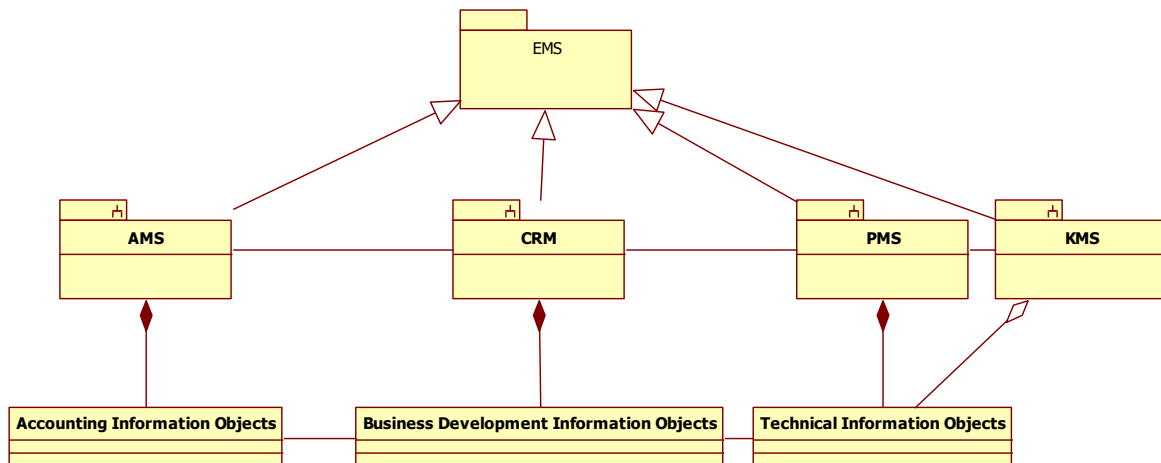
Figure 86: TO-BE Transformation Actor-Dependency Model

Identify your transformed Actor-Dependency Model revolving around four major clusters:

- Business Development Team (Business – Client relationship)
  - **Introduce:** Business-Client Management System
  - **Improve:** Business-Client Task Dependency
  - **Improve:** Business-Client Goal Dependency
- Technical Team (Technical – Client & Technical – Internal relationships)
  - **Introduce:** Technical-and-Knowledge Project Management System
  - **Improve:** Technical-Client Task Dependency
  - **Improve:** Technical-Client Goal Dependency
  - **Improve:** Internal Technical Task Dependency
  - **Improve:** Internal Technical Goal Dependency
- Accounting & Finance Team (Accounting – Client relationship)
  - **Introduce:** Accounting-Client Management System
  - **Improve:** Accounting Task Dependency
  - **Improve:** Accounting Goal Dependency

And ensure proper relationships for the dependency between Goal Dependency, Task Dependency, and Resource Dependency.



**Information Object Transformation:****Figure 87: TO-BE Transformation Information Object Model**

Identify your transformed Information Object Models revolving around the three main clusters of information objects:

- Overall
  - **Introduce:** Enterprise Management System (EMS) Schema
- Business Development Team
  - **Introduce:** Client Relationship Management (CRM) System Schema
- Technical Team
  - **Introduce:** Project Management System (PMS) Schema
- Accounting & Finance Team
  - **Introduce:** Account Management System (AMS) Schema

And build the new relationships between the information object using associations (Generalization, Dependency, Aggregation, and Composition)

**Rationale**

Each SCF contains a sub-organization that is represented in one of those three components. The rationale is to identify those departments, their roles and responsibilities and their relationship in order to establish the correct AS-IS state.

**Examples**



## For the Business Development component:

### 1- Goal Transformation:

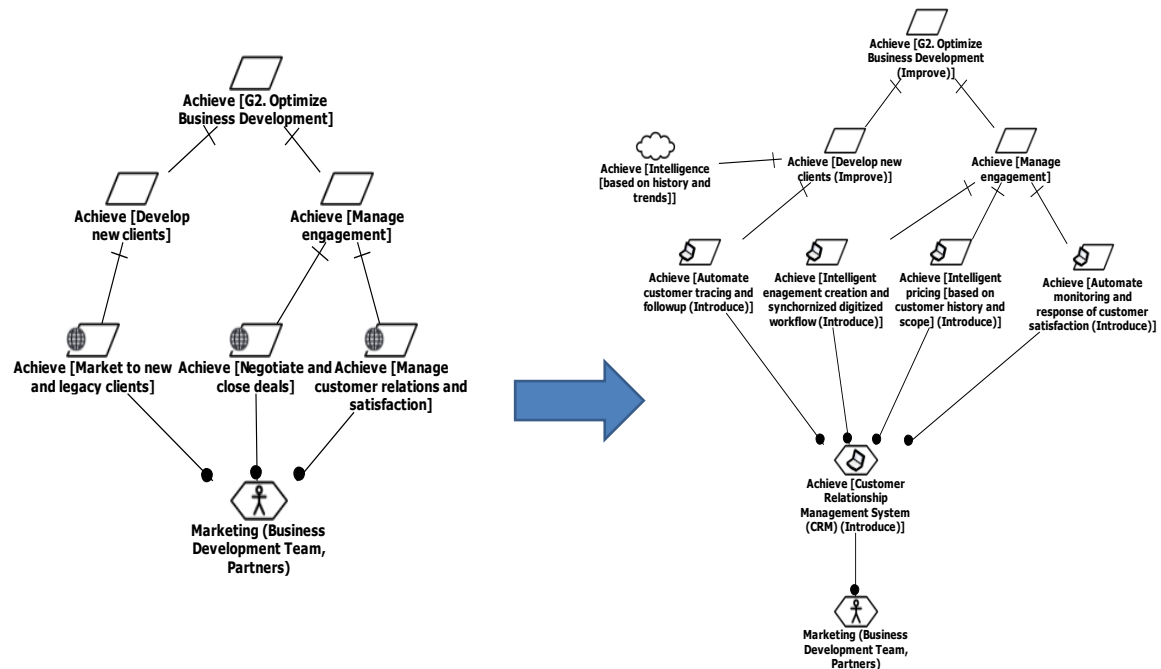


Figure 88: Demonstrating Sub-goal Transformation for Business development goals

### 2- Capability Transformation:

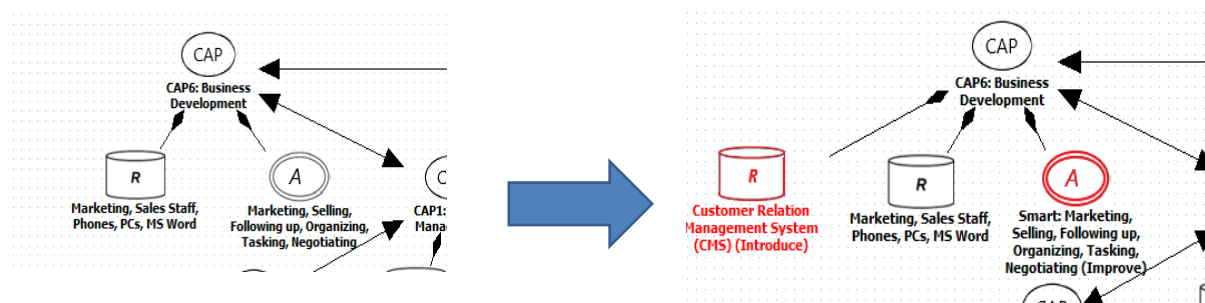
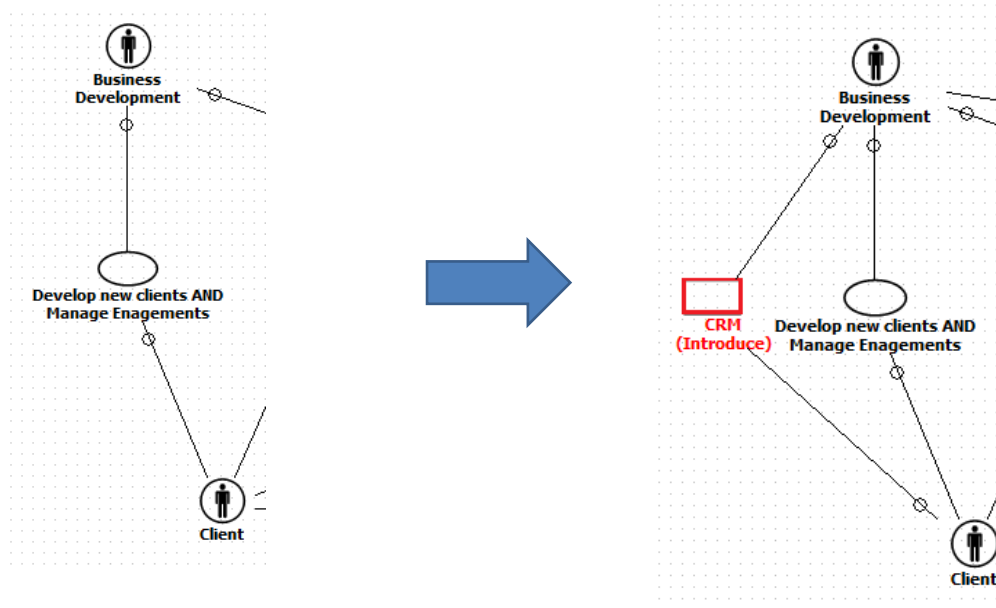


Figure 89: Demonstrating Capability Transformation for the Business Development Capability



## 3- Actor-Dependency transformation:



**Figure 90: Demonstrating Actor-Dependency Transformation for the Business Development Capability**

The examples in **Error! Reference source not found.**, **Error! Reference source not found.** and **REF\_Ref88054935 \h \\* MERGEFORMAT Error! Reference source not found.** demonstrate the transformation of the Business Development Goals, Capabilities and Actor-Dependency (respectively). The Goals are redesigned to Achieve the transformed automated and digitally-enabled operational objectives and processes. The Capabilities (both Resources and Abilities) are upgraded to match those newly transformed goals and demonstrate the role of the new technologies and people roles. The Actor-Dependency transformation shows the dependency on the newly added technologies and process relationships. All three perspectives are analyzed and modelled together in tandem to understand the transformation of Technology, People and Processes.

More examples of transformation models can be found in the TO-BE models demonstrated in Appendix 1.5, Appendix 2.5, Appendix 3.5, Appendix 4.5, Appendix 5.5 and finally, Appendix 6.5 for six use cases accordingly.

#### Related patterns



The Structure and Process Patterns (SPP) can complement this pattern in implementing the complete transformation model.



## Appendix 8: Literature Review Process

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### 1 Query 1: Problem Domain

The following steps were used to identify the article selected for my literature review in the areas related to my problem domain.

#### 1.1 Search Query Used for Problem Domain

[https://www.librarysearch.manchester.ac.uk/discovery/search?query=any,exact,Digital%20Transformation,OR&query=any,exact,Enterprise%20Transformation,AND&pfilter=lang,exact,eng,AND&pfilter=cdate,exact,20000101,AND&pfilter=cdate,exact,20200531,AND&tab=Everything&search\\_scope=MyInst and CI&sortby=rank&vid=44MAN INST:MU NUI&mfacet=level,include,peer\\_reviewed,1&mfacet=rtype,include,articles,1&mfacet=rtype,include,conference\\_proceedings,1&mfacet=rtype,include,dissertations,1&mfacet=rtype,include,books,1&mfacet=rtype,include,reviews,1&mfacet=rtype,include,journals,1&mfacet=domain,include,Social%20Sciences%20Citation%20Index%20\(Web%20of%20Science\),1&mode=advanced&offset=0&pcAvailability=true](https://www.librarysearch.manchester.ac.uk/discovery/search?query=any,exact,Digital%20Transformation,OR&query=any,exact,Enterprise%20Transformation,AND&pfilter=lang,exact,eng,AND&pfilter=cdate,exact,20000101,AND&pfilter=cdate,exact,20200531,AND&tab=Everything&search_scope=MyInst and CI&sortby=rank&vid=44MAN INST:MU NUI&mfacet=level,include,peer_reviewed,1&mfacet=rtype,include,articles,1&mfacet=rtype,include,conference_proceedings,1&mfacet=rtype,include,dissertations,1&mfacet=rtype,include,books,1&mfacet=rtype,include,reviews,1&mfacet=rtype,include,journals,1&mfacet=domain,include,Social%20Sciences%20Citation%20Index%20(Web%20of%20Science),1&mode=advanced&offset=0&pcAvailability=true)

#### 1.2 Keywords and Filters used:

Through the Manchester Library Search Engine, filtering only

1. Collection: Social Science Citation Index (Web of Science),
2. Keywords: “Enterprise Transformation” OR “Digital Transformation”
3. Language: English
4. Type: Articles and Reviews




## Appendix 8: Literature Review Process

Search for: ☒ All Library Collections ☐ Special Collections

Any field ▼ is (exact) ▼ Digital Transformation

OR ▼ Any field ▼ is (exact) ▼ Enterprise Transformation

+ Add A New Line  Clear

Material Type  
All items ▼

Language  
English ▼

Start Date:  
01 ▼ 01 ▼ 2000

End Date:  
31 ▼ 05 ▼ 2020

→ Any field is (exact) Digital Transformation

→ OR Any field is (exact) Enterprise Transformation


 Search

Figure 91: Filters used in Search in Problem Domain



## Appendix 8: Literature Review Process

### 1.3 Results of Problem domain:

EndNote X7 - [My EndNote Library.enl]

File Edit References Groups Tools Window Help

APA 6th

Search Options Search Whole Group Set Match Case Match Words

Any Field Contains

Author	Year	Title	Rating	Journal	Reference Type
Simmons, E.; McLean, G.	2020	Understanding the paradigm shift in maritime ...		Worldwide Hospitality and ...	Journal Article
Schmitt, Daniel; Muyoya, Chisenga	2020	Influence in Technological Innovation Spaces: A...		Sustainability	Journal Article
Rainnie, Al; Dean, Mark	2020	Industry 4.0 and the future of quality work in t...		Labour & Industry: a journal...	Journal Article
Preindl, R.; Nikolopoulos, K.; Litsiou, K.	2020	Transformation strategies for the supply chain: th...	★ ★ ★	Supply Chain Forum	Journal Article
Peters, Michael A.	2020	Beyond technological unemployment: the futu...		Educational Philosophy and ...	Journal Article
Nwaiwu, F.; Duduci, M.; Chromjakova...	2020	Industry 4.0 concepts within the czech sme ma...		Business: Theory and Practi...	Journal Article
Müller, J. M.; Buliga, O.; Voigt, K. I.	2020	The role of absorptive capacity and innovation ...		European Management Jou...	Journal Article
Liedtka, Jeanne	2020	Putting Technology in Its Place: Design Thinkin...		California Management Re...	Journal Article
Joaquin, Ordieres-Meré; Tomás Priet...	2020	Digitalization: An Opportunity for Contributing ...		Sustainability	Journal Article
Joaquin, Ordieres-Meré; Tomás Priet...	2020	Digitalization: An Opportunity for Contributing ...		The International Journal o...	Journal Article
Elmassah, Suzanna; Mohieldin, Mahm...	2020	Digital transformation and localizing the Sustai...		Ecological Economics	Journal Article
Darko, Amos; Chan, Albert P. C.; Adab...	2020	Artificial intelligence in the AEC industry: Scien...		Automation in Construction	Journal Article
Coviello, Nicole	2020	Born digitals: Thoughts on their internationaliz...		Journal of International Bus...	Journal Article
Correia, Fábio Daniel; Carvalho, Andr...	2020	A new approach to organisational excellence fo...		Total Quality Management ...	Journal Article
Beynon, Malcolm J.; Jones, Paul; Pick...	2020	Growth and innovation of SMEs in local enterpr...		The International Journal o...	Journal Article
Babić, Rosario	2020	Conceptualizing the electronic word-of-mouth...		Journal of the Academy of ...	Journal Article
Abad-Segura, Emilio; González-Zama...	2020	Sustainable Management of Digital Transforma...		Sustainability	Journal Article
Zhou, Steven; Zhou, Abby; Feng, Jun...	2019	Dynamic capabilities and organizational perfor...		Journal of Management an...	Journal Article
Ylijoki, Ossi; Porras, Jari	2019	A recipe for big data value creation		Business Process Managem...	Journal Article
Yablonsky, Sergey	2019	Dimensional Data-Driven Artificial Intellig...		Technology Innovation Man...	Journal Article
Vial, Gregory	2019	Understanding digital transformation: A review a...	★ ★ ★ ★ ★	Journal of Strategic Informat...	Journal Article
Trivelli, Leonello; Apicella, Andrea; C...	2019	From precision agriculture to Industry 4.0		British Food Journal	Journal Article
Thorpe, Esther	2019	How automation can help digital transformation	★ ★		Generic
Szalavetz, A.	2019	Digitalisation, automation and upgrading in glo...		Post-Communist Economies	Journal Article
Spescha, Andrin; Woerter, Martin	2019	Innovation and firm growth over the business ...		Industry and Innovation	Journal Article
Silva, Glessia; Di Serio, Luiz; Bezerra, ...	2019	Public Policies on Innovation and Small Busines...		Brazilian Administration Re...	Journal Article
Sharma, Gautam	2019	Innovation and entrepreneurship research in In...		The Journal of Managemen...	Journal Article
Sehlin, Daniel; Truedsson, Maja; Cron...	2019	A conceptual cooperative model designed for ...		International Journal of Qu...	Journal Article
Saarikko, Ted; Jonsson, Katrin; Burstr...	2019	Software platform establishment: effectuation...		Information Technology & ...	Journal Article
Ruckstuhl, Katharina; Rabello, Rafael...	2019	Navigating Boundaries in Additive Manufacturi...		Technology Innovation Man...	Journal Article
Ramesh, Nagesh; Delen, Dursun	2019	Why do enterprise transformations fail? HINT: IT'S...		Journal of Enterprise Transfor...	Journal Article
Raghupathi, Viju; Raghupathi, Wullia...	2019	Exploring science-and-technology-led innovati...		Journal of Innovation and E...	Journal Article
Rachinger, Michael; Rauter, Romana; ...	2019	Digitalization and its influence on business model...	★ ★ ★	Journal of Manufacturing Te...	Journal Article
Prem, Erich	2019	Artificial Intelligence for Innovation in Austria		Technology Innovation Man...	Journal Article
Pellegrino, Gabriele; Piva, Mariacristi...	2019	Beyond R&D: the role of embodied technologi...		Journal of Evolutionary Eco...	Journal Article
Nuccio, Massimiliano; Guerzoni, Marco	2019	Big data: Hell or heaven? Digital platforms and ...		Competition & Change	Journal Article
Nițescu, Dan; Murgu, Valentin; Căpriț...	2019	IMPACT OF LABOR, FDI AND R&D ON BUSINES...		Amfiteatru Economic	Journal Article
Neirotti, P.; Pesce, D.	2019	ICT-based innovation and its competitive outco...		European Journal of Innova...	Journal Article
Negassi, Syoum; Lhuillery, Stephane; ...	2019	Does the relationship between innovation and ...		Economics of Innovation an...	Journal Article
Nambisan, Satish; Wright, Mike; Feldm...	2019	The digital transformation of innovation and entr...	★ ★ ★	Research Policy	Journal Article
Medhora, Rohinton P.	2019	Policy choices in the 21st century - where to st...		Middle East Development J...	Journal Article
Li, Genyi; Jiao, Hao; Addo, Frederick; ...	2019	Career sustainability during manufacturing inno...		Career Development Inter...	Journal Article
Lewkowicz, Myriam; Liron, Romain	2019	The Missing "Turn to Practice" in the Digital Tra...		Computer Supported Coop...	Journal Article

Figure 92: Endnote library with literature review references

### 1.4 Query 2: Solution Domain

The following steps were used to identify the article selected for my literature review in the areas related to my problem domain.



## Appendix 8: Literature Review Process

### 1.5 Search Query Used for Solution Domain

[https://www.librarysearch.manchester.ac.uk/discovery/search?query=any,exact,Capability%20Modelling,OR&query=any,exact,Conceptual%20Modelling,AND&query=any,exact,Dynamic%20Capability,AND&pfilter=lang,exact,eng,AND&tab=Everything&search\\_scope=MyInst\\_and\\_CI&sortby=rank&vid=44MAN\\_INST:MU\\_NUI&mode=advanced&offset=0&pcAvailability=true](https://www.librarysearch.manchester.ac.uk/discovery/search?query=any,exact,Capability%20Modelling,OR&query=any,exact,Conceptual%20Modelling,AND&query=any,exact,Dynamic%20Capability,AND&pfilter=lang,exact,eng,AND&tab=Everything&search_scope=MyInst_and_CI&sortby=rank&vid=44MAN_INST:MU_NUI&mode=advanced&offset=0&pcAvailability=true)

### 1.6 Keywords and filters used

Through the Manchester Library Search Engine, filtering only

1. Collection: Social Science Citation Index (Web of Science),
2. Keywords: “Capability Modelling” OR “Requirements Engineering” OR “Conceptual Modelling” OR “Dynamic Capability
3. Language: English
4. Type: Articles and Reviews

The screenshot displays the Manchester Library Search Engine interface. At the top, there are radio buttons for 'All Library Collections' (selected) and 'Special Collections'. Below this, the search query is built using a series of filters: 'Any field is (exact) Capability Modelling', 'OR Any field is (exact) Requirements Engineering', 'OR Any field is (exact) Conceptual Modelling', and 'AND Any field is (exact) Dynamic Capability'. To the right of the query, there are dropdown menus for 'Material Type' (set to 'All items'), 'Language' (set to 'English'), 'Start Date' (set to 'Day', 'Month', 'Year'), and 'End Date' (set to 'Day', 'Month', 'Year'). At the bottom left, there are buttons for '+ Add A New Line' and 'Clear'. At the bottom right, there is a 'Search' button with a magnifying glass icon. The search results are displayed at the bottom, showing the full query: 'Any field is (exact) Capability Modelling OR Any field is (exact) Requirements Engineering OR Any field is (exact) Conceptual Modelling AND Any field is (exact) Dynamic Capability'.

Figure 93: Filters used in Search in Solution Domain



