ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

SCHOOL OF BUSINESS
DEPARTMENT OF MANAGEMENT SCIENCE AND TECHNOLOGY

MASTER THESIS

CORE BANKING SYSTEM TRANSFORMATION

SARA QYQJA

COMPANY : DELOITTE GREECE

Supervisor : Dr. Athanasia Pouloudi - Professor

Submitted as part of the claims for the acquisition
Master's Degree (MSc) in Management Science and Technology

Athens, July, 2022

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Certificate of Diploma Thesis

I, hereby, declare that the work presented in this thesis in fulfillment of the requirements for the award of Master of Science (MSc) submitted in the Department of Management Science and Technology at Athens University of Economics and Business has been executed and authored by me and has not been submitted or approved in the framework of someone else's postgraduate or undergraduate degree in Greece or abroad. This thesis, having been executed by me, represents my personal views on the subject. The sources I raised for the elaboration of this thesis are all mentioned, and the material used was either given to me by the company or created by me.

QYQJA SARA

MSc student in Management Science and Technology

Περίληψη

Η σημερινή εποχή χαρακτηρίζεται από ευρεία χρήση της τεχνολογίας και ψηφιοποίηση των υπηρεσιών. Υπό αυτό το πρίσμα, οι επιχειρήσεις έχουν αναγκαστεί να αναθεωρήσουν τον τρόπο λειτουργίας τους, προκειμένου να μπορέσουν να ανταποκριθούν στις ραγδαίες εξελίξεις και να διασφαλίσουν την επιβίωσή τους. Αυτή η τάση δεν θα μπορούσε να αφήσει ανεπηρέαστες τις τράπεζες οι οποίες οδηγούνται στον εκσυγχρονισμό των πληροφοριακών τους συστημάτων. Ο εκσυγχρονισμός των πληροφοριακών συστημάτων αν και αναγκαίος, είναι μια αρκετά ακριβή διαδικασία που ενέχει πολλές προκλήσεις.

Ο σκοπός της διπλωματικής εργασίας ήταν, μέσω της χρήσης ενός θεωρητικού μοντέλου, η μελέτη των λόγων που οδηγούν μια τράπεζα να αλλάξει το κεντρικό πληροφοριακό της σύστημα, τις προκλήσεις και τις ευκαιρίες κατά την αλλαγή αυτή, τόσο θεωρητικά όσο και σε πρακτικό επίπεδο και η σύγκριση θεωρίας και πράξης. Συγκεκριμένα, μελετήθηκε το έργο αλλαγής κεντρικού πληροφοριακού συστήματος μιας από τις τέσσερις συστημικές ελληνικές τράπεζες. Το έργο βρίσκεται εν εξελίξει καθότι ξεκίνησε το 2020 και αναμένεται να ολοκληρωθεί το 2025.

Η παρούσα εργασία, λόγω της λεπτομερούς εκ των έσω πληροφόρησης που παρέχει, μπορεί να παράσχει γνώση σχετικά με τις ενέργειες που ακολουθεί μια επιχείρηση, σε πρακτικό επίπεδο. Επιπλέον, μπορεί να βοηθήσει συμβουλευτικές επιχειρήσεις που αναλαμβάνουν έργα αλλαγής πληροφοριακών συστημάτων.

Λέξεις Κλειδιά: Βασικές τραπεζικές δραστηριότητες; Κεντρικό τραπεζικό σύστημα; Μετασχηματισμός; Πλαίσιο εκσυγχρονισμού; Προκλήσεις μετασχηματισμού;

Abstract

Today's era is characterized by widespread use of technology and digitization of services. In this aspect, businesses have been forced to review the way they operate in order to be able to respond to the rapid developments and ensure their survival. This trend could not leave unaffected the banks, which are being driven to modernize their IT systems. The modernization of information systems, although necessary, is a fairly expensive process that involves many challenges.

The purpose of the dissertation was, through the use of a theoretical model, to study the reasons that lead a bank to change its central information system, the challenges and opportunities during this change, both theoretically and on a practical level and the comparison between theory and practice. Specifically, the project to change the central information system of one of the four systemic Greek banks was studied. The project is ongoing as it started in 2020 and is expected to be completed in 2025.

The current dissertation, due to the detailed information it provides from within, can offer insight into the actions taken by a bank at a practical level. In addition, it can help consulting firms undertaking IT change projects.

Keywords: Core banking; System; Transformation; Modernization framework; Challenges;
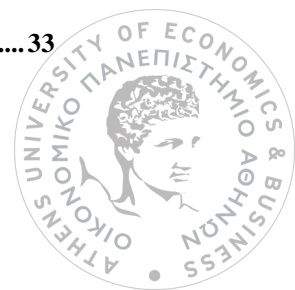
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Introduction

1.1 The Banking Sector

The increasing use of new technologies, cloud banking, and sophisticated processes have forced traditional banking to review the way it operates. The majority of US and European banks run their core banking operations on incumbent systems. These systems are either deployed in-house or are a highly customized and complex version of a vendor systems that were deployed in the 1980s and the 1990s (Goldstein, 2018).

Since then, the customer needs and demands have changed a lot. Today's era requires modernized banking systems that offer better agility, scalability and are very flexible. Thus, banks need to modernize their core banking system in order to respond to evolving customer demands.

1.2 Thesis Concept and Contribution

Core banking modernization, however vital for the survival of organizations in the digital era, is a strategic decision that is rather expensive, time consuming and involves many stakeholders. Banks need to take into consideration many factors and carefully study the alternatives, the costs, and the benefits before coming into a conclusion regarding the core banking modernization. The goal of this thesis is, by using a business case framework as a guide, to
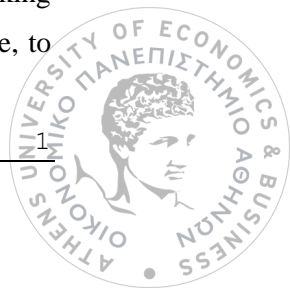
analyze the operational steps, the challenges, and the factors that organizations, especially banks, have to take into consideration, in order to achieve their goal, both in theory and in practice. A case study of the core banking transformation of a major Greek bank is used to in the practical section. The case study provides detailed inside information that are no accessible to the public and can help other organization who plan to modernize their systems. It can also help in an academic level for examination of whether and how theory is implemented in practice.

1.3 Thesis Structure

The first chapter of the thesis consists of a brief introduction to the banking sector and a description of the thesis concept. In the second chapter the information system in the banking sector is studied, regarding the evolution of banking in Europe, the evolution of information system and the current trends in banking sector, and the issues related to legacy systems that lead to the need of transforming the information system. In the third chapter the business case framework for modernization is studied. This is a framework that helps organization decide whether a change regarding the information system should be pursued or not. In this unit the benefits and expenses are identified in quantitative level. Furthermore, the challenges related to the transformation and the benefits are analyzed. The approaches to core banking transformation, the vendor selection, the system integrator selection are also studied. The fourth chapter is related to the case study on an important Greek bank which is in the process of changing its core banking system. The reasons for the change are analyzed along with the challenges the management identified and the mitigation actions they have planned in order to minimize the effects of these challenges. The last chapter is a conclusion of the core banking transformation actions and any extensions that can be considered in the future.

2

Information Systems in the Banking Sector

2.1 Evolution of the Banking Sector in Europe

"A bank is a financial institution licensed to receive deposits and make loans. Banks may also provide financial services such as wealth management, currency exchange, and safe deposit boxes." Barone (2019). The banking sector is more that crucial to the modern economy due to the services they provide for businesses, individuals, and even whole countries. Banks have become one of the main factors of raising the level of economic development of the world. Those institutions are at the center of the monetary and investment business and are directly related with the management of the financial risks present in an economic system.

However important banks are for the economy of each country, and for the whole world's economy, the banking sector, just like other sectors, is facing challenges related to the technological evolution. This evolution is leading Banks to close branches and reduce the number of employees. In the following diagrams an overview of the banking sector in Europe over the past year is presented.

Figure 1 (Saravia, 2022, p.4) indicates that credit institutions have faced a decrease of 33,3% in the past decade. This trend is the result of several factors such as mergers and acquisitions that occurred due to the economic crisis of 2008.
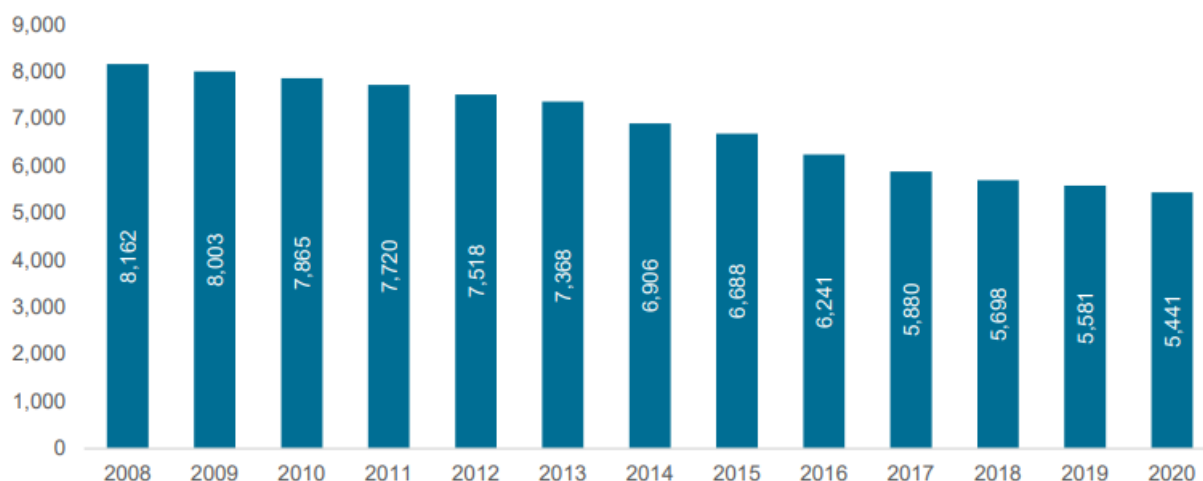
Figure 1: Number of Credit Institutions in the EU per year (Source: Saravia, 2022, p.4)

The wide use of the internet and the capabilities it provides have had a great impact on the banking sector. Saravia (2020, p.7) states that "the increasing use of digital banking by consumers as more than half of EU individuals, 58%, used internet banking in 2019, up from 54% in 2018, and 25% in 2007". The aforementioned statement indicates that banking customers have adopted electronic payments and online banking rather enthusiastically. The wide use of internet banking and the merges and acquisitions have led to further reduction on banks' physical presence by cutting down their branch networks. Figure 2 (Saravia, 2022, p.8) indicates the drastic reduction of the number of domestic branches (36%) during the past decade in the EU.
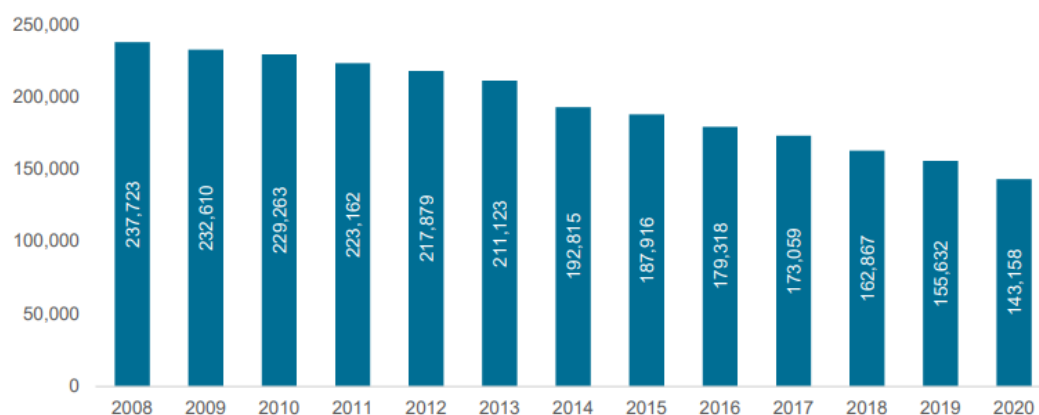
Figure 2: Number of Domestic Branches per year.(Source : Saravia, 2022, p.8)

The reduction of branch network and the adoption of e-banking have important consequences on banks' employment levels. According to Saravia (2020) over the last twelve years almost half a million job positions have been lost in the European Union in the banking sector. Figure 3 (Saravia, 2022, p.10) illustrates the reductions in number of employees throughout the past twelve years.
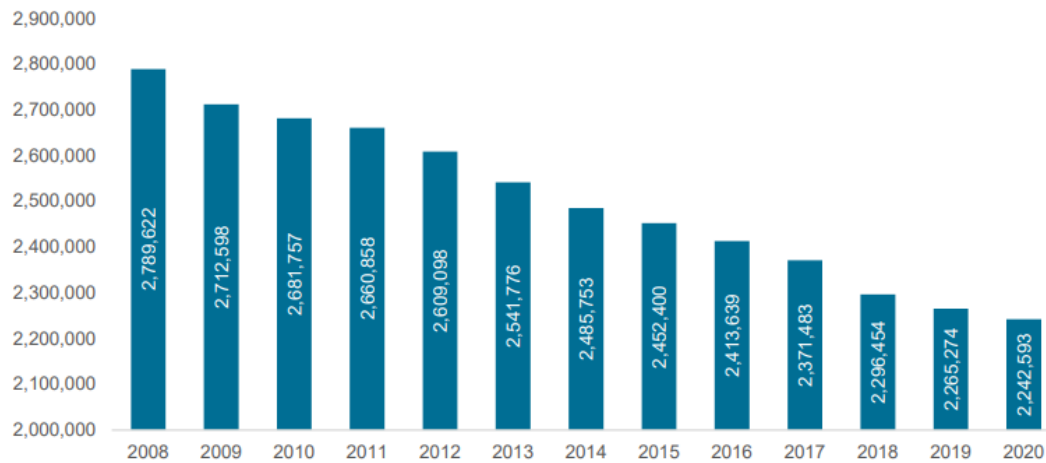
Figure 3: Number of Employees in Credit Institutions per year. (Source : Saravia, 2022, p.10)

For Greece, in particular, as reported by the European Bank Federation, the domestic credit institutions which incorporated are 15, out of which six are cooperative banks and nine are commercial. Of the nine commercial banks, only four are deemed "systemically significant credit institutions", according to the respective SSM definition. "The share of the five largest credit institutions in total assets reaches almost 97.4% of the banking system)." Saravia (2022, p.47). Other interesting figures mentioned in Saravia's research in 2022 are the number of banks' branches in Greece which in 2019 was 1,702 whereas in 2018 there were 1,834 branches, the number of total bank employees which is 33,097 while in 2019 it was 36,727 and the number of ATM that is 5,797 compared to 2019 that there were 5,702 ATMs.

Saravia (2018) in her research indicates that the number of branches in 2010 were 3165, the number of employees was 55887 and the number of ATMs was 6749. According to the same research, the number of branches in 2018 was 2168, the employees were 41707 and the number of ATM was 5532. These numbers indicate that the branches have decreased by 46% since 2010 and similarly and the number of employees and of ATMs have dropped by 34% and 22%, respectively.

2.2 Basic core banking functions

Banking operations are performed by software especially developed for this purpose. This software is called Core Banking System Software (CBS). A Core Banking System consists of the basic software components for managing the services that a bank provides to its customers through its channels and branches (Kundal, 2016). Gartner's (2022) definition of a core banking system (CBS) is "a back-end system that processes daily banking transactions and posts updates to accounts and other financial records". According to Malyshev (2022), the term CORE stands for Centralized Online Real-time Environment. As stated in Gartner (2002) "Core banking systems typically include deposit, loan and credit processing capabilities, with interfaces to
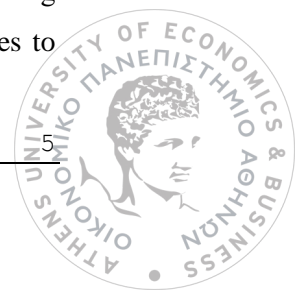
general ledger systems and reporting tools". To be more specific, Haralayya (2021), breaks down the key core banking functions as following :

- Opening new accounts
- Transaction processing and book-keeping
- Loan processing
- Processing cash deposits and withdrawals
- Clearing cheques
- Interest rate arbitration
- New products and tools innovation
- Customer relations
- Statistical reporting
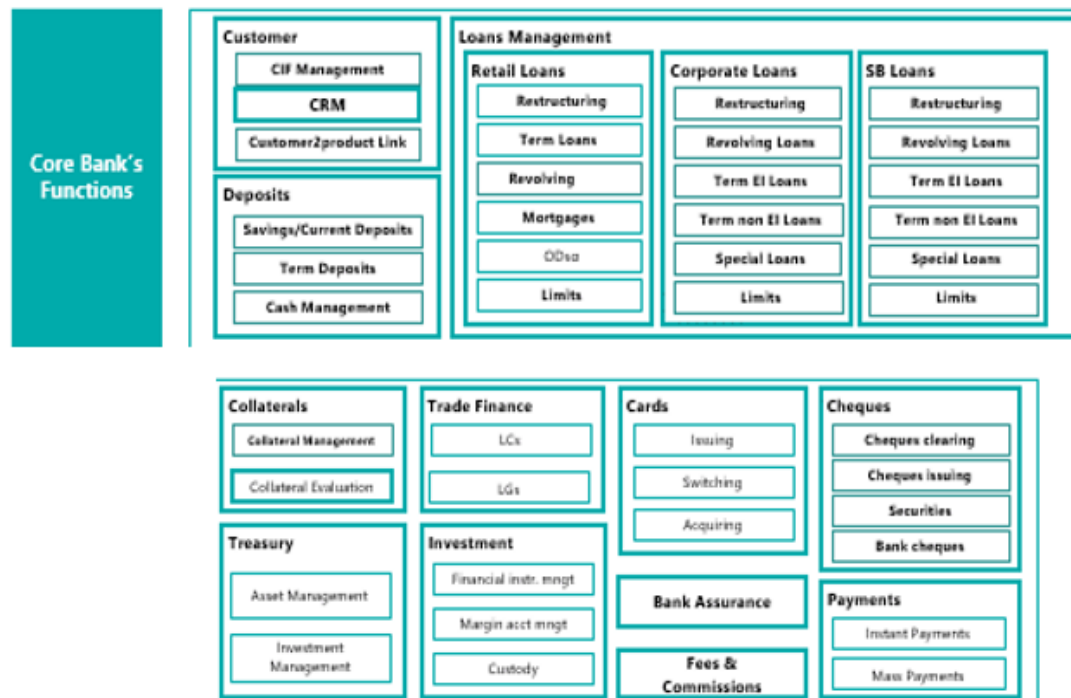
Figure 4 : Greece: Core banking functions (Adapted from Deloitte 2022)

2.3 Evolution of core banking systems and Trends in Banking Sector

Evolution is vital for every organization and institution in order to achieve survival and longevity. Yadav (2014) and Foest (2019) have presented a very similar timeline of the Core Banking System approach per decade, presented in Figure 5 (Yadav, 2014, p.4) and Figure 6 (Foest, 2019, p.6) respectively. According to their timelines the core banking systems were developed in the 1960s and 1970s. The capabilities those systems provided were basic functionalities to ease the core banking transactions. During the 1980s the core banking systems

were focused on products and were developed in silos, which resulted in losing sight of the total satisfaction of the customers. The core banking systems developed in the 1990 closed that gap by being customer oriented and more flexible, breaking down the walls created by silos and replacing it with multi-channel processing and integration strategies and introducing Application Service Provides (ASP) and Service Oriented Architecture (SOA. In the 2000s multi-channel platforms were adopted in the banking sector to ensure channel confluence and provide a holistic customer experience. At the same time cloud-based platforms were adopted to ease real-time processing across the various channels. In the 2010s the consequences of the economic crisis and the crisis in the banking sectors made the banks focus on regulatory compliance and risk management and the exploitation of big data. Furthermore, the extensive use of smartphones created the need for mobile solutions and application. In 2014, Yadav stated that the future of core banking systems would be all about focusing on process-centric, global, and fast solutions that are easily adaptable and scalable.
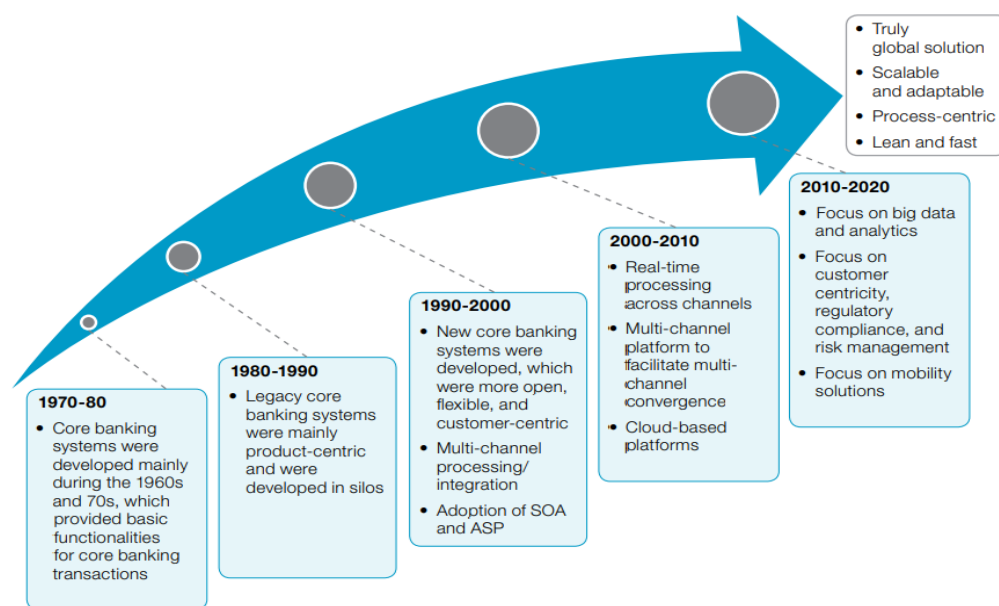
Figure 5: Core Banking Systems Evolution.(Source : Yadav, 2014, p.4)
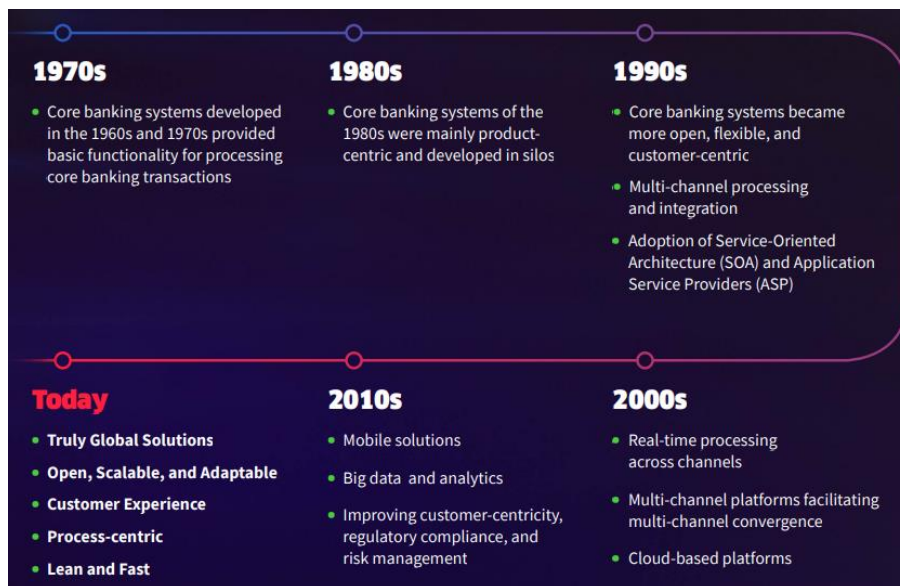
Figure 6: Evolution of Core Banking Systems by decade. (Source : Foest, 2019, p.6)

Yadav was completely right. According to Malviya et al. (2020) trends in 2020s focus on omni-channel strategies, open banking and fintech collaborations, digital onboarding, cloud computing and compliance.

2.3.1 Compliance

As a general trend in banking sector Kooijmans et al. (2012) and Malviya et al. (2020) emphasize in the importance of regulatory compliance. Regulatory compliance refers to all local and global, if applicable, regulation and laws that banks must adhere wherever they operate. Examples of such laws and regulation are the following :

- GDPR (Global Data Protection Regulation), a European a legal framework which regulates the way organizations collect and process the personal data of EU citizens (Frankenfield, 2020)
- AML (Anti-Money Laundering) a directive which aims at preventing the use of financial circuits to disguise illicit funds as legitimate income (Kenton, 2019)
- Capital Requirements Regulation (CRR) which contains the detailed proactive requirements for

   investment firms and credit institutions (European Banking Authority, 2019)

As different regulations may apply in different countries, banks with multinational presence have an increased complexity complying with various international regulations. "It is estimated that by 2020, global banks would be required to comply with over 120000 pages of regulations." (Kumar, 2018). The consequences of non-compliance come in the form of hefty fines and penalties. "In 2020 there were multiple institutions that received major fines of over 11 billion dollars. U.S. banks Goldman Sachs, Wells Fargo, and JP Morgan Chase paid upwards of $7.50

billion." (Itech 2021). According to Kumar (2018) Britain's largest banks spend approximately 660 million pounds a year in order to ensure compliance to AML regulations alone, in order to avoid even greater fines and penalties.

2.3.2 Omni-channel

Omni-channel is defined as "a coordinated multi-channel offering that provides a seamless experience when using all of the retailer's shopping channels" Levy et al. (2013, p.67). According to Hamouda's research (2019), the channels that comprise the bank omni-channel are Branches, ATMs, Internet Banking, Mobile Banking, Social Banking and Call Centers. However, as the technology evolves, the channels keep diversifying and thus the management of these challenge is becoming more complex and challenging. As mentioned by Levy et al. (2013, p.67) the channels need to provide a seamless experience for the customers which means that they must be very well integrated. Hamouda (2019) proved in her research that there is a high positive correlation between the omni-challenge integration and the customer satisfaction and loyalty. This means that omni-channel is very important for the competitive advantage for the banks.

2.3.3 Open banking and Fintech collaborations

Jamison (2021) and Malviya et al (2020) emphasize on the importance of collaboration between banks and fintech organizations. Apart from omni-channel integration and on-click services, customers seem to demand various services in the most effortless way in real-time. Collaborations with fintech organizations are the most efficient way of fulfilling these needs. According to Adepetun (2018) banks need to embrace complimentary solutions provided by fintechs in order to improve their services and strengthen their customer base. Fintechs can also be benefited from working closely with bank in order to boost their credibility and explore new ways of improving efficiency.

2.3.4 Digital onboarding

Marley (2020) defines customer digital onboarding as "Digital onboarding is the online process of procuring new customers online by ensuring that they have complete access to all the services and products provided by an institution, conveniently and quickly. Through onboarding, banks begin their official consensual relationship with the client". In other words, digital onboarding can make the onboarding easy, fast and seamless and can create a lasting experience for customers. According to Malviya et al (2020) some of the key components of digital customer onboarding are video-based- identification, digital signature and verification and real-time data.

2.3.5 Cloud computing

Although cloud computing technology, as known today, has been around for many years, cloud adoption has been steadily rising across industries in the past decade. According to Vailshery (2022) enterprise spending on data center hardware and software and cloud infrastructure services was 61.7 billion dollars, while in 2021 276 billion dollars were spend for the same purposes. Magoulas & Swoyer (2020) reveal in their research that more than 88% of the respondents use cloud someway and approximately 25% of the respondents stated that their companies plan to move all of their applications to the cloud in the next year, while 67% expect to move half or more of their applications during the next twelve months

2.3.6 Core banking systems replacement

Another trend that Malviya et al (2020) point out is the replacement of core banking platforms. The core banking modernization activities that were postponed due to the economic crisis are starting to become priority for the banking sector. According to Foest (2018) "Core banking modernization refers to the replacement, upgrade, or outsourcing of a bank's existing core banking systems and information technology (IT) environment."

2.4 Issues related to legacy banking systems

Legacy systems' limited abilities have necessitated the replacement of legacy systems with modern and agile core banking systems. Mitrovich (2011, p.3) presents five key factors that cause dissatisfaction for legacy core banking systems, as shown in Figure 7.
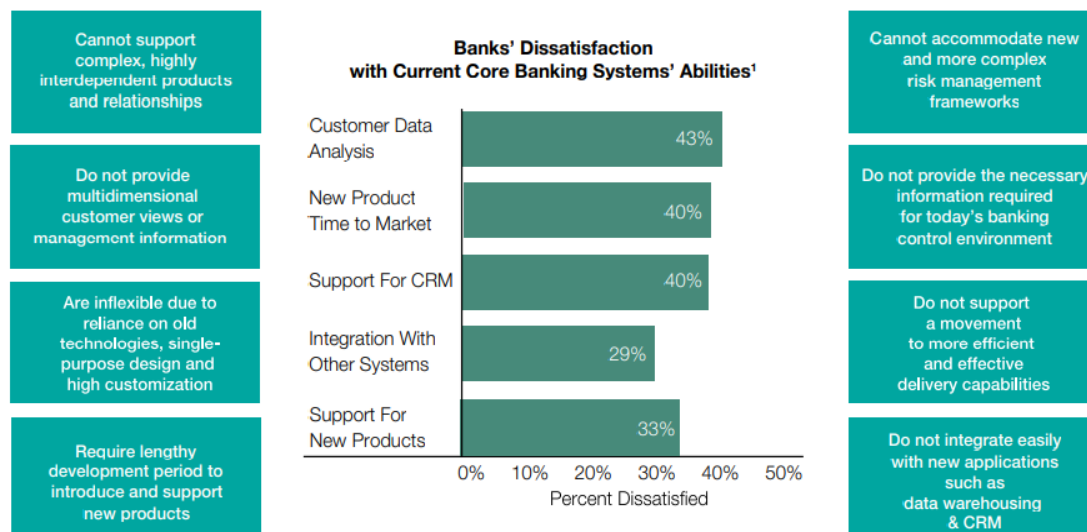
Figure 7 : Banks' Dissatisfaction with Current Core Banking Systems' Abilities (Source : Mitrovich, 2011, p.3)

According to figure 7, the most important factor is the inability of provision of multidimensional views or management information.

Doshi et al. (2020) divide the challenges attributed to legacy core systems into two categories. The first category is related to business challenges, such as the provision of poor digital customer experience, difficulty in platform integration after merges and acquisitions, difficulty with launching new products and services and regulatory compliance management challenges. The second category is related to technical challenges. Such challenges are the difficulty of responding to changing business and customer needs due to lack of flexibility and agility, the challenge of IT infrastructure cost due to limited flexibility, the shortage of talent because of the obsolete technology and the integration challenges with third-party platforms and applications.

The issues related to the legacy systems have necessitated the replacement of legacy systems with modern and agile core banking systems. According to the survey by Doshi et al. (2020), 36% of the respondents are in the process of adopting a modern core banking system, 32% operate a combination of legacy and modern core banking system, 27% operate a legacy system and their need of adopting a modern system is urgent and only 5% use a legacy system with which they are satisfied and have no intention of modernization actions.

Yadav (2014), Kundal (2016) and Foest (2018), Foest (2019) categorize the drivers that lead to the adoption of a modern core banking system into two groups, the internal and the external. The first category involves attributes such as product and channel growth. The continuous introduction of new banking product that cater different customer segments combined with the expanding channel network has led to banks facing increasing complexity trying to handle the rise of transactional and payment volume. Another internal driver is the management of legacy systems, as the technology used becomes obsolete over the years and fewer people have knowledge of these systems, making the adoption of new systems a necessity. Cost reduction is a very important driver as well. Choudhary (2017) states that "Maintenance of legacy systems still occupies a large part of most bank's IT budget. For example. In 2010, nearly 79% of the IT budget of the banking sector was spent on maintenance projects.". Financial institutions need to address external imperatives as well. The first one is related to compliance with the ever-changing regulations enhancing risk management and governance and increasing transparency. Next driver is customer centricity, meaning the focus on customer service and care. By using real-time data analytics and transaction date financial institutions are able to provide personalized offerings and experiences to their customers.

3

Pursuing Modernization in the Banking Sector

3.1 Business case framework for modernization

However important the reasons for core business modernization might be, the bank needs to build a business case in order to identify the value of the transformation and evaluate whether the project is feasible and beneficial and to what extent. The business case is also used as a reference point, before the beginning of the project and throughout the duration of it, to facilitate the organizations map the process of decision making.

Herman and Siegelaub (2009) have presented such a framework that consists of four steps. According to their framework, the first step is to identify as the first step of the framework the recognition of the reasons that lead the bank to consider the transformation and the strategic goals of the transformation. The second step includes the identification of the benefits and the identification of the alternative options and their anticipated results. The third step is the identification of the costs and the benefits in a quantitative level (ex. expenses, timescale). The fourth and last step is related to the opportunities, risks and challenges that are expected to occur during the transformation process.

Foest (2019) has developed a business case framework for modernization which is presented in Figure 8 (Foest, 2019, p.6). According to his framework, the first step of this framework aims at the evaluation of the reasons the project must be conducted and the strategic intentions that are expected to be met. The second step is the cost – benefit analysis which is elaborated as the timeline, the challenges and opportunities that might occur during the project. The next step is related to the identification and the evaluation of the alternative options to core banking replacement and the available approaches. The fourth step is the cost-benefits analysis in terms of the expenses and the revenues expected. If the results of the business case indicate the necessity for a change, what is called a positive business case, then the company should proceed further. On the contrary, if there is a negative business case then the bank should consider another alternative approach or even the termination of the transformation process.

The sequence of the phases in the two frameworks discussed might be different, however the content of the steps remains the same. For the purposes of the current thesis Foest's (2019) framework is going to be used for the description and the analysis of each step discussed previously.
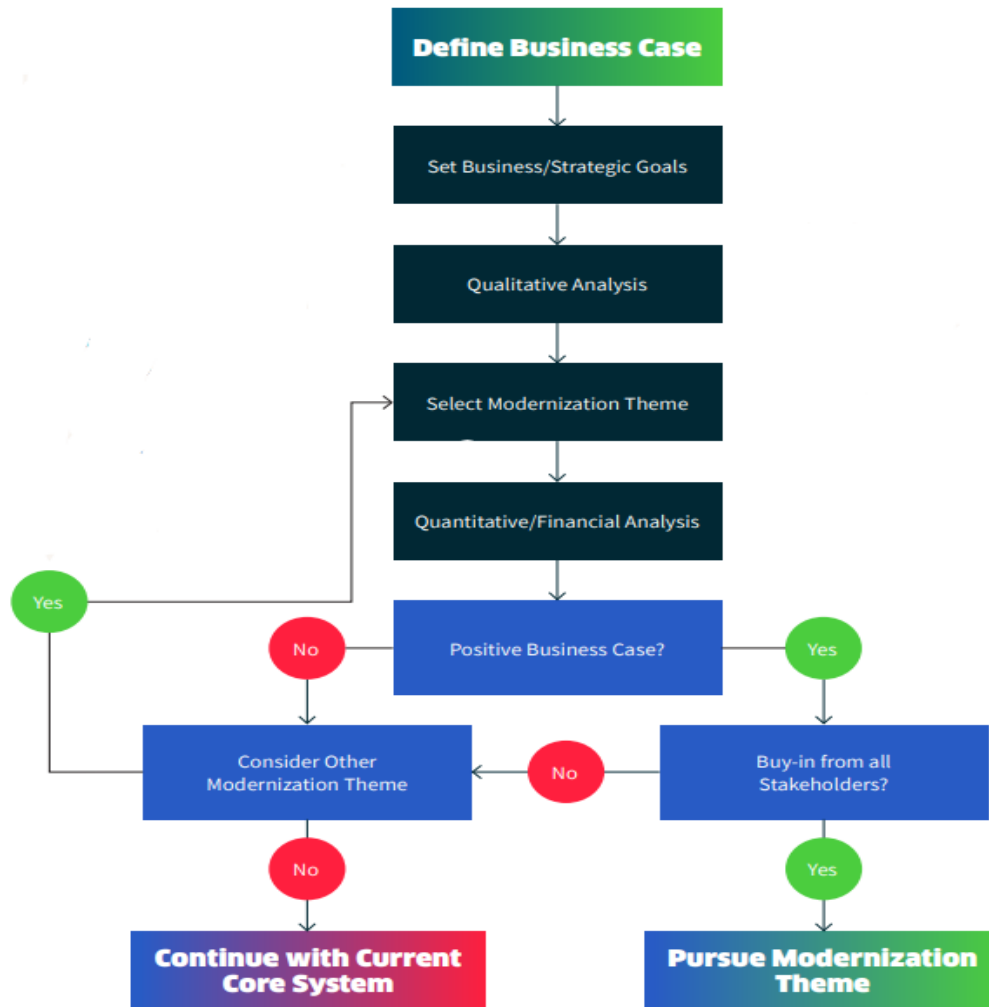
Figure 8 : Business Case Framework for Modernization.

3.1.1   Strategic goals of core banking transformation

In accordance with the framework presented by Foest (2019), the first step is to identify the objectives and long-term strategic and business goals that are expected to be achieve by the specific project. These goals can be related to market share increase, future product portfolio vision, targeting the customer base and cutting down operating costs.

3.1.2 Qualitative analysis

3.1.2.1 Benefits

The next step is the qualitative analysis in which the non-financial benefits and the challenges of modernization are examined. According to Yadav (2014) these benefits can be divided into three categories, business, operation, and technology. Business goals can be related to decreased product time-to-market as the new core banking system can achieve improved compliance with emerging laws and regulations. In addition, the architectural flexibility enables cross-selling opportunities, product innovation and multi-channel customer approach. Another business benefit is the quicker new market entry. As reported by Kooijmans et al (2012) "Banks with a technology and operations template that can be reused effectively—with minor localization costs—can open new businesses in emerging markets within months, leaping over the competition and achieving first-to-market advantages.". Operational benefits are the ones related to the day-to-day activities. Such is the automation of manual activities which leads to increase productivity. Another one is the creation of standard business processes that will allow the various services to operate in conjunction with each other and thus increase cross-selling opportunities and customer engagement. As far as technology benefits are concerned, a modern core banking system can reduce the incidents of product software defect by identifying them early in the process which leads to better product quality. Furthermore, by replacing the product-based legacy systems that operated in silos with new integrated systems that are service-based can ease the development and testing of new products or features. All these benefits can lead to satisfied customers, greater brand perception and a strong competitive advantage.

Investigating more the technological benefits, Aggarwal (2006, p.30) presents in Figure 9 the aspects in which the bank is going to be benefited from the adoption of a new core banking system. As presented in Figure 9, the most important qualitative advantage of the project is the increase of system flexibility. Other benefits are system integration, process simplification, scalability and decrease in errors.
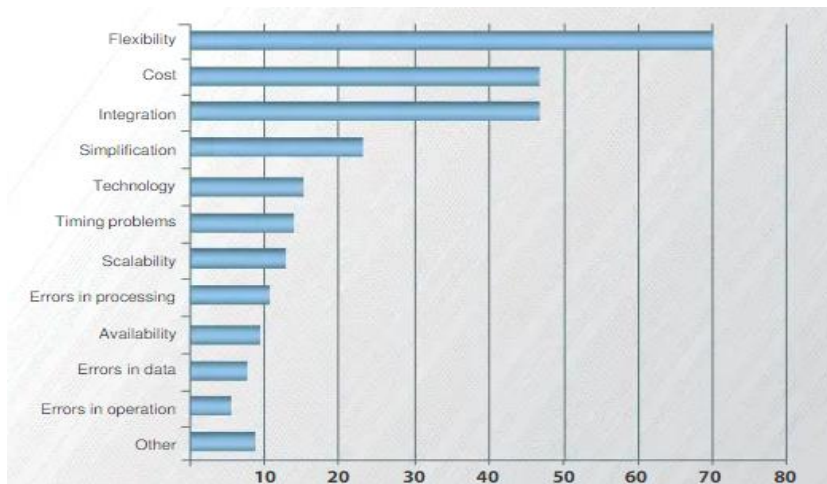
Figure 9 : Technological benefits for core banking replacement. (Source : Aggarwal, 2006, p.30)

3.1.2.2 Challenges

It is true that core banking modernization is rather beneficial for banks and the aforementioned benefits give this statement some credence. However, the challenges an institution must overcome so as to achieve its goal are significant.

Resource availability

Due to the importance of the project, the management must ensure the resource availability, especially as far as human and monetary resources are concerned (Haralayya, 2021). The provision of the resources can be challenging because core banking transformation can be characterized as a complex project that requires a lot of time, effort, and monetary resources. The expenses have to be predicted with the biggest accuracy possible in each phase of the transformation process so that the necessary resources can be provided. Transparency and communication with the sponsors and the executives are very important in order to for them to be persuaded for the need of sponsorship.

Lack of connection between project and strategy

Discenza and Forman (2007) claim that some of the reasons that lead to project failure is the lack of establishing a clear connection between the project and the business strategy and the inadequate planning. Thus, a well-defined roadmap of the project, which will monitor closely the progress of the project, is imperative. This project management framework should portray in detail the phases of the project as well as the time each step needs to be completed. Expect of time distribution it is of high importance that the bank spreads the money reasonably, according to the requirements of each phase. It is consequential that the business and technical leaders work hand-in-hand in the design of the roadmap. The reason for their close collaboration

is due to the fact that the technical leaders are aware of the requirements of each step while the business leaders are of the available resources and can ensure the alignment with the business and strategic objective of the projects.

Requirements document

Another factor that can create challenges during the project is the lack of a requirements document or an inadequate one (Ramakrishnan, 2010). The purpose of this document is the specification of all the requirements the bank has for the new system and the business needs or objective it is expected to meet, both in technical and functional level. It is important to mention that the requirements are classified and prioritized for better change and risk management. The requirements document can be issued as a request for a proposal (RFP) to solicit bids from potential vendors and can be a refence point for all the stakeholders. So, due the criticality of this document an insufficient one can even lead to the failure or termination of the project.

Governance

Project governance can be defined as a set of management rules, relationships, protocols, systems, and structures that provide the framework within decisions are made for project implementation and development for achieving business or strategic intentions (Bekker & Steyn, 2009). Therefore, "Project governance, covers every aspect of the project life from initial selection to prioritization to monitoring to delivery." Caliste (2012). Project Governance is a pivotal factor for the successful progress and completion of the project.

The goal of the program governance plan is to provide an effective governance plan for the address of common delivery activities, facilitate project success and management of the relationship between the bank and the vendors. Specifically, it provides project knowledge and ensures that all the program stakeholders and team members receive all the information they need in a timely manner. It also establishes organizational interfaces for management and operation of the program. This includes establishing and maintaining organization charts for both the bank and the vendors. Another use of governance is to define and document the interfaces between the bank and vendors by establishing roles and authorities to operate the interfaces. Defining an efficient escalation process and defining how various elements will be processed, transmitted, and approved between the bank the vendors are some of the governance roles as well. Finally, governance is responsible for establishing the correct process of financial management.

Stakeholder Management

Core banking is the center of the bank's functions, thus the changes related to the core banking affect many stakeholders, internal and external. Managing all the stakeholders can be quite challenging as each group of stakeholders can have different interests and concerns.(Haralayya 2021, Ramakrishnan 2010). "These stakeholders may pressure the implementation to meet their requirements and may further raise the project complexity.", Haralayya (2021). The success of the project might be in jeopardy in case of agreement to the project and its objectives is not ensured and long-term commitment to it by the stakeholders. An example of the stakeholder diagram is presented in Figure 10 (Smith, 2000).

According to Smith (2000) a successful stakeholder management consists of the following steps. The first is to identify the involved parties. The second is to identify the interest of each stakeholder, the impact level they might have on the project and then prioritize them in relation to the other stakeholders. Next is the assessment of the involved and affected parties regarding their importance and the influence they might have on the project. Fourth step is related to the assumptions about how each stakeholders' views the project and reveal identified risks. The last step is the definition of the stakeholder participation and the establishment of a communication plan.
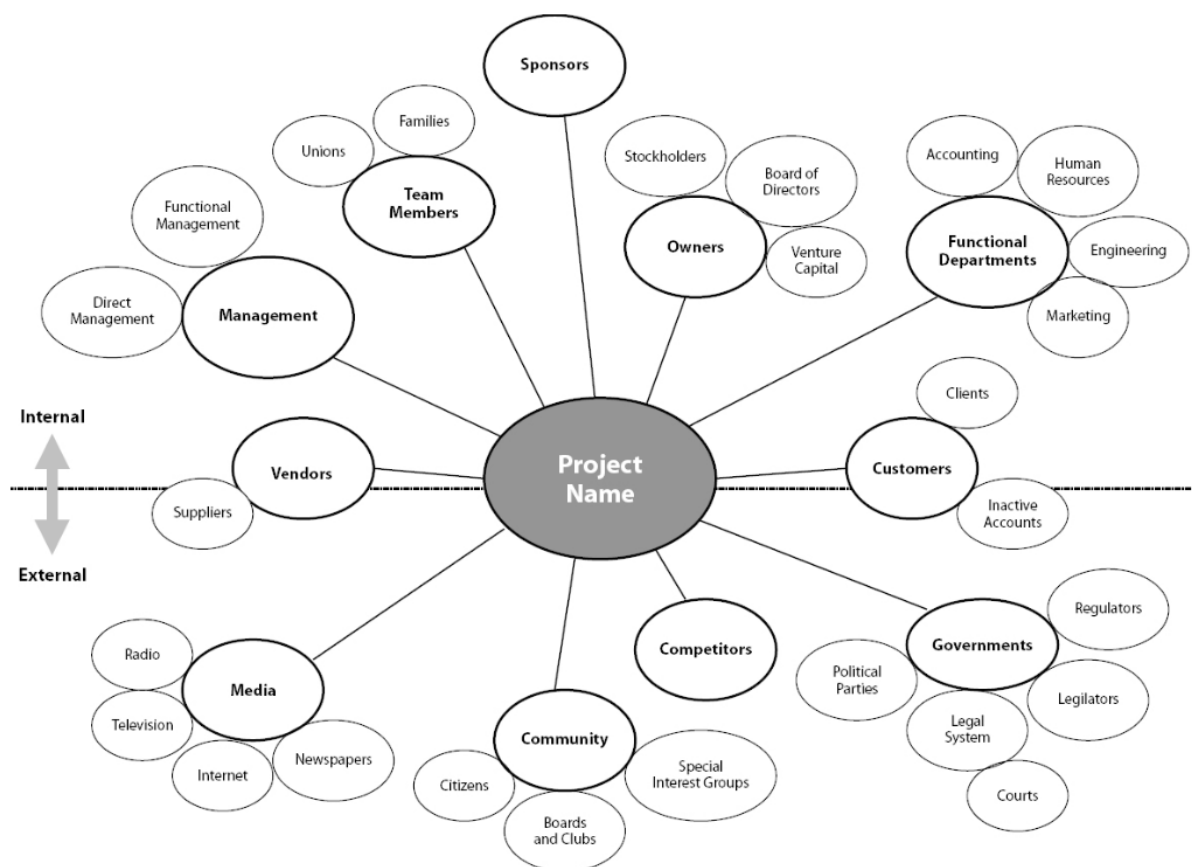
Figure 10 : Stakeholder Diagram (Source : Smith, 2000)

Resistance to change

Changes in procedures, technology, policies and roles are only some of the changes related to core banking transformation. An effective management of all these changes is linked to a successful outcome. Paton and Mccalman (2008, p.16) state that "Change management is never a choice between technological, organizational or people-oriented solutions, but involves combinations for the best fit; integrated strategies designed to produce results". Human factor is a very important aspect of change as during the implementation some individuals might display resistance to change. "The label "resistance" is frequently applied to all cases of nonuse of a system, even when nonuse may reflect ignorance of the system's existence, inadequate training in system operation, or personal fear of the computer." Markus (1983). According to Markus (1983) the causes of resistance are divided into three categories. The first one is people-determined, or in other words factors internal to people and groups, which consists of personal traits, their cognitive style, and the human nature such as the fear of unknown. The second category is system-determined factors such as poor user-friendliness, inadequate technical design, or implementation. The third group is related the Interaction of system and context of use which takes into consideration sociotechnical (division of labor) and political (division of power) variants. Paton and Mccalman (2008, p.52-53) identify some of the reasons for resistance to change as following :

- The new system might result in organization redesign establishing new power bases, hierarchical structure, communication networks and in some cases it could result in redeployment or even job loss

- Employees may face technological challenges due to personal incapability or non-user-friendly environment.

- Employees that are used to doing things in a certain manner or might have grown apathetic in their working life are now requested to get out of their comfort and actually make an effort to learn new things.

- The change spreads throughout the supply chain hindering the equilibrium that is established within the supply chain. The managements needs to carefully plan the change and ensure that it will not harm one group of stakeholders while benefiting another.

Paton and Mccalman (2008, p. 4) advocate that "Successful exploitation of a change situation requires knowledge of the circumstances surrounding a situation, understating of the interactions and the potential impact of associated variables.". So, in order for the management to address these issues a communication plan needs to be established so that the stakeholders can appreciate the decision to transform the core banking and enlighten any "grey area" related

to the risks associated to the new system. Ramakrishnan (2010) supports that "the key leads should also participate in the solution evaluation process" and get involved in the requirements document process.

Kumar Basu (2015, p.28-42) discusses the main reasons that cause resistance to change and the mitigation actions that need to be taken under four management styles, as presented in Figure 11 (Kumar Basu, 2015, p.41). The management styles are : Operational Improvement (OI), Evolutionary Learning (EL), Programmatic Leadership (PL), Transformational Leadership (TL). Kumar Basu (2015) states that the mitigation actions included in figure 11 are effective in all four aforementioned management styles and the suggested mitigation actions are effective in all of them. The first reason that triggers resistance to change as shown in figure 11 is lack of awareness of the process and the procedures that are going to be followed. The best way to tackle this problem is by grouping teams and plan communication actions for raising awareness. Another reason is that people get comfortable in their current status and situation and are afraid of change. The solution to this is having a clear vision and sharing it with the stakeholders and having leaders that people trust and can count on. Organizational culture and history are also factors that can lead to resistance to change. An assessment of the impact the new system is going to have to culture and finding ways to fill potential gaps could be the best approach. The most import factor is the fear of people losing their jobs. A training strategy has to be developed to help people gain new skills or enhance to ones they already have and make them feel confident and capable.

Employee Resistance	Mitigated through	Management Style			
		OI Case B	EL Case D	PL Case A, F	TL Case C, E
Lack of awareness	Integrated planning and teams Awareness communication	Yes	Yes	Yes	Yes
Comfort with the status quo and fear of the unknown	Vision clarity Leadership and accountability	Yes	Yes	Yes	Yes
Organizational history and culture	Relentless impact assessment	Yes	Yes	Yes	Yes
Opposition to the new technologies, requirements, and processes introduced by the change	Stakeholder engagement Leadership and accountability	Yes	Yes	Yes	Yes
Fear of job loss	Training and awareness communication	Yes	Yes	Yes	Yes

Figure 11 : Resistance to change and Mitigation Actions.(Source : Kumar Basu, 2015, p.41)

3.1.3   Selection of modernization theme

The third step is the selection of the modernization theme the bank wants to pursue and the identification of the alternative options. The organization needs to decide the core banking transformation approach and the acquisition approach.

3.1.3.1   Factors considered in system selection

Before discussing further regarding the modernization plan and the alternative choices the organization has, it would be very useful to examine the general key factors based on which a core banking system is selected. As reported by Aggarwal (2006) cost is the most important factor when choosing a modernization plan or a system.

Apart from upfront costs, maintenance cost is mentioned as a major factor for the selection. As second most critical point is considered the product time-to-market as faster product rollout can lead to competitive advantage. Third party applications availability and ease of integration with peripheral systems are other main factors. When choosing to outsource or buy, vendor reputation and record tracking came very high in the list. Other factors such as real-time capabilities, modularity, and scalability where also considered important. The factors are presented in Figure 12 (Aggarwal, 2006, p.31) proportionally, according to their significance in the selection process.
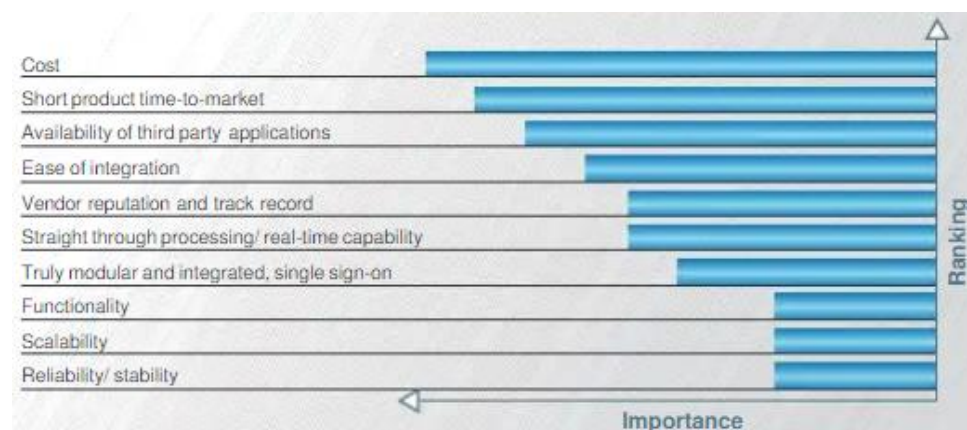
Figure 12 : Factors Considered in System Selection.(Source : Aggarwal, 2006, p.31)

3.1.3.2   Core banking transformation approaches

According to Kooijmans et al. (2012) the approaches to core banking transformation are four, as presented in Figure 13 (Kooijmans et al., 2012, p.16). The first one is the use of out of the box packages that are going to replace the legacy systes. Banks can either choose to replace the whole system at once or replace the legacy system progressively. The rip and replace strategy is considered a very risky one since it requires large time allocation. Moreover, here are high technology dependences and complexity due to multichannel and many integration points and

there is a high risk of compromising day one functionalities in case of technical issue. In progressively replace or phased approach, sections of the legacy are going to be replaced in each phase. This means that the legacy system and the new one are going to coexist until the former system is completely replaced. Since there are going to be two functional systems a thorough co-existence strategy must be developed. The bank can choose to segment the phases based on products, customer segments, regions, branches, or roll out by core banking function, Kilimnik & Pavlovski (2014).
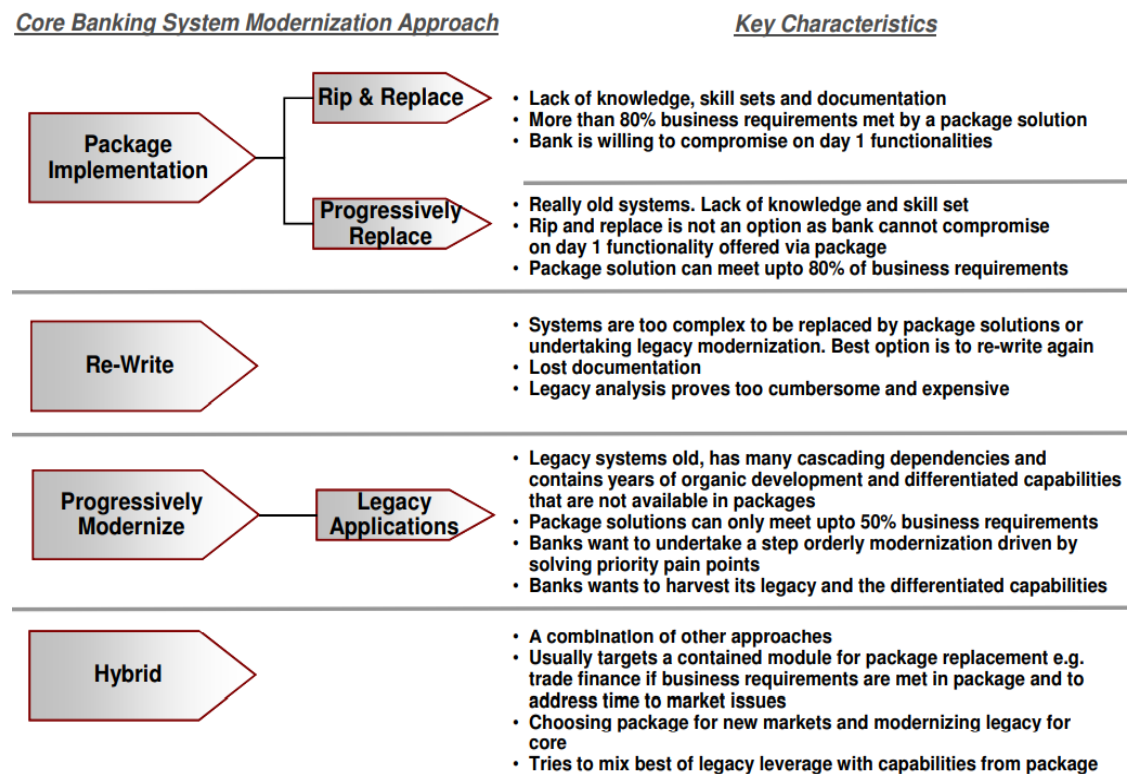
Figure 13 : Core Banking System Modernization Approach (Source : Kooijmans et al., 2012, p.16)

The package approach offers quicker transformation and does not compromise day one functionalities. Customization is needed so that the operational needs can be met. More details regarding the package approach are being discussed in the next unit "Approaches to information system acquisition".

The second modernization approach is to re-write the legacy system. The rewrite approach is more suitable for legacy systems that are either too old or too complex and the IT department occupies very skilled and disciplined employees. The third strategy is to the existing system but upgrade it on a new release, or re-engineer and enhance it with some new features. Some of the reasons for choosing this approach can be the existence of some differentiated capabilities that are not supported by packages or the fact that packages can cover less than half of the business requirements. In order for the re-write approach to be successful there needs to be a clear roadmap of the upgrade strategy and the alignment between the Information Technology

department and the Management has to be very strong. The fourth approach is a combination of the aforementioned approaches.

3.1.3.3 Approaches to information system acquisition

Except for the core banking transformation approaches, the organization has to consider the way the new information system is going be acquired. According to literature there are three ways to do so, in-house development, outsourcing and purchase of system software and services (Δουκίδης, 2011, p.420-440). In-house software development means that the company uses its own resources (in-house team) to develop or implement the software. On the other hand, outsource development refers to the practice of hiring a third-party provider for the development of products and services in a variety of fields. Both these two approaches have advantages and disadvantages.

Starting with the challenges of in-house implementation, the resources and technology available for software development in an organization are very limited compared to an organization that is specialized in such projects. The staff must be trained in order to gain expertise in certain areas and new personnel having that expertise has to be hired. Cost wise, in most cases it is more expensive for a company to hire technology and domain experts than to decide to outsource. Another factor to think of are unexpected costs that might occur for purchasing for example new hardware or for maintenance purposes. Maintenance is a very complex task that is time and cost consuming and experts have to be hired for its purposes. In terms of speed of the project's progress, it is natural that due to the previously mentioned limitations, in-house development is slower compared to outsource development (Aitzaz, Syed, et al., 2016, p.18-22).

Proceeding, the advantages of in-house systems could be considered as the risks related to outsourcing. Firstly, as Aitzaz et al. mention, the seamless development of the system is under the control of the organization with in-housing, while with outsourcing the organization is completely depended on the performance of the third party. Third parties in many cases can be geographically spread and have cultural and language differences, which can create communication challenges that do not exist with in-housing. Furthermore, another advantage of in-house development is that management is more efficient and centralized. In-house development provides more business process control which can lead to competitive disadvantage in the future. Moreover, security and privacy aspects are better protected with in house-development. The last three aspects are considered as the most important factors by Doukidis (Δουκίδης, 2011, p.432-433,439).

The third way of acquiring an information system (system or package purchase) refers to the purchase of out-of-the box systems that are specifically developed for the business need and
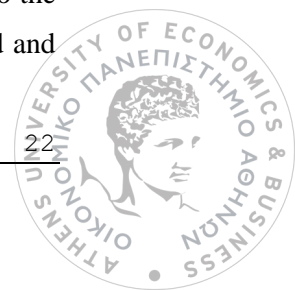
are provided by vendors. These packages are already developed and need to be customized according to the business needs of the organization. As a result, in case the appropriate package is chosen it can be quickly deployed with a low cost.

Figure 14 (Aggarwal, 2006, p.46) presents the key characteristics of the three methods analyzed previously.
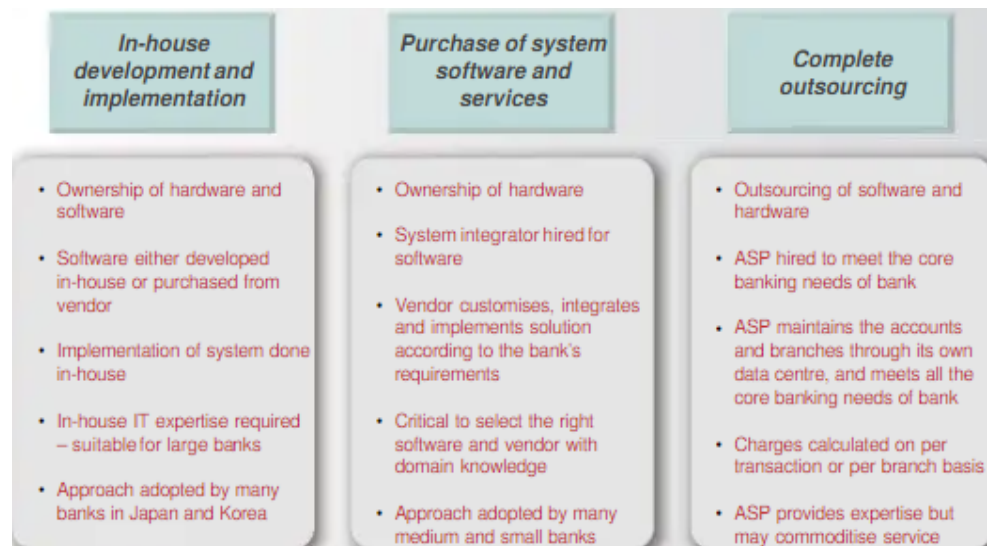
Figure 14 : Approaches to information system acquisition (Spurce : Aggarwal, 2006, p.46)

3.1.3.4   Package and Vendor Selection

As mentioned previously, the package – vendor selection is critical for the success of the transformation. Apart from the factors mentioned in unit "Factors considered in system selection" that apply in general, there are some extra points that need to be taken into consideration during the package – vendor selection process. According to Kooijmans et al. (2012) and Δουκίδης (2011) a factor that needs to be considered is the level of agreement to requirements document and the level of customization needed. In case of a wrong package selection, the customizations needed is extensive and it can lead to high development and maintenance costs. Another important factor is the level of package and systems integrity. The packages need to be integrated with the systems that are going to stay in place in order for the whole core banking system to be functional. If the systems are not compatible with the package the procedure of making them compatible can be very challenging, time consuming and very costly. Architecture is also of great importance because the architectural modularity is inversely proportional to customization and integration challenges. In addition, the package must ensure bank's flexibility and agility so that it can adapt to business changes.

3.1.3.5 System Integrators

Organizations need to hire experts, called system integrators (SI), that helps the organization with the core banking transformation activities. To be more specific, "Systems integrators are not software vendors but rather a bank's strategic partner with the breadth and depth of transformation capabilities mandated to lead and deliver the challenging transformation journey. Their role is to help the bank define and implement the future state business architecture, processes and technologies while overseeing the transformation with proper governance and controls" (Hilmi et al, 2017). From the aforementioned it is clear that system integrators are key factors for the success or failure of the core banking transformation project and thus selecting the right system integrator can be very challenging. A number of criteria have been set to help with this critical decision. As reported by Hilmi et al (2017) the first one is the expertise the SI has with the specific solution or package that is proposed. This mean that the SI has to obtain a track record of implementation of the specific package in similar transformation projects that were successful. Next criteria are the availability and utilization of skilled and experienced business and solution architects. The previous criteria are of absolute importance, since as mentioned before, architecture, customization and integration are critical for the success of the project. Another factor mentioned by Hilmi et al (2017) is the capability of managing the data migration process. The system integrator needs to have expertise in supporting migration processes in order to minimize the risks involved and maximize the probability of successful migration. Quality management and quality assurance are important factors as well. The system integrator should have a quality management that assures high-quality of the deliverables, using suitable standards, tool and metrics for monitoring and controlling the project. Another criterion is the knowledge transfer. The SI should be willing to help the bank's resources build and strengthen their internal capabilities instead of working in silos. "One of the key responsibilities of a system integrator is to manage communication and changes across vendor organizations and different groups within the bank." Hilmi et al. (2017). In this scope, system integrator needs to have strong expertise in people and communication management as well as local experts who understand the culture in order to facilitate the communication process.

3.1.4   Quantitative analysis

The next step of the framework is the conduction of a qualitative analysis in which the implication of modernization in terms of financial benefits is measured. Regarding the costs, Foest (2019) categorizes the expenses into upfront and recurring costs. The upfront category refers to "an amount of money paid before a particular piece of work or a particular service is done or received", Cambridge Dictionary (2022). This category includes charges for initial subscription

fees and licenses as well as costs for hardware purposes. It also includes costs for vendor and system integrator payment and other third-party services that might occur, for both implementation and customization purposes. Recurring costs refer to internal it costs for equipment and maintenance, personnel payroll and training, and charges for licenses and subscription fees if applicable. It is natural that in the beginning of the project the capital investment is going to be significant in order to cover all the expenses.

Regarding the quantitative benefits, according to Foest (2019), the use of analytical tools provided by the new system can strengthen the bank's competitive position which can lead to acquisition and retention of more customers. All of which, lead to higher gains per customer. Furthermore, bank operations are faster and improved and automation of manual tasks can lead to less mistakes, improved productivity and the need for less employees and physical branches, which mean less costs and increased revenues. Another benefit of the replacement is the reduced costs for launching new products and services, due to faster time-to-market. The last benefit mentioned by Foest (2019) is the reduced IT maintenance cost due to the improved architecture. While the costs occur from day one, the benefits are going to occur after the deployment of the new core banking system, and it takes a long time for the project to reach the break-even point and start being profitable. The long payback period of core banking transformation projects might make the management hesitant to invest the necessary capital (Haralayya, 2021). It is important to meticulously calculate the return on investment (ROI) while measuring qualitive factors such as process improvements. Figure 15 (Yadav, 2014) presents the cost-benefit analysis over time.
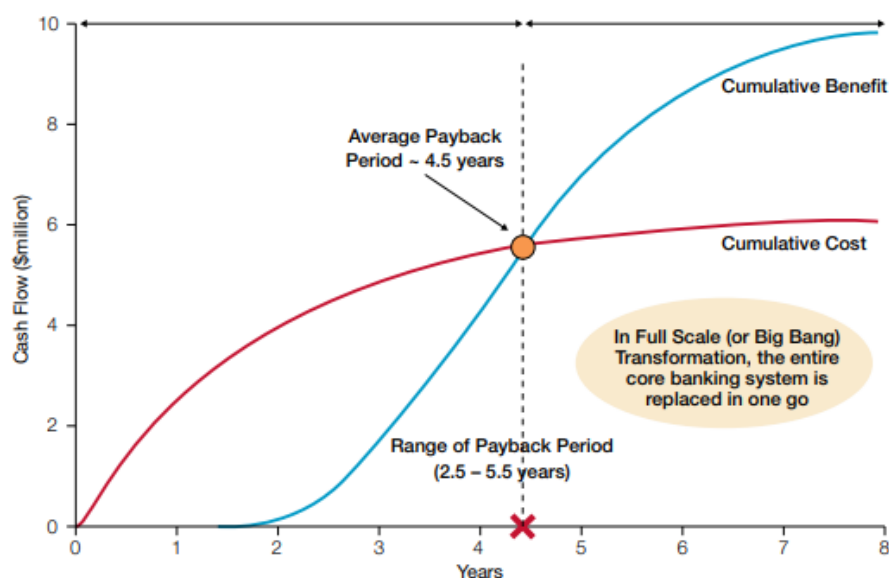
Figure 15 : Core banking replacement costs and benefits diagram (Source : Yadav, 2014)

3.1.5 *Next steps in the business case framework*

The next step in the business case framework is to determine whether there is a positive or a negative business case. A positive business case means that the bank has considered all the factors, qualitative and quantitative costs, and benefits, has decided the modernization theme, and has come in the conclusion that the modernization/transformation is necessary and feasible. After the conclusion, the management need to make sure that all stakeholders are willing to work towards the success and that are going to stay committed. As discussed in the "challenges" unit, achieving stakeholder buy-in is a difficult goal that can determine the success or failure of the whole project.

3.2 *Other factors for consideration*

Apart from the issues discussed in the business case framework, it is very important for the businesses to take into consideration other factors that are not included in the framework such as the selection of the organization structure and the evaluation and selection of the system development model that is going to be implemented.

3.2.1 *Organizational structure*

"An organizational structure is a system that outlines how certain activities are directed in order to achieve the goals of an organization. These activities can include rules, roles, and responsibilities. The organizational structure also determines how information flows between levels within the company." Kenton (2021).

The use of the organizational structure is the definition of a specific hierarchy within an organization or project. This means that it defines the job of every employee and the way it is placed within the overall system. The lack of an organizational structure or the existence of a poor defined one can be very challenging for the organization or the project. It can lead to employees not knowing their supervisor or to whom they report and can create uncertainty regarding their roles and the responsibilities or can even be unaware of what is expected of them within the organization or the project. A formal and detailed structure can provide security and confidence to all employees regardless of their position. Everyone is aware of their roles, responsibilities and the flow of authority and information and can be more productive and efficient since they are more focused on their tasks.

"Organizational structures are normally illustrated in some sort of chart or diagram like a pyramid, where the most powerful members of the organization sit at the top, while those with the least amount of power are at the bottom." Kenton (2021).

The types of organizational structure according to Duncan (1979) and Kenton (2021) by function, division and matrix. Functional structure, also referred as bureaucratic structure, divides the organization based on the specialization of its workforce. Divisional or multidivisional structure divides the company based on the projects, products, or subsidiaries operated. Matrix structure groups employees across different superiors, divisions, or departments.

Table 1, which is adapted from Duncan (1979) provides a brief comparison of the organizational structures.

Structure	Strengths	Weaknesses
Functional	• Best in stable environment • Supports in-depth skill development • Simple decision/communication network ideal in small, limited-output organizations	• Slow response time • Decisions pile at top • Poor coordination • Bottlenecks caused by sequential tasks
Divisional	• Suitable for fast change • High product, project, or program visibility • Task responsibility, contact points clear to customers or clients • Processes multiple tasks in parallel, easy to cross functional lines	• Innovation/growth restricted to existing project areas • Shared functions hard to coordinate • Possible internal task conflicts, priority conflicts
Matrix	• Emphasis on product/market • Reduces information requirements as focus is on single product/market • Full-time focus of personnel on project of matrix • Matrix manager is coordinator of functions for single project	• Costly to maintain personnel pool to staff matrix • Dual authority of matrix manager and functional area managers • Duplication of effort • Participants in matrix need to have good interpersonal skills

Table 1 : Comparison of organizational structure (Adapted from : Duncan 1979)

According to Duncan (1979) and Kenton (2021) a number of factors have to be taken into consideration for the selection of the most suitable organizational structure. Duncan (1979) groups these factors into two categories, internal and external. The internal ones refer to the organizational personnel, and factors such as their technological and educational skills and background, the organizational functions such as the level of independence of the organizational units and the objectives, the goals and the culture of the organization. The

external factors are related to the customers, the competition, sociopolitical factors, and the technological level of the industry.

3.2.2   System Development Life Cycle

The System Development Life Cycle (SDLC) is an iterative process consisted of multiples steps and structured in a methodical way. This process is used for modeling or providing a framework for technical and non-technical activities. It aims to deliver a quality system that meets or even exceeds business expectations or to manage decision-making progression. In other words, the system development life cycle is a process that enables the users to transform a newly developed project into an operational one.

The most common and widely used models are the "Waterfall Model" and the "Agile Methodology".

Waterfall

Royce in 1970 was the first to document and describe in depth the development of complex software systems. Figure 16 (Royce, 1970, p.329) presents the implementation steps to develop a large software system, which is widely known as "Waterfall Model".

Unhelkar (2016) emphasizes on the sequential dependability on the previous deliverable, which means that each step of the life cycle can start after the previous step is completed, without any overlapping. According to Balaji & Murugaiyan (2012) and Van Casteren (2017) it is essential that the requirements are clear before proceeding to the next step of the waterfall model. In each phase, the tasks need to follow a certain timetable and be completed prior to their deadline. Regarding the documentation and testing, they are executed at the end of each phase and testing is executed after the code has been completely developed. This practice facilitates the maintenance of the quality of deliverables. Testers, however, are involved only in the testing phase of the life cycle.
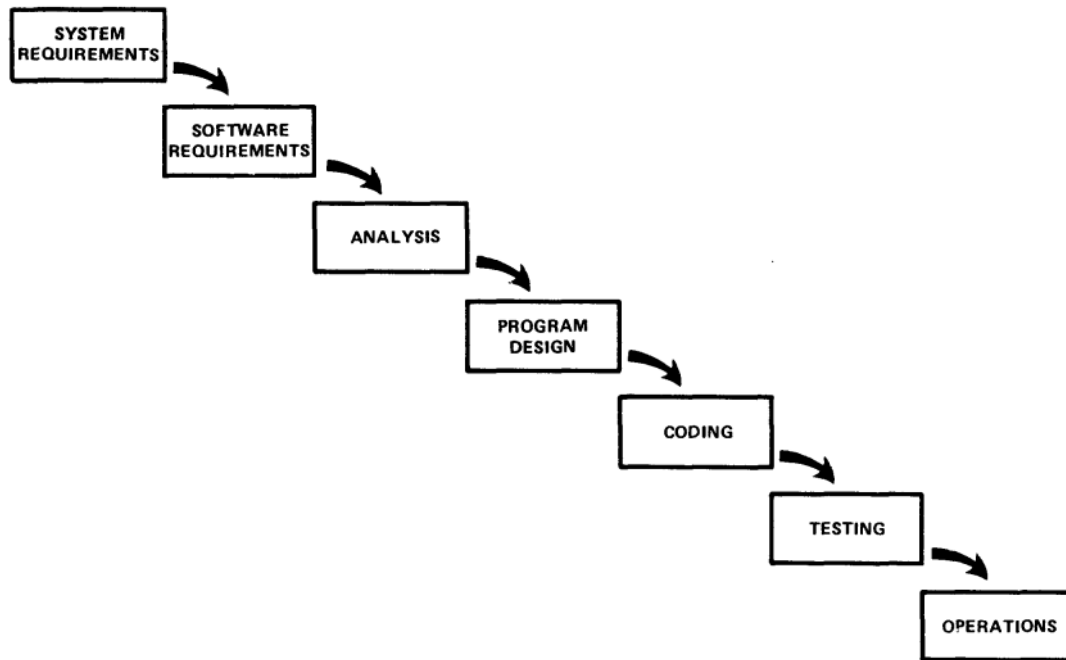
Figure 16 : Implementation steps to develop a large computer program for delivery to a customer (Source : Royce, 1970, p.329)

In the Waterfall Model, the phase of the involvement of the testers is the source of one of the most important disadvantages of this model. As stated by Balaji & Murugaiyan (2012) "The problems in one phase are never solved completely during that phase and in fact many problems regarding a particular phase arise after the phase is signed off, this result in badly structured system.". Another problem with this model is that since each step can only start after the previous is completed, which is very time consuming and expensive since useful resources remain idle for a long time. Balaji & Murugaiyan (2012) also mention the difficulty in requirements change by the customer and state that the change can not be implemented in the current development process.

Waterfall model might have some important disadvantages, but it also has some very strong advantages. As identified by Balaji & Murugaiyan (2012) and Van Casteren (2017) the fact that the requirements are clearly stated prior to the development is one of the most important advantages. The sequential and linear character facilitates the implementation and can minimize the number of resources needed since the same ones can be used in more than one phase.

Agile

In 2001, Fowler and Highsmith presented "The Manifesto for Agile Software Development" or as it is widely known "The Agile Manifesto" through which the foundation of modern Agility was announced.

Agile methodology is characterized by continuous iteration of development and testing throughout the software development lifecycle of the project. This means that development and testing activities are conducted concurrently.

Fowler & Highsmith (2001) established a number of principles regarding agile method. The first principle is customer satisfaction through early and continuous software delivery. The next rule is related to the ability of managing a change in the requirements even late in development. The third principle is related to software delivery. Agile methodology uses iterations, or sprints, which are short time frames lasting from one to four weeks each. Each sprint involves a team that includes members from all functions (planning, design, coding, unit testing, deployment, and acceptance testing – review) which is the fourth principle. Fowler & Highsmith (2001) also mention that team member have to be supported and trusted.
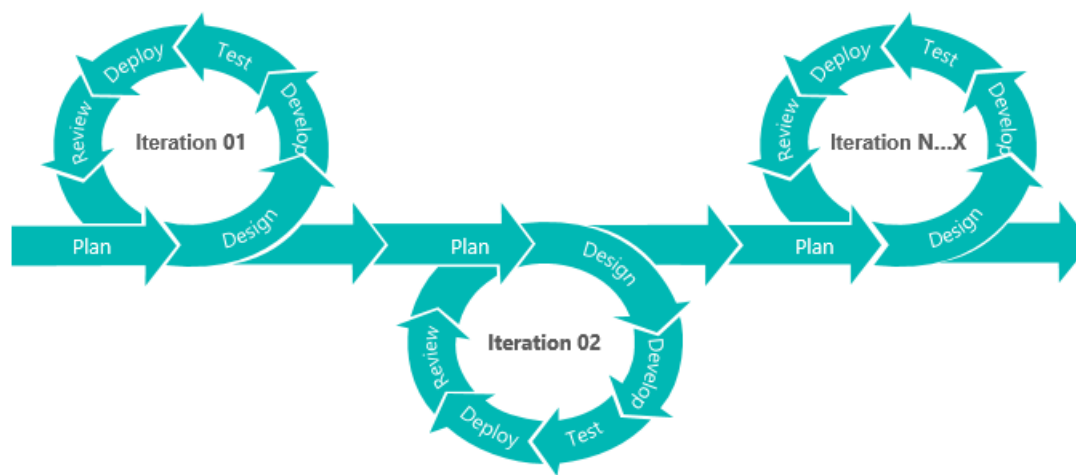
Figure 17 : Agile Methodology Iteration Intervals

Agile methodology due its ad-hoc, reactive nature has many advantages. It facilitates rapid delivery, easily adaptable, breaks down silos through cross-function collaboration and due to testing in every sprint it helps early problem detection.

Agile's nature, however, is the source of its disadvantages. Ad-hoc and reactive activities can lead to poor budget and time planning and quality can be jeopardized due to lack of clear specifications of the new requirements. Furthermore, continuous changes to the requirements and the specifications make it very challenging to maintain updated documentation.

Agile vs Waterfall

In the following table the differences between agile and waterfall models are presented regarding the application, technical, and personnel aspects, as presented by Van Casteren (2017).

Project characteristics	Agile	Waterfall
Application		
Primary goals	Rapid value, responding to change	Predictability, stability, high assurance
Size	Smaller teams and small projects	Larger teams and large projects
Management		
Communications	Tacit interpersonal knowledge	Explicit documented knowledge
Customer relations	Dedicated onsite customers, focused on face-to-face conversation	As-needed customer interactions, focused on contract provisions
Planning and control	Internalized plans, qualitative control	Documented plans, quantitative control
Technical		
Requirements	Prioritized informal stories and test cases, under-going unforeseeable change	Formalized project, capability, interface, quality, foreseeable evolution requirements
Development	Simple design, short increments, refactoring assumed inexpensive	Extensive design, longer increments, refactoring assumed expensive
Test	Executable test cases define requirements, testing	Documented test plans and procedures
Personnel		
Customers	Dedicated, collaborative, representative, authorized, committed, and knowledgeable performers, always collocated	Collaborative, representative, authorized, committed, and knowledgeable performers, not always collocated
Developers	At least 30% full-time Level 2 and 3 experts; no Level 1B or Level –1 personnel	50% Level 3s early; 10% throughout; 30% Level 1B's workable; no Level -1s

| Culture | Comfort and empowerment via many degrees of freedom (thriving on chaos) | Comfort and empowerment via framework of policies and procedures (thriving on order) |

Table 2 : Agile and Waterfall Project Characteristics (Adapted from : Van Casteren 2017)

Van Casteren (2017) categorized software development employees into five clusters according to their skill set. Level -1 is the lowest level and is comprised by employees who are "unable or unwilling to collaborate or follow shared methods" regardless of their technical skills. Level 1B is the next level and consists of personnel that is able to perform simple procedural method such as simple coding. Level 1A employees can be considered as experienced level 1Bs who are able to perform discretionary method steps such as sizing stories to fit increments. The next level is Level 2 which is comprised of personnel able to tailor a method to fit a precedented new situation. Last level is Level 3 which consists of the most experienced and skilled employees who can revise a method by breaking its rules in order to fit an unprecedented new situation.

Both Agile and Waterfall methodology have advantages and disadvantages. The selection of the system development lifecycle model depends on many factors and there is not a right or wrong choice. The management needs to consider factors such as the size of the project, the skill level of the employees and the frequency of change in the requirements.

3.3 Overview

In this chapter, the organizational actions for core banking transformation at a theoretical level were presented and analyzed in depth. In the next chapter, the actions taken by a bank using a real case study are going to be examined, using the same framework as a reference point both for guidance and comparison reasons, between theoretical and practical level.

4

Case Study

4.1 Introduction

This case study refers to one of the four systemic banks in Greece and the replacement of their core banking systems which started in 2020 and is expected to finish in 2025. The existing core banking systems are going to be replaced with one system package. This project is considered major both in terms of resources needed and significance for the success and existence of the Bank in the future.

The purpose of this case study analysis is to depict whether the theory and the framework described in the first part is applied by the Bank and to analyze some of the most important factors for the Bank, regarding their core banking transformation project.

The information used for this case study are gained through various sources. The first source is unstructured interviews with project managers and team leaders. The second source is a web-based collaboration software which contains highly confidential technical and business information regarding the project. The access to this software is constrained and needs to be approved by the management. The third source is a web-based issue tracking and project management tool that also requires management approval to gain access. The fourth source is personal observation and discussions that were conducted, due to the involvement in the migration phase of the project as part of the Deloitte team.

Due to confidentiality, quantitative information regarding the costs and expected revenues of the projects were not provided.

4.2 Program Solution

As mentioned before, the project started in 2020. This means that the vendor and the partners as well as the modernization themes and approaches are already selected by the Bank.

The new Core Banking System is replacing the existing CBS applications and covers a set of critical as-is capabilities and new capabilities and requirements from business both retail and corporate as well as support functions. One of the main objectives of the program is to deliver a solution through which future business requirements can be delivered with ease. In addition, integration with peripheral systems, migration and other non-functional requirements can be covered utilizing a flexible integration layer. This architecture can make integration easier to setup and maintain.

Partner A, which is a multinational technology corporation, is the prime contractor and leading System Integrator for the CBS program. **Deloitte** is a sub-contractor of **Partner A** for the provision of certain services in the areas of Gap Analysis and Implementation. Deloitte has also been appointed from the Bank with a role in the Program Governance. **Partner B** is the implementation partner actively participating in the integration and customization activities from the role of the software vendor. Partner B also acts as the software vendor for the new core banking suite of products that are licensed by the Bank. Partner B is responsible for the integration of data into new system that has already been extracted from a source system by the bank or Partner A, into the new system, in line with the defined parameters and schemas. New system will expose any standard API, which the System Integrator will adopt and integrate into the target systems.

Regarding the human resources, it is planned that the personnel required throughout the Program's lifetime is, on average, 300 in total, out of which 120 are from the bank and 180 from vendors. It needs to be clarified that the term personnel, in this case, includes both low and high (ex. managers) hierarchical positions. As mentioned earlier, since this project is of high priority to the bank, the personnel engaged should be only occupied with the program activities. Thus, almost 85% of the team members, which translates to 255 people, will be full-time in the program. As far as the proportion of Business and IT personnel is concerned, it is expected to be 40% - 60% correspondingly. This proportion it justified by the huge volume of technical work that needs be completed.

The new core banking system is designed to replace four key systems of the existing system : Customer, Retail Loans, Corporate Loans and Deposits.

4.3 Business case framework for modernization

The framework used by the bank in the kick-off presentation is similar to the one presented by Foest (2019). However, using the framework presented by Foest (2019) as a mapping tool, can facilitate the study regarding the comparison of the Bank's business case for transformation, which is going to be analyzed in this section and the theoretical matters that were presented previously.

4.3.1 Strategic intentions and Qualitative Benefits

According to the framework presented by Foest (2019), the first steps are the definition of the strategic intentions of the project and the qualitative analysis. The project kick-off presentation presented the six key strategic intentions of the core banking transformation for the organization. The first one is the adoption of a **flexible** software with a high degree of parametrization, able to support the increasing demand without the need of a multitude of supporting applications. It is important to mention that the bank already supports more than 5800 products and the goal is to decrease those products to 990, which translates to approximately 80% decrease, in approximately 150 product families across retail and corporate. The second intention is to improve competitiveness due to faster rollout of products and **reduce time-to-market** for newer products. The incumbent system requires up to 7 months time-to-market for major changes while the international benchmark is only 2 months. At the same time, **operational risk** will be decreased as scarce IT skills, used for the support of outdated systems and program languages such as COBOL, will no longer be necessary. The next point is related to **reduced IT maintenance**. The bank needs to adopt a highly agile core banking system that does not suffer from excessive complexity or fragmentation. The consolidation of several stand-alone applications which can interact with one another means reduced IT maintenance and faster problem solving. The current system has 38 different 'core systems' among 585 applications. The goal is to merge and integrate those core systems in the most efficient way. Another principle is about adopting a new core banking system which is able to exploit the capabilities **cloud** computing can offer, which is the future of banking as mentioned in the trends of banking sector. With the existing system it is very difficult to integrate with cloud technology and it requires much time and effort. The last strategic intention is the **regulatory compliance** with various legislation that apply in the various countries the Bank operates.

4.3.2 Challenges and risks

The next step in the modernization framework is to identify the qualitative risks or challenges that are involved in the core banking replacement project. The first and most important challenge and a critical factor for the project success according to the interviews is **Change Management**. Its main role is to ensure that the strategy is realised throughout the organization and taking actions regarding leading, engaging and supporting people through change at both the individual and organisational level. The success of the project is highly dependent on people's active participation and willingness to adapt. Participation in activities and trainings, efficient response times and collaboration between the various times both inside and outside of the bank are some of principles that have to be followed. "The change for the Bank's personnel

is going to be difficult in the beginning, but with the help of Partner B we have established a training program that we help employees adapt in the new system" Bank PMO. Another important challenge in such projects is '**gap analysis**'. The very challenging purpose of gap analysis is to identify the functionalities of both current and new system and recognize those functionalities that the new core banking system does not serve adequately or that are not available in the incumbent system but need to be delivered by the new system. Another challenge, that is generated by gap analysis but was emphasized during the interviews as a challenge itself, is the **Change Request Management**. The purpose of this process is to request an alteration and control the change requested. In order for the project to be successful it is critical that roles and responsibilities as well as the detailed processes need to be established and make sure that they are followed. **Governance** is also a factor that was highly raised in the interviews when discussing about challenges as well as throughout the project documentation. As mentioned earlier, governance facilitates information management, project delivery, roles and responsibilities of bank and partners, and escalation management. These are critical activities for the success of the project and thus a thorough governance plan is a great challenge for the organization. The next challenge is related to **stakeholder** management and categorization as mentioned in the "Pursuing modernization in banking sector" section. "**Quality**" and "Quality Management" are some of the terms that were highlighted during the interviews and throughout the project documentation. "Core banking transformation projects emphasize on the quality of the deliverables. It is important that we can keep up with the deadlines, but we prefer to be a little late than delivering a product that doesn't meet the quality standards." Bank PMO. The last challenge is related to the **Covid-19 Pandemic**. Since the project started during the pandemic the Bank tried to find ways to minimize the effects it may have on the project. It has introduced new challenges and risks for business as it has brought to surface the need for managing remote working. In this scope the bank must define working methods for Delivery Teams and ensure access to the Bank's systems remotely and resolve Security and Networking issues as soon as possible.

In the following sections the most important and complex risks and challenges are presented in detail along with the approaches and activities the bank has planned in order to manage them and reduce their impact.

4.3.2.1 Change Management

As already mentioned, change management is one of the most important factors for a successful business transformation. Its missions are to define the delivery approach that is necessary to achieve the project objectives successfully and facilitate the business transformation journey during the execution of the project. It also aims at ensuring that the business strategy is realized,
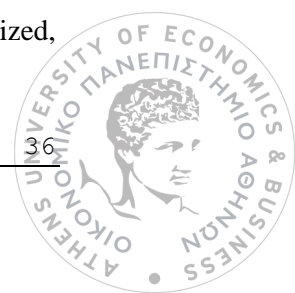
via leading, engaging and supporting people through change at both the individual and organizational level and minimize resistance to change.

The actions and responsibilities of Change Enablement are divides into two group accordingly to whether they are done once-off or repetitive. Regarding the first category, it has the overall responsibility for developing the change enablement framework and the definition of the training strategy needed for the smoothest transition to the new system. Successful communication of the project's achievements as well as the provision of adequate publicity to the stakeholder are also expected from change management. Lastly, it is in charge for creating a unique program identity. As far as the latter category is concerned, change enablement is responsible for planning and coordinating the training activities to meet the training plan objectives, which are discussed in detail later in the thesis. It also organizes Business Induction Training (BIT) on the product for targeted Business SMEs of each specific Stream, to help business users increase their familiarity with the new Core Banking System and improve the user friendliness of the solution where possible. Moreover, it plans and prepares all parties involved in the core banking transformation process either directly, for example users, or indirectly, for example support functions, in order to achieve operational readiness ahead of the go-live date. It is critical that change enablement process starts at the very beginning of the project and ends after the complete system release.

In the beginning of the program, change management needs to develop a repository of the business processes that are affected by the core banking transformation. The next step is the identification of the stakeholders who suit the criteria of the change agent role. Change agents can either be change sponsors in case they come from leadership, upper management levels or head of division, or they can be change champions if they belong to hierarchical levels between end users and lower management. Change agents are very important for the change enablement process are they act as influencers and are seen as trusted advisors by their colleagues. Regarding the criteria or qualifications needed, the first is related to strong communication skills and proactiveness and high-performance in their field of knowledge or skills. They, also, need to have a deep understanding of the current processes and systems. Moreover, robust knowledge of the wider team is required, in order to support resource coordination for ad-hoc activities. Finally, they should be able to articulate feedback to the relevant change program. Third step in the change enablement roadmap is the organization of business induction trainings in which targeted business SMEs of each specific team are going to participate. Since these trainings take place before the streams, the system used is the vanilla version which means that has no customizations applied yet. Before the begging of each stream the cycle integration points must be identified. Prior to the completion of the last interval for each stream, change enablement management needs to participate in the three-week delivery iterations which

include planning, demonstrations, backlogs that need to be addressed and reordering of the activities when and if necessary. Before the beginning of the user acceptance test cycle, activities that are necessary for the new core banking system implementation are defined. After the user acceptance test cycle, key business users impacted by the transformation must be identified and tailored training sessions must be offered in order to increase familiarity with the new system. Following the complete system release is the creation of an extensive knowledge library that is going to facilitate as a training and learning repository throughout the program execution. The existing documents must be updated, and new ones need to be developed in order to finalize the new process repository. The change management plan is presented in the diagram below in a more detailed way.
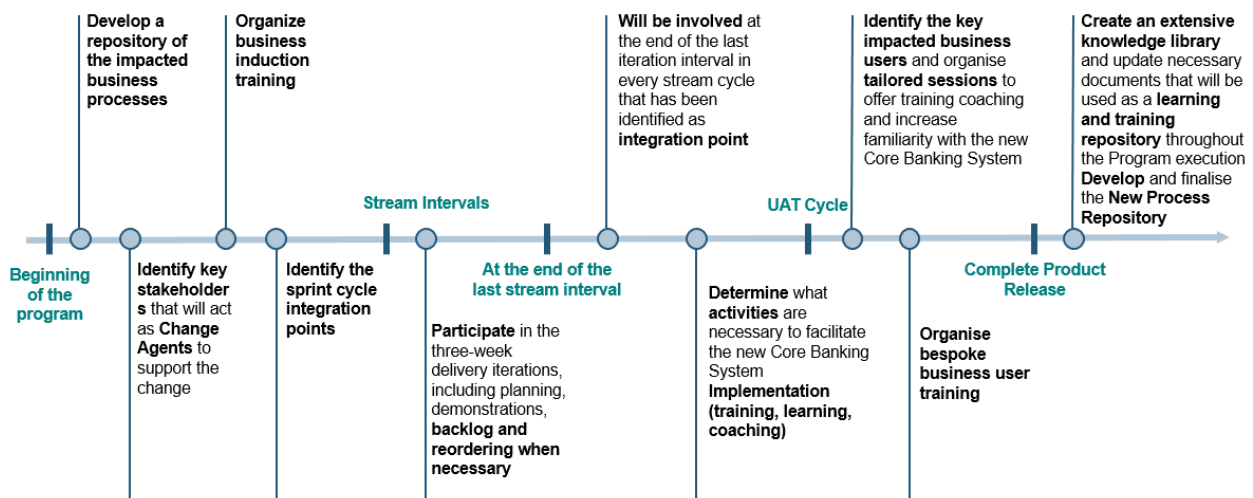
Figure 18 : Change Enablement Framework

Training Strategy

A critical factor for the success of the program is the change enablement achieved through the training and reskilling of the bank's personnel as mentioned by Kumar Basu (2015) and the Bank's PMO. Training refers to the methods, tools or approaches which provide to employees the knowledge, skills, and competences they need in order to improve their job performance and meet both the short-term and long-term organizational goals. Training strategy should establish coherent and consistent approaches and standards for training across the teams of CBS program and it should develop an approach that provides knowledge transfer and post-training reference to end-users. Training activities should support the upskilling of bank's resources in order to be able to participate at the design and implementation of the new core banking system and to develop gradually evolved capabilities in order to make the most of the new system. They should aim to a smooth transition to the new way of working for the end users both at the front end and back-office systems. Lastly, they should create and maintain a comprehensive and innovative CBS training program suitable for reskilling the existing workforce and at the

same time include a framework for onboarding newcomers that will be used for the implementation and the operation of the system.

The Training Strategy is developed under the CBS Training Task Team in consultation with external experts from the Solution Vendor (SV), Partner B, the Solution Integrator (SI), Partner A and the Bank group human resource development division. The primary intended target audiences for this strategy are CBS Program Teams members both staff and flexible capacity, CBS teams supervisors and management, CBS-affiliated teams' workforce from the SI and Bank personnel currently outside of CBS Teams but who will be invited to act as Subject Matter Experts (SMEs) during the CBS program implementation. Secondary audiences that will also benefit from this training strategy when the program is about to deliver, include Bank end-users and application support personnel who will be responsible for the daily operations, support, and application management.

The bank has set several guiding principles regarding training strategy, its implementation and the staff that is involved. Learning is considered an integral component of bank's culture and it is required to fulfill the increasing expectations of core banking system replacement project. The Bank recognizes that learning is a long process through which the CBS program workforce can develop knowledge and skills through informal and formal interactions. Organized training must be targeted at specific capability gaps and seek to accelerate, strengthen, and consolidate the application of newly acquired learning to the banking workplace. The Bank also recognizes that individuals come from different learning backgrounds and therefore require exposure to different training modalities. As a result, the Bank seeks to increase training opportunities for its staff, teams, and partners with increased accessibility and adaption to the training needs and preferences of the primary audience. But learning comes not just from training, but also from experience on the job. The 70:20:10 Model for Learning and Development is a commonly used formula within the training profession to describe the optimal sources of learning. The model suggests that individuals obtain 70% of their knowledge from job-related experiences, 20% from interactions with others and 10% from formal learning events.

In order for the training strategy to achieve the goals defined earlier, several critical success factors have been established. Support and commitment of sponsors, along with the engagement of subject matter experts in the training process is of high important. As a result, the changes at all levels of the organization are understood and all functions affected by the change can have the appropriate training course, with a training coordinator and a specific training team that covers their needs. Training needs to serve clearly established objectives and learning outcomes and has certain measures of success. The Bank emphasizes on the identification of the best course design framework that is consistent with the organizational culture, taking into consideration past experiences, and building a network of technical support. At the same time,
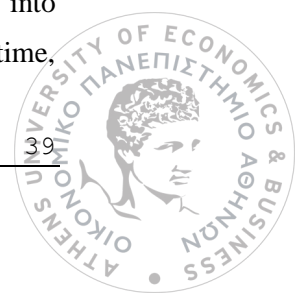
the recognition of the target audience and the best methods of training delivery that are feasible, add value, and are aligned with the stated training objectives is very important.

Challenges and Risks of training strategy

A successful strategy needs to take into consideration the challenges and risks of the training plan. The fact that the personnel involved in the core banking transformation and, especially, the personnel affected by it come from different technological backgrounds is a challenge itself. Reskilling these personnel is even harder as training strategy must be developed in the most efficient way to cover the needs of the audience, with respect to the available resources. In this scope, the management need to identify and engage with the right training provider for proactive and effective training program, a process which is time consuming. Another challenge is the creation and coordination of training courses, either in form of once-off training or repetitive training cycles, that incorporate the gradual new implementations of the program and the implementation of training sessions that cover the current needs of the personnel. Furthermore, the creation of an effective onboarding process that can achieve a faster adaptation of new skills and knowledge is rather challenging. Raising awareness for the need to attend training courses in any form is one of the most difficult tasks of training strategy as it requires the engagement with diverse stakeholders both from IT and business units.

Except for challenges and risks, a strategy or plan must always take constraints into consideration as they are the key factors affecting the implementation and quality of the training program. One of the most important constraints is time. When having plenty of time available, training can be better organized, from planning, to implementation, to the quality of things learned. Training timing is also very important in accordance with its application, as providing the training earlier or later than needed can limit the effectiveness. Budget is also one of the critical constraints. Insufficient financial resources may lead to the fact that programs are selected based on their cost and not on the organizational and employees' actual needs, or worst-case scenario, it can even lead to courses not being conducted. The next and last constraint identified by the bank is the availability and engagement of the personnel-audience in terms of participation on the respected program schedule, self-assessment exercises and operational educational environments for practice. The self-development part of a training activity is very frequently evaded, but it should be considered necessary and as significant as the formal training. To minimize this issue means for measurement should be identified.

Training Governance

A well-defined training strategy includes the establishment of a thorough governance and management plan that are related to the CBS delivery implementation. The Bank has assigned four training governance bodies.

The first one is the CBS training coordinator, which leads and coordinates learning strategy development, implementation and monitoring of progress. This role is also in charge of coordinating the learning strategy implementation, establishment of focal points across the Bank, information flow, management, communication, planning, procurement, resource mobilization and reporting. CBS training coordinator is also responsible for training quality, and training design and roll-out. Several business units are required to participate in designing and delivering function-specific training within the overall CBS Training Strategy and standards, and to contribute to mandatory and other categories of training and learning.

Next, is the CBS training task team which is consisted by the Leads from different Teams and Streams of the Program. They hold a meeting annually in order to depict their training needs, assess the trends with the solution vendors and solution integrators and finally draw a plan. The training task team's responsibility is the proposal of the annual training plan, that is approved by the CBS program director.

The third body consists of the bank human resource development division and the human resource partners of the business areas, units and function that are affected by the core banking system transformation in any way. Their involvement constructively aims to add value and accelerate the process of training and development activities with all the aforementioned parties, by facilitating them in actions such us forming the learning strategy, reviewing, piloting, designing, planning, implementing, monitoring, evaluating and every other necessary aspect within their field of expertise. They work closely with the CBS training coordinator, the CBS training task team and the training focal points for the training strategy and its implementation.

Training focal points is the last governance body. It is comprised of all the IT units, the Corporate and the Retail Business Units which are responsible for the branches' strategy, the customer entity, the products and lifecycle of loans and deposits. They are responsible for ensuring that the training activities are aligned with the CBS annual global training implementation plan and their personnel needs. Training focal points work closely with the CBS Training Task Team to ensure coordination, coherence, and quality.

The following diagram present on overview of the training strategy implementation phases.
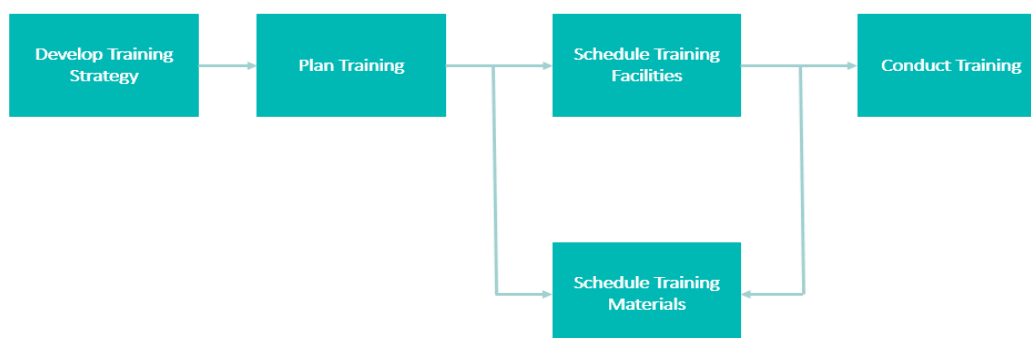
Figure 19 : Training Strategy Implementation Steps

In the first phase which is training strategy development, a) the training audience is evaluated and determined, b) the training media and delivery strategy are defined, c) the training logistics and facilities are assessed, d) the needed document strategy is developed, e) the training curricula and standards are designed and lastly, f) the high-level training plan is developed.

The next step is about planning the training process. In this phase, the training requirements and high-level plan is confirmed, the course modules along with the objectives and timing planning is specified, the course plan and schedule are determined and finally, the training and course materials are developed.

The third step is comprised of two sub-steps that run in parallel. Schedule training facilities involves activities such as planning training logistics and facilities and preparation for the training program. Prepare training material is related to preparation, testing and validation of the course material and environment.

The final step is the execution of training. In this phase training applicable are conducted, training material is refined if needed and training is delivered and evaluated.

The Bank has identified the training types that will be used, along with a brief description, the trainer and the trainee as shown in the table below :

Training Type	Description	Trainer	Trainee
Induction training	The first goal of this training type is the presentation of the product and the processes for the familiarization with the new core banking solution. They also work as prerequisite for the gap analysis workshops.	Solution Vendors	Bank's Core Team (business units, business analysts and IT)
Technical Training	The purpose of technical training is to reskill the existing and on-boarding technical personnel. These courses also cover the administration of operating systems, databases and middleware. Technical training is very important as it	Software and hardware providers	Infrastructure team, business solution teams, delivery teams

	includes Java and JavaScript programming course, which are the main languages the new core banking systems is developed in. In addition, the trainees get ready for the official product certification. It is required that the architecture blueprint has been finalized prior to this form of training is conducted.		
On-the-job training	This form of training takes place during the implementation of each sprint. The goal of on-the-job training is to help trainees build skills. It involves coaching and ad-hoc knowledge sharing events.	System Vendors and System Integrators	Delivery Team
Train the Trainer	Train the trainer takes place for every delivery wave, upon the finalization of the system integration testing and before the user acceptance tests. It is more in a form of presentation, and it covers all the user roles including front-end users back-end users and support users.	System Vendors and System Integrators	Bank's core teams and Bank's trainers
End-user training	This training takes place in collaboration with the group human resource development division. It involves targeted audience per stream and in selected areas classroom courses are conducted. In most cases they come in form of e-learning courses that aim in knowledge building by demonstrations via simulations, assessments and skill checks.	Bank Trainers	Branch frontend and Business Operators, Help Desk, Business units users

Table 3 : Types of training forms

4.3.2.2   Gap Analysis

Gap analysis is one of the most important activities in such projects. This is because based on the outcome of the gap analysis team, the needed customizations are proposed. Discrepancies that occur during gap analysis can lead to system parametrization. In order for the Bank to minimize failure of identifying gaps, or errors, has assigned Process CoE as a part of the gap analysis team. "A Center of Excellence (CoE) is a body in an organization that works across business units (BUs) or product lines within a BU and has a leading-edge knowledge and competency in that area. It is comprised of highly skilled individuals and experts, who disseminate knowledge in an organization and share best practices." (Salta et al., 2020).

However, not all gaps can be spotted on time, so according to the project plan presented in figure 24 and Bank PMO, although this activity was planned to be completed in the first trimester of 2022, it is extended further due to discrepancies that occurred between the existing systems and the new one and failed to be detected in the beginning due to the completely different structure between the two systems.

4.3.2.3 Change Request Management

As mentioned earlier, in any project, the need for a potential change in task or process can never be completely omitted, however thorough the project is designed. Change requests aim to document in a detailed and official way, the aspects that need to be modified and what modifications are needed.

Change request management documents are a core component of the change management process. Preparatory to describing the change request management process, the roles, and activities of each role, along with a mapping with the program roles, must be established. The following table contains the certain information.

Role	Activities	Mapping with Program Roles
Change Identifier	Identifies potential changes in scope and informs Change Manager	A change identifier can be any member of the program team or any of the program stakeholders
Change Manager	In charge of owning and coordinating the change management process	A change manager can be a member of the vendor PMO Team
Change Request Implementation Manager	Their role is to own and implement the approved change request	They can either be part of the vendor program team lead or the Bank program team lead
Change Control Board	In charge of approving or rejecting the change request (level 1)	These responsibilities are applicable for the change control board
Steering Committee	Responsible for approving or rejecting the change request (level 2)	These responsibilities are applicable for the steering committee
Executive Committee	Responsible for approving or rejecting the change request (level 3)	These responsibilities are applicable for the executive committee

Table 4 : Change Management Roles

The overall Change Request Management Procedure can be summarized in nine steps. The first step is the request for change. The team lead or stream lead raises the initial change request and sends it to the Bank PMO Team. Then, the Bank PMO Team conducts the initial screening and logs the change request in the program change request log. The next step is the review of the

initial program change request. In more details, after conducting the initial screening and validating the information provided, the Bank PMO team submits the change request to the change control board (CCB). The CCB reviews the change request and approves, rejects, or provides a recommendation for further approval. Consequently, if the change request is approved by the CCB, then the Bank PMO team initiates and executes the signature process, which is described later on. In case the change request is rejected, the Steering Committee is informed, and the outcome is logged in the Change Request log. If further approval is required, then the Change Request will be presented at the Steering Committee. The Steering Committee reviews the Change Request and either approves, rejects, or escalates to the Executive Committee for further approval. If the Change Request is approved, then the Bank PMO Team initiates and executes the signature process. If the Change Request is rejected, the outcome is logged in the Program Change Request log. At this step the Executive Committee reviews the change request and proceeds to either approve or reject it. In case of change request approval by any of the Governance Bodies in the hierarchy during the procedure, the Bank PMO Team will initiate and execute the signature process. If the change request is rejected, the outcome is logged in the Program Change Request log and the procedure ends. The next two steps are only applicable if the change request is approved. Implementation of the change request comes next. As the Bank PMO Team has executed the signature process, the Vendor begins with the implementation of the Change Request. As soon as the signature process has been finalized, the process to "Add New Activity" in the program plan for the implementation of the Change Request should also be initiated.

Although the change management project is carefully planned in order to facilitate the change request procedure, it was made clear by some program team leaders, in this case change identifiers, that the process was very time consuming and some simple change requests are escalated and thus some activities are falling out of schedule or are not done according to best practice. For example, the migration team found a gap in the new system, the change request is made and is now escalated to the executive committee. The migration team has to wait for the decision and thus has fallen out of schedule. And as they reported this is just one of the examples regarding this issue.

Figure 20 represents the process-flow that is followed to raise, assess, evaluate, and decide on the implementation or rejection of a Change Request.
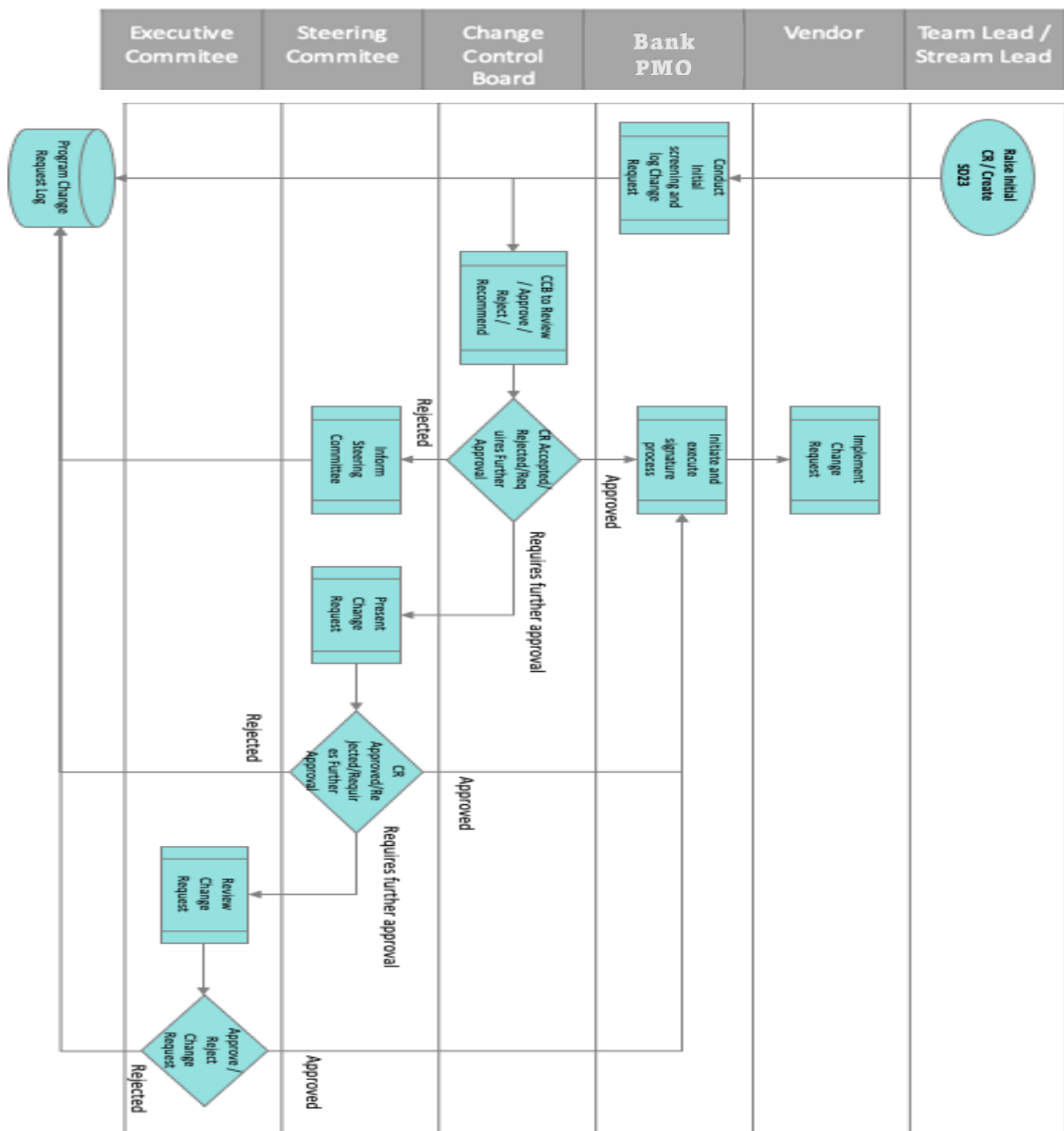
Figure 20 : Change Request Process

4.3.2.4 Program Stakeholders

This section provides an overview of the internal program stakeholder environment and a high-level description of their role on the project to better explain the impact of the transformation in these different stakeholder groups. The first category consists of the users of the new systems landscape. The users are further mentioned below:

- Central Unit Users
- IT General Unit
- Operations
- Corporate Banking Units
- Business Products & Retail Loans

- Retail Deposits Products and Investments

- Branch Users

The next category are operators of legacy systems followed by operators of systems to be integrated. The two next group of users are vendors and in-house software engineers for legacy systems and for systems to be integrated. Bank's support units and functions (Legal, Compliance, Risk, Audit, Security, Internal Control, Finance, Procurement, Human Resources) are each considered a group on their own. Each governance body and their meetings are also considered a group on their own.
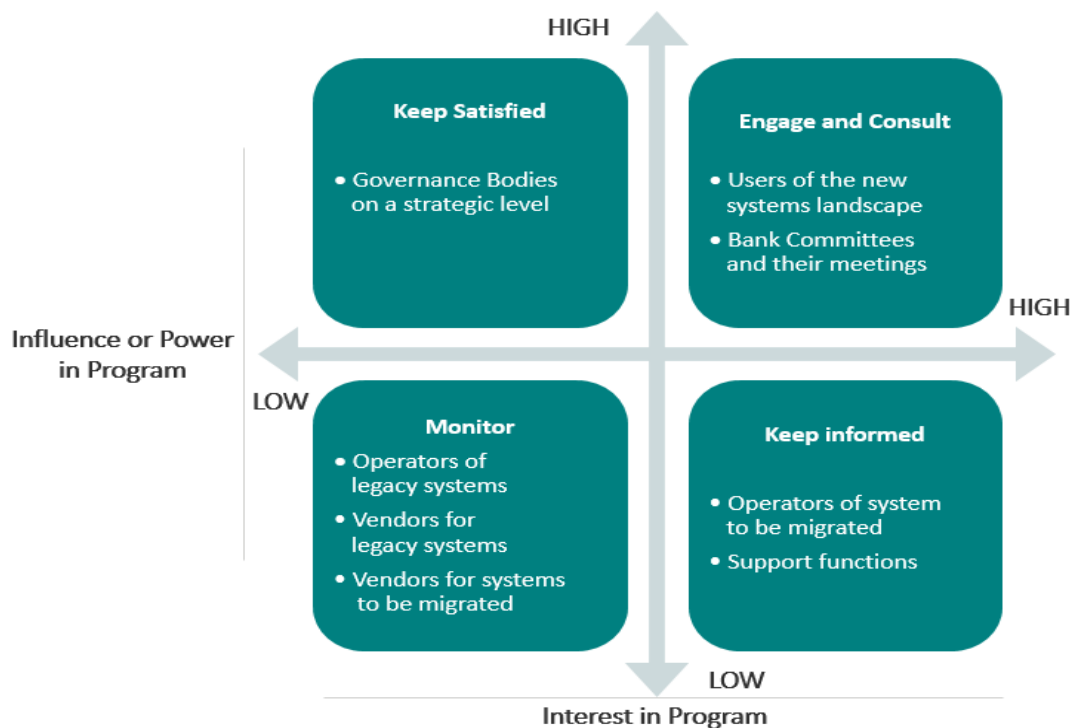
Figure 21 : Program Stakeholder Map

After having identified the impacted stakeholder groups, a simple graphic representation is used to identify the level of interest and influence of each stakeholder group on the program, the level of interaction expected between the program and each stakeholder group and the actions required so that the program team can ensure a smooth cooperation and interaction with the various stakeholder groups.

4.3.2.5   Governance

Governance is very important for the project success as reported by Caliste (2012) and bank interview sources. Thus, the Bank has planned to institute a formal governance based on some principles. Governance should be lean organized and consist of few committees that conduct meetings on a schedule which is predefined by the program management. Joint participation by business and IT departments should be ensured in every body and meeting, especially those whose purpose is decision making. This principle can be justified by the expertise each part can

bring "to the table" and facilitate the progress of decision making leading to the best decision possible. Each body is given a certain authority decision making in order to achieve fast progress of the project and at the same time avoid escalation of potential issues. It is crucial that resolution of issues is achieved at the lowest possible level, saving time and monetary resources. All meetings and actions of the bodies are overviewed and monitored by the Bank's operational risk team assuring that each bodies' decisions were authorized based on their authority and that there are no hidden risks or any undetected side effects from those decisions or actions.

It is imperative that a communication plan is established for Governance where the frequency of the meetings of each body and sub-body is clearly stated. Furthermore, the plan should indicate the attendees, by their role, and the objectives of the meetings must be mentioned.

Project governance consists of the following bodies:

Program team bodies have the lowest level of authority, and their decision making is restricted in tactical issues. These bodies are composed of leaders from all program teams and are divided according to their purpose. The purpose of the first sub-body is conducting status report meetings which aim at providing detailed status of the program, such as planning progress, issues that have occurred, potential risks, resource usage and availability (RAG status)[1] as well as the identification of open items and decision making regarding follow-up actions. The next sub-body is responsible for carrying out planning meetings which goal is to monitor running activities and discuss planning issues. Stage gate meetings shall be conducted in order to review the criteria of entering or exiting a stage gate or else phase gate and decide whether to proceed to the next stage in case certain criteria are met. The next sub-body's objectives are to review program changes when they occur and to initiate the change control process. More specifically Program Change Advisory meetings should evaluate and analyze each change and then decide whether to approve or reject a change. In case a change follows out of the meetings' jurisdiction due it's significance for example, then these meetings can decide to escalate those issues to Steering Committee for further approvals. Design Authority is the fifth and last sub-body. The purpose of their meetings is to discuss items regarding architecture and functionality issues and decide which is the optimal solution. In more details, one of their roles is to develop, promote and control standards for IT systems and proceed to control the level of agreement of the design to IT guidelines and best practices. Moreover, Design Authority Meetings should review and evaluate the architectural designs, provide recommendations, and take decisions on designing issues and the evolution of core banking system items.

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[1] "In project management, RAG is an acronym that stands for Red Amer Green Status and relates to project status reporting which is utilized by the project manager to indicate how well a certain project is performing" PMTips (2016)

Steering Committee is the next level of governance procedure. It is responsible for the success of transformation and change issues, as it sets targets and boundaries for change control. As mentioned before, Program Change Advisory sub-body in some cases need the permission of the Steering Committee to proceed in certain changes regarding for example timelines and resources.

Executive Committee is one level above Steering Committee as far as authority is concerned. The objective of this body is to take decisions on already escalated issues. Such issues can be managing major change requests that require changes in project prioritization of the delivery schedule.

The highest level of governance is **Board of Directors.** This body is planned to conduct meetings every three weeks and the purpose of the meetings is mostly to supervise the project, inform the participants about the progress and verify that there are no legal matters. When needed, they take decisions exclusively on strategical issues regarding the project. Examples of such issues are the vision and the overall goals of the project, large matters that affect the status of the project and high-level policy decisions.

The figure below illustrates the pyramid of governance based on the complexity of the issues each level has to deal with and the level of authority they are given, as well as the frequency in which meetings are conducted. The base of the pyramid indicates frequent meetings and low authority and simple decisions, while the top of the pyramid indicates rare meetings and high authority and difficult decisions.

Figure 22 : Governance Pyramid

The detailed Governance communication plan is designed as following:

Governance Bodies	Frequency	Attendees	Objective
Board of Directors	Every 3 months	Members of Bank Board Bank Program Director Vendor Program Leads	Informed for the program progress Take decision if needed
Executive Committee	Every 6 weeks	Members of Bank's Executive Committee Bank Program Director Vendor Program Leads	Informed for the program progress Take decisions on escalated issues (e.g., (re)prioritization of delivery, change requests)
Steering Committee	Monthly	Program Sponsors Bank Program Director Vendor Program Leads Bank PMO Lead Vendor PMO Lead	Responsible for the success of the program Sets targets and boundary conditions for the program (e.g., timeline, resources)

Status Report	Weekly	Bank Program Director Vendor Program Leads Bank PMO Lead Vendor PMO Lead Program Teams Leads Program Streams Leads	Harvest and Communicate RAG and detailed Status from all Teams and Stream/Sub-Streams in terms of planning, issues & risks, program open items and change requests Monitor actions from previous Status Reports Decide the points to Escalate to other Governance Bodies
Planning	Weekly	Bank PMO Lead Vendor PMO Lead Program Teams Leads Program Streams Leads	Monitor activities of the program plan Discuss planning issues
Stage Gate	Upon Stage Exit/Entry	Bank Program Director Vendor Program Leads Bank PMO Lead Vendor PMO Lead Program Teams Leads Program Streams Leads	Review the Entry/Exit Stage Gate criteria Decide whether to proceed to the next stage
Program Change Advisory	Bi-weekly/ ad-hoc upon change raised	Bank Program Director Vendor Program Leads Bank PMO Lead Vendor PMO Lead Program Teams Leads - optional Program Streams Leads - optional	Review Program Changes and Change Control Approve/Reject Changes Decide whether to escalate to Steering Committee for further approvals
Design Authority	Bi-weekly/ ad-hoc	Solution Architect Lead Bank PMO Lead Vendor PMO Lead Program Teams Leads - optional Program Streams Leads - optional	Review and evaluates designs in the context of the overall architecture Provide recommendations and Take Decisions on designs Develop, promotes and controls standards for IT systems and checks the adherence of design to IT guidelines and best practices Decide on CBS Evolution items

Table 5 : Governance Communication Plan

4.3.2.6   Quality Management Plan

"Quality management is the act of overseeing all activities and tasks that must be accomplished to maintain a desired level of excellence. This includes the determination of a quality policy, creating and implementing quality planning and assurance, and quality control and quality improvement. It is also referred to as total quality management (TQM)." Barone (2020).

The Bank has established a quality framework to better manage the process. The center of the framework are the quality activities. The quality metrics and quality templates are inputs to the quality activities, whereas the quality checkpoints and the quality gates are points in time where the execution of the quality activity takes place. The quality activities will subsequently lead to the quality assessment and recommendation that will be submitted to the quality evaluation.
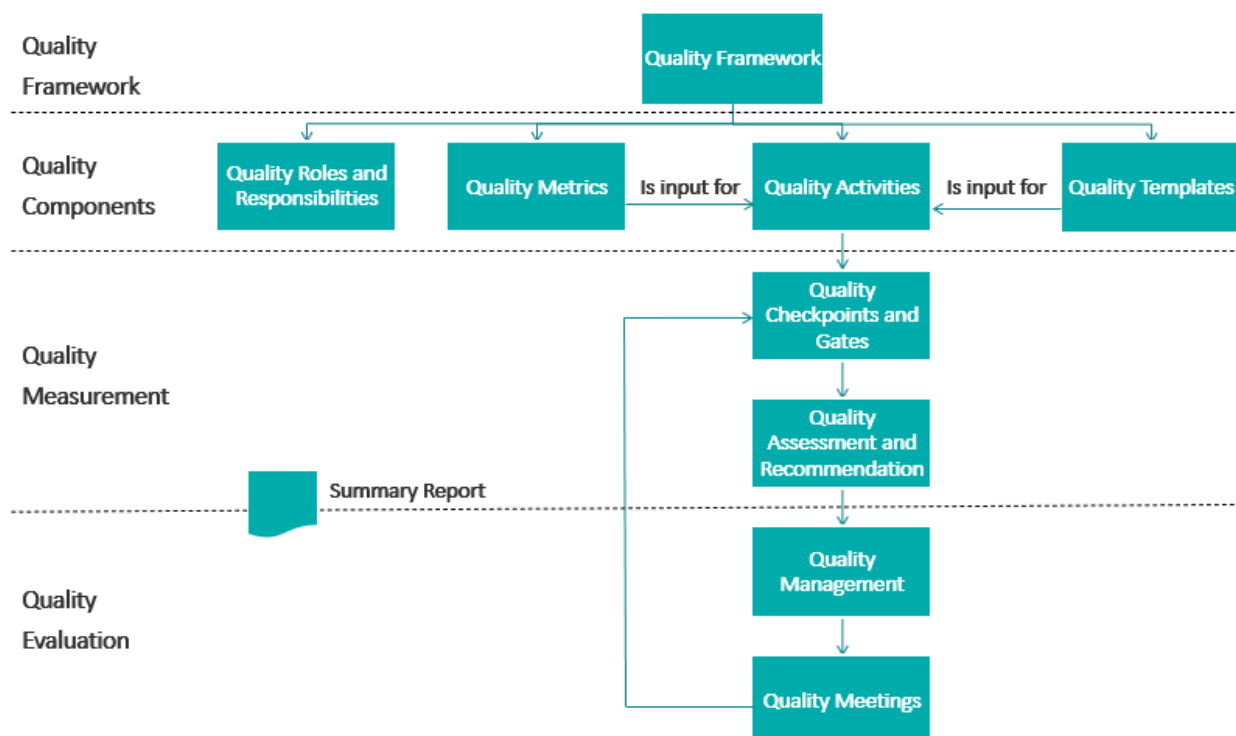
Figure 23 : Quality Management Framework

The table below outlines the key stakeholders and roles involved in implementing the quality plan on the program, which is the first step in the quality management framework:

Role	Name	Responsibility and Authority
Program Directors	Bank Partner A Partner B	Program Directors have the overall accountability for the enforcement of the Program Quality Plan

Role	Name	Responsibility and Authority
Client and Delivery Leads	Partner A Partner B Deloitte	Client and Delivery Leads share the overall accountability for the enforcement of the Program Quality Plan along with the Program Directors
PMO Leads	Bank Partner A Partner B	Responsible for the execution of the Quality Plan and monitor Quality Templates and Reports
PMO Quality Manager	This role will be covered by members of the PMO team (Bank and Partner A)	Responsible for ensuring that the Quality Activities are conducted, for performing certain quality activities, facilitating the Quality Meeting and producing the Summary Report
Quality Activity Contributors	All Program members	All Program members are responsible for adhering and contributing to the Program Quality Framework
External Quality Manager / Executive	Partner A	Quality Assurance Quarterly review with key Bank stakeholders

Table 6 : Quality Management Roles and Responsibilities

The next step in the framework is the definition of quality metrics. A quality metric specifically describes the measure that will be verified to control the quality of the deliverable. These metrics are input for the establishment of quality activities. They are defined as the set of actions that will be performed during the execution of each main activity during the program with the aim to provide the appropriate metric.

Another prerequisite for quality activities are the quality templates. A quality template is the reporting tool that will be used and will contain the fields required to be collected for the metric. Another input to the quality activity and supplementary to the quality metric are quality templates. They can be in the form of a checklist, a report, or even an email.

After the quality activities are established, the quality checkpoints and gates must be defined. Quality checkpoints are reviews that will be performed to measure the quality of specific deliverables and will take place during the execution of each of the main activities. Quality gates are reviews that will be performed to measure the quality of all the deliverables during the checkpoints and will take place at the end of each of the respective main activities. Once

completed and provided that the results are satisfactory, the main activity is marked as complete and exited.

Next, quality assessment is a comprehensive review of the quality metrics, quality templates and activities. During the quality recommendation the PMO quality manager along with the SMEs will identify any quality issues in the quality metrics produced and come up with recommendations if necessary. T

he PMO quality manager needs to produce the summary report that will incorporate all the quality metrics that have been produced and any recommendations agreed. Quality management, taking as input the summary report are all these activities that help manage the outcome of the quality assessment and recommendation.

The summary report is then presented at the quality meeting where a review between the participants takes place to determine whether corrective or remediation action is required.

Quality meeting is the vehicle used to take necessary decisions based on the outcome of the quality recommendation, and it is a specifically organized meeting to help evaluate the findings of the Summary report and the recommendations made. Participants of this meeting are the program directors, client delivery leads, PMO leads, stream leads, the program team leads and the program quality manager who is responsible for facilitating the quality meeting.

4.3.3 *Modernization Theme*

Next step according to the modernization framework is the selection of the modernization approach.

4.3.3.1 *Core banking transformation approaches*

Out of the four transformation approaches reported by Kooijmans et al. (2012) Bank decided that the "Package Implementation" and specifically the "Progressively Replace" strategy is the most suitable. The legacy systems the bank has are very old and are Cobol based. Due to the fact that the technology used is obsolete and people no longer study them, there is no available skill set and knowledge. Furthermore, the Bank Program Director mentioned in an interview that the package chosen meets "…almost 82% of the business requirements" which is considered "…a great fit" as he mentioned. The argument is also supported by Kooijmans et al. (2012) The reasons "Progressively Replace" was preferred to "Rip and Replace" is the fact that the later engages more risk when it comes to day one functionalities that the first one and the bank surely cannot compromise on that aspect.

Regarding the roll out strategies proposed by Kilimnik & Pavlovski (2014), the Bank decided to roll out by customer segment. The reasons for this strategy selection is to consolidate the
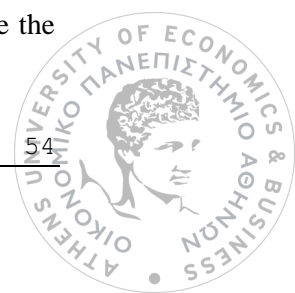
customer records in a central repository and tackle the data duplication problem that is going on.

It is planned that the full roadmap of the program has a horizon of approximately 4.5 years in order for the functional requirements of the bank to be covered. The project is broken down into six delivery streams. To be more specific, 'Customer' and 'Corporate Loans' have one delivery stream. 'Retail Loans' is divided to two delivery streams, 'Retail Loans' and 'Retail Credits and Overdrafts'. 'Deposits' is also planned to be delivered by two delivery streams, 'Deposits' and 'Term Deposits'.

The bank has planned the delivery approach based on some guiding principles. The first is related to business needs that are not covered by the existing legacy system. Business areas that are not adequately enabled by existing legacy core systems, such as Corporate Loans, shall be developed first so that they have immediate benefit from the implementation of the new core banking system. The next principle refers to technical complexities. Areas that have such complexities should be worked from the beginning of the project so as to provide sufficient time to successfully be delivered on schedule. Such system is 'Customer' that has a large number of interfaces within the rest of the banking systems. The next principle has to do with minimizing the impact of the program. More specifically, changes to production should be planned in a gradual way in order to avoid impacting many customers at the same time and synchronously allowing for gradual assessment of the system performance. This principle is facilitated by the phased data migration which eliminates downtime or operational interruptions and leads to a smoother adjustment to the new system.

Figure 24 portrays the roadmap of the core banking transformation project on a high level. As one may notice, 'Customer' has the biggest duration, of all delivery streams as it is planned to last four years. This is justified by the importance of the particular system, since it contains all the customers of the bank, either they are classified as 'retail', 'corporate' or 'group' customers, and thus it is connected to plenty other banking systems and functions. Furthermore, the volume of 'Customer' is way larger than the other systems.
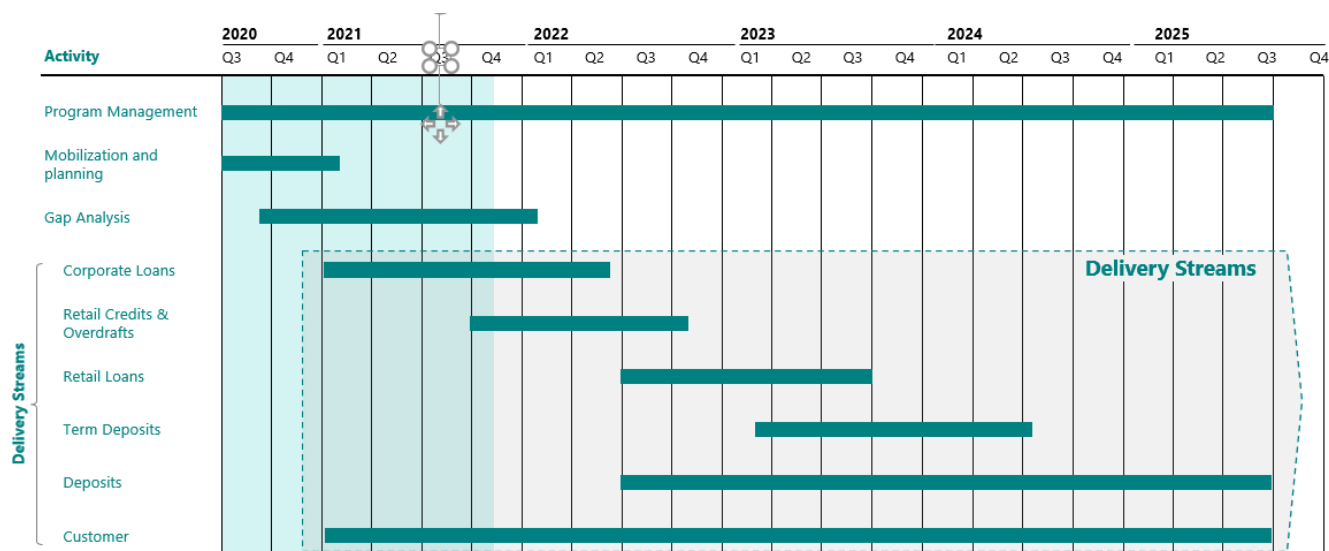
Figure 24 : CBS project roadmap

In each stream, personnel from all program teams is assigned and they have full support from all the affected teams across the bank.

4.3.3.2 *Approaches to information system acquisition*

As far as the approaches to system acquisition are concerned, the bank decided to buy a system package from a vendor instead of in-house implementation or outsourcing. "In-house development is not a feasible option at the moment. We don't have the appropriate knowledge and staff and it was way too expensive to even think of this option." Bank Program Director. So, according to the Bank Program Director the feasible options were outsourcing and package implementation. As stated by the Bank Program Director, the bank requested offers for both outsourcing and system packages. The factors that were pivotal for the decision to adopt the later approach, as mentioned by the Bank Program Director, was mostly cost, since the packages that are available in the market can cover most of the business requirements, secondly.

4.3.3.3 *System Integrator*

System integrator, as already discussed, is critical for the success of such projects. As mentioned earlier, Partner A was chosen as a system integrator for the particular core banking transformation project. Partner A satisfies all the criteria considering the system integrator selection that were analyzed in the theoretical part, such as experience in core banking transformation projects and experienced staff. However, the most important factor that led to the selection is the fact that Partner A has been a contractor of the bank for many years. According to Partner A and Bank sources, the bank's systems that are currently used were either created or customized by Partner A. As a result of the many years of partnership, Partner A has

deep knowledge of the current systems, is well trusted by the Bank and is familiar with the culture and the management style.

Deloitte was chosen as a subcontractor due to the good collaboration with the Bank and Partner A throughout the years which ensures the knowledge of the systems, the culture and the management style and increase the probability of a successful result.

Contrary to the usual business practice the Bank firstly decided the system integrator and then the vendor.

4.3.3.4   Package and Vendor Selection

It is a common practice that vendors and system integrators collaborate and form proposals as a unit. It is also a common practice that they do not only pair with each other, which means that a system integrator can form a proposal with more than one vendor.

The bank received many proposals for the project, however, the Bank had already made the selection regarding the system integrator. As a re result, the vendors who collaborated with Partner A were more privilege that others during the selection process. Partner B was chosen among the other vendors based mostly on the level the business requirements that are covered without any customization and the overall cost. Other crucial factors for selection were the level, the cost, and the duration of post-deployment support.

4.4 Other factors for consideration

As mentioned earlier, the framework, however helpful, does not include all the factors that the Bank has to take into consideration during the replacement project. The factors that were emphasized by the Bank but were not included in the framework presented by Foest (2019) are reference architecture, organizational structure, system development life cycle, legacy systems modernization, and controls.

4.4.1   Reference Architecture

The reference architecture, illustrated in Figure 25, containes the components of the architecture blueprint. These components are described below for better understanding.

Security is a set of solutions and processes aiming at protecting Confidentiality, Integrity and Availability of information processed through the whole architectural layers chain.

Infrastructure provides raw materials such as servers, storage, networking components to development users so that they can perform in a smooth and flexible manner.

Coexistence administrator manages the Customer Master Data file throughout the rollout of core banking system modules.
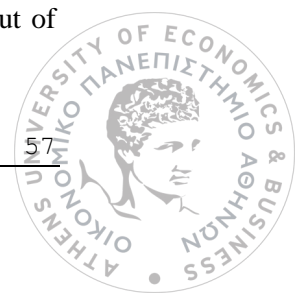
Data integration is the process of transferring data between different sources.

Business Process Management (BPM) is used to analyse, map, execute, monitor and re-engine business processes, adding decisional rules, collaboration functionalities and real-time business monitoring in a multichannel context.

Event Hub is built to be a horizontally scalable, fault-tolerant, commit log to allow distributed data streams and stream processing applications.

Enterprise Service Bus (ESB) is the main system-oriented architecture (SOA) enabler that allows different types of integration in a heterogeneous landscape (bundled via web services or specific adapters) obtaining a decoupling layer.

Application programming interface (API) is the gate to open the Bank towards third party applications and channels. It is important to introduce API Governance to avoid unnecessary proliferation of APIs.
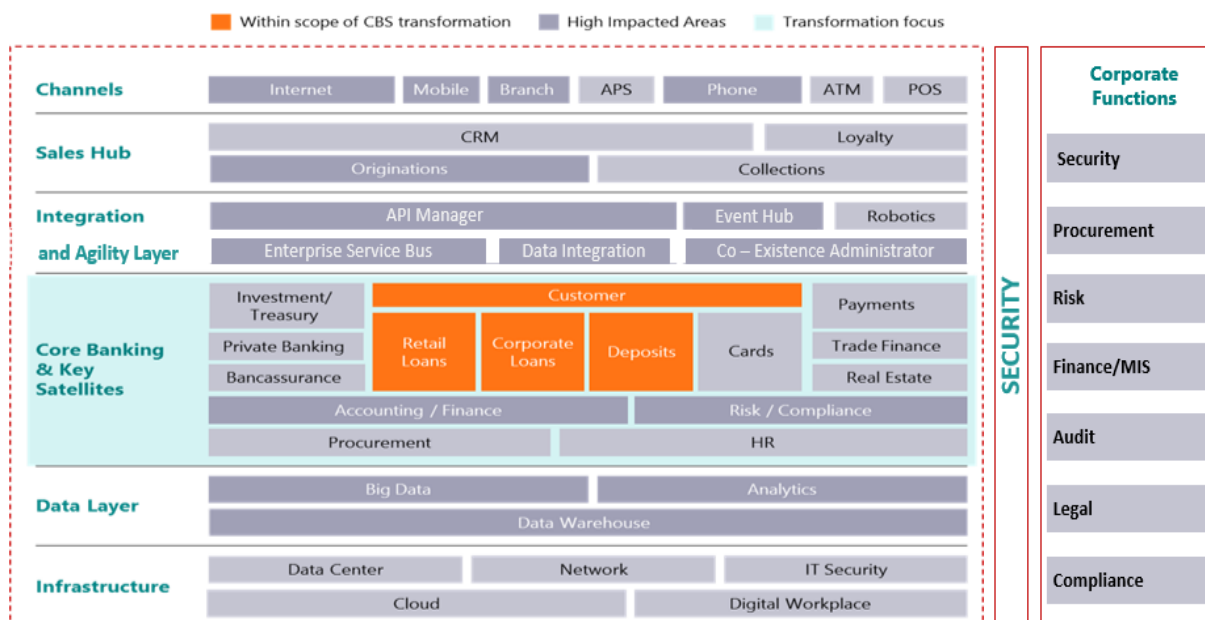
Figure 25 : Architectural Blueprint

4.4.2 CBS organizational structure

Except for the architectural blueprint of the project it is important to design the organization structure. As displayed in the figure 26, the bank is following a divisional structure and especially a product project structure since each program team is considered an autonomous unit that has its own purpose and the personnel occupied in each program team is not involved in others. However, the autonomy must not be confused with silos. All program teams must work as a system and achieve seamless communication, especially in management level and collaboration among the teams as well as increased problem solving. Apart from program teams, the structure presents the teams that are going to be affected across the banks.

Program Sponsors safeguard the program financing and scope and are accountable for achieving the program objectives and benefits. In that context, they chair the Program Steering Committee and exercise strategic control on targets and boundary conditions for program execution such setting priorities, milestones, and resources. Furthermore, they provide guidance and support the Bank Program Director or the Program Directors collectively on priorities, escalated issues or on risk mitigation actions. They also Influence Bank stakeholders positioned outside of the program remit to drive sustainable solutions for the Program.

SMEs is an acronym for Subject Mater Experts, which is a consulting team for the product director team.

Program Directors are responsible for achieving the program objectives and benefits both for the Bank and their company, as program director teams consists of people both inside and outside the bank (partner A and B). In that context, within the program organization they have to manage the program plan, scope and the respective contractual provisions. They also have to seek ways to resolve escalated issues and mitigate high program risks in alignment with other program directors. Another responsibility of program directors is to formulate and present the program status in the program Steering Committee. Within their respective company perimeter, managing the program budget and directing program leads and their teams is one of the Program Directors roles. Another responsibility applicable to this team is overviewing resource planning and acquiring the appropriate resources with the respective skillset. Program Directors are also responsible for decision making on issues escalated by the team leads, or on risk mitigation actions as well as communicating the program status and influence towards achieving its objectives.

Client and Delivery Leads are in charge of supporting and consulting the respective program director, on the overall program execution and on enablers for achieving its objectives as requested. They act as the escalation point for the Bank Program Director, for subjects related to respective Company performance. Client and delivery leads participate in the respective program governance bodies and are engaged in the decision making process.

Within their assigned delivery stream, the stream leads or steam managers are responsible for timely and complete provision of the required business analysis and use cases, during gap analysis workshops. They act as business owners of the respective delivery stream for the bank and are counterparty of the respective delivery stream project manager. Their role is so important that they are considered the focal point of the engaged business resources during the stream implementation.

Within their respective company perimeter, the Bank PMO and vendor management lead act as the "glue" for all program governance activities from Bank side. A short description of the processes of which this team is responsible is outlined below:
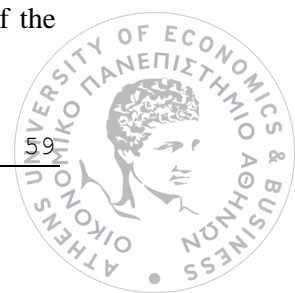
- Planning & Monitoring: Develop and update program plan and monitor program tasks and milestones progress against baseline

- Resource Management: Define and manage resources for the program, track and monitor assignment and utilization of resources and on/off boarding process as well as logistics

- Issue Management: Identify, assess, document, progress, track issues throughout their resolution and escalate issues as needed

- Risk Management: Identify, assess, document, progress, track risks throughout their mitigation and escalate risks as needed

- Document Management: Define and manage the Contractual Deliverable Process, oversee the delivery and tracking of the Key Deliverables. Maintain the document repository, define and update document templates and define and monitor the application of associated controls

- Change Management: Track, register and manage changes to the agreed program baselines of scope, time, and cost

- Communication Management: Generate and facilitate a forum for sharing of program information. Set-up communication efficiency & program collaboration

- Financial Management: Manage the financial management process of the program, budget, payments plan and invoices. Monitor and maintain financial documents

- Governance: Own the methodology, processes, and tools, to ensure effective operation of the program

- Stakeholders Management: Ensure that the interests of affected key people or groups are considered and that they are actively involved in the change and encouraged to support the change

- Performance & Reporting: Capture the current status of program performance, produce management reports, and communicate performance to key stakeholders

- Quality Management: Set up the mechanisms to ensure that the program is performing its delivery role at the highest quality standards

Program Team Leads are, within the subject area of their responsibility, in charge of defining the approach, methodology, processes and tools necessary to each respective delivery stream. They are also responsible for sourcing and training technically capable resources with the aim to staff the delivery stream teams and execute the respective activities for the effective delivery of the program. Managing their team workload and deliverables as part of the program main activities and delivery streams is another role of theirs. They are also held accountable for the timely and proper execution of the activities falling within the remit of their respective teams and for engaging with the liaisons nominated by the affected teams across the Bank.

As far as the main activities and areas of responsibility of the Supporting Functions are concerned:

- Legal is in charge of defining and reviewing legal specifications. They also work together with the business teams in order to review or revise contracts, when needed.

- Compliance is responsible for specifying compliance requirements. In this case, compliance needs to ensure that the new Core Banking System is compliant with international, regional and local regulations

- Risk ensures that operational risks are appropriately identified and assessed, the internal controls are appropriately designed and operate effectively in the program. It is also responsible for running program risk assessment on a monthly or bi-monthly basis, report, and follow-up corrective actions.

- Audit's role is to monitor program execution and endure that it runs in accordance to Bank project delivery regulation and identify omissions in internal controls and suggest solution

- Procurement is responsible for performing commercial negotiations and agreements as well as monitoring and controlling system integrator and vendor spend

- Security's role is to specify security policies, standards and guidelines and ensure that they are covered by the new core banking system. They are in charge of end-to-end security, data protection, connectivity, access management and development and testing.

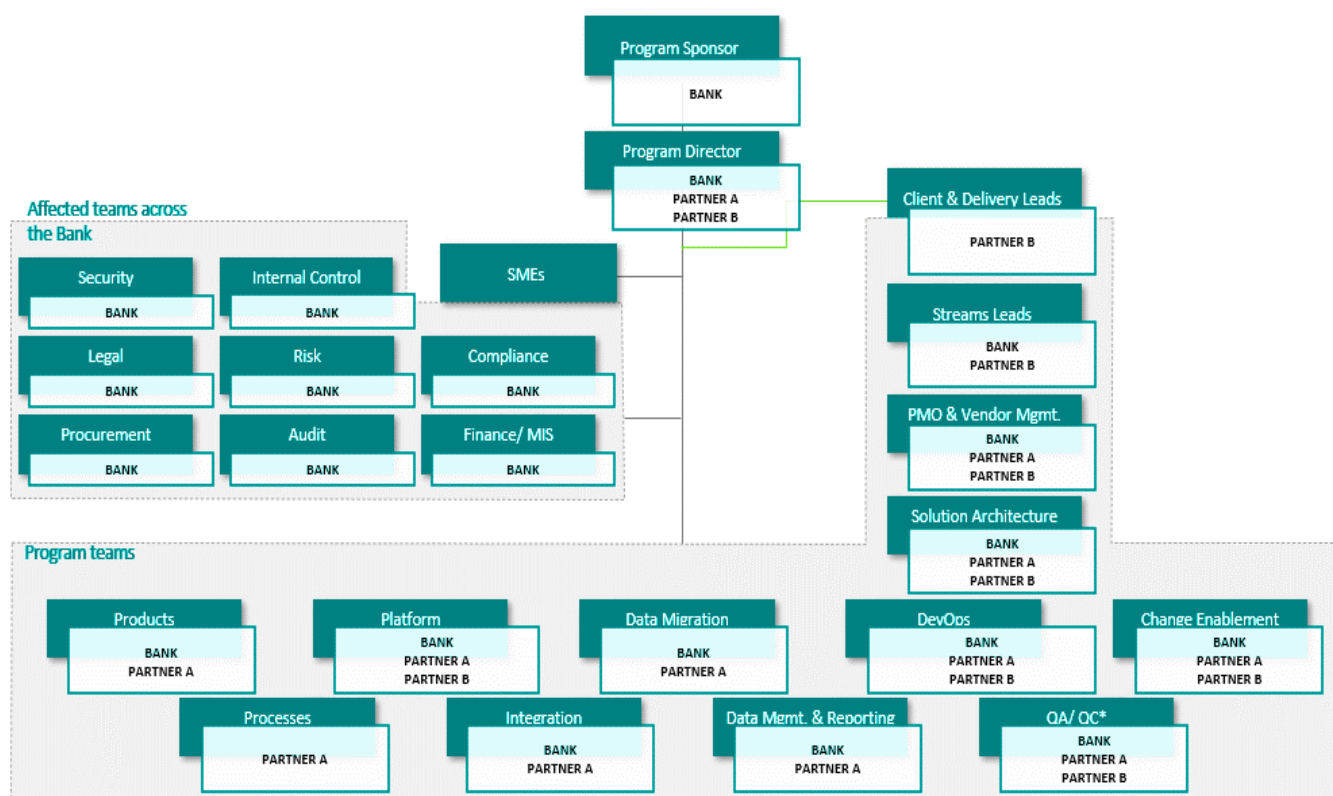The diagram below illustrates the core banking system transformation structure.

Figure 26 : CBS Organization Structure

The following table displays in detail the roles and responsibilities of management of each level of hierarchy based on whether they work for partner A, partner B, or Deloitte.

	PARTNER A	PARTNER B	DELOITTE
Program Director	Responsible for the overall delivery of the program and accountable for the program's success. Works with the Project Office and delivery structures as a primary point of contact for the Bank, providing account leadership to the service delivery team. Owns quality for service provided by partner A and is responsible for tracking and reporting on service and project level performance.	Responsible for the overall delivery of the Partner B workstream. He works with the Bank and Partner A Program Directors and acts a primary point of contact for them, providing account leadership to the service delivery team. Owns quality for service provided by Partner B and is responsible for tracking and reporting on service and project level performance.	Responsible for the overall delivery of the program and accountable for the program's success. He/she works with the Project Office and delivery structures as a primary point of contact for the Bank, providing account leadership to the service delivery team. Reports to the Program Management and he is a member of the Steering Committee Forum

	Reports to the Program Management Office and is a member of the Steering Committee Forum	Reports to the Program Management and is a member of the Steering Committee Forum	
Program Manager	Responsible to consolidate project plans and manage the overall program plan, working together with the Project/Delivery Managers and the individual project managers. Responsible for program level reporting and communication management. Responsible to setup, maintain and tune, project management processes and procedures. Handles overall resource planning and staff onboarding / offboarding and/or escalates resourcing issues to the Steering Committee Forum Has the overall financial responsibility of the project reporting to the PE Reports to the Steering Committee Forum	Responsible to consolidate project plans and manage the overall program plan, working together with the Project/Delivery Managers and the individual project managers. Responsible for program level reporting and communication management Responsible to setup, maintain and tune, project management processes and procedures Handles overall resource planning and staff onboarding / offboarding and/or escalates resourcing issues to the Program Director and Steering Committee Forum Has the overall financial responsibility of the project reporting to the Program Director	Responsible to review and manage the overall program plan, working together with the Project/Delivery Managers and the individual project managers. Responsible for program level reporting and communication management. Responsible to setup, maintain and tune, project management processes and procedures. Handles overall resource planning and staff onboarding / offboarding and/or escalates resourcing issues to the Steering Committee Forum Reports to the Steering Committee Forum
Project Manager/ Leads	Plans, tracks progress and coordinates the stream/services responsible for.	Plans, tracks progress and coordinates the stream / services responsible for.	Plans, tracks progress and coordinates the stream / services under his/her responsibility.

	Builds and maintains a cohesive team, that cooperates effectively across project boundaries. Tracks team member performance, prepares and conducts project reviews and deals with issues and problems that occur during the software development life cycle

Responsible to deliver / accept deliverables for the project(s).

Responsible for change management for the projects / services under him in cooperation with the Program Manager

Manages resource planning and day to day resources

Reports to the Program Management Office | Tracks team member performance in Sprints / Iterarions

Responsible to deliver / accept deliverables for the project(s)

Responsible for co-ordinating Program Change requests impact analysis and management for the project deliverables / services under him in cooperation with the Program Manager / Program Director

Manages resource planning and day to day resources

Reports to the Program Director and Program Management Office | Builds and maintains a cohesive team, that cooperates effectively across project boundaries.

Tracks team member performance, prepares and conducts project reviews and deals with issues and problems that occur during the software development life cycle

Responsible to deliver / accept deliverables for the project(s) under his/her responsibility

Responsible for change management for the projects / services under him in cooperation with the Program Manager

Manages resource planning and day to day resources |
| Enterprise Architect | Responsible of the overall Program Architecture management and for monitoring the technical tasks on a micro-level

Raises issues and risks to the Project Manager and tracks the day to day performance of the team Responsible to deliver/ review/accept technical deliverables | Applies subject expertise in operations and processes performed by the program Solution Set

Provides subject expertise and guidance to IT Developers during SDLC Process

Verifies technical reference information | |

		including training and system requirements	
	Reports to the Project Management Team	Documents processes and disseminates information to all relevant stakeholders	
		Validates requirements and deliverables within the Partner B product set	
		Participates in Design Authority and Program Change Board proving Technical and Functional perspective	

Table 7 : Management Roles and Responsibilities of Partners

As far as program teams are concerned, starting with "Product" team, it is responsible for implementing the gap analysis, scheduling, organizing and chairing workshops in order to collect requirements and present native features and built-in functionalities. It is also in charge of documenting all potential gaps an analyzes whether it is indeed a gap or not. Confirming requirements at sprint, release and program level and tracking the evolution of the requirement is the "product" team responsibility as well.

"Processes" team oversees scheduling, organizing and chairing workshops that aim to capture business processes and find ways to adopt business processes that have been introduced due to the new system. After the new processes are identified, the team is responsible for delivering the documentation needed.

Next, is "platform" team who are responsible of delivering the functional and technical specifications, system parameterization and customization, code review and unit test, promoting the code to testing environment and maintaining the "golden copy"[2] of the solution. "Integration" is in charge of the delivery of interface agreement of functional and technical design, the delivery of interface inventory and the integration implementation for peripheral systems, such as digital and physical channels, and any other implementation if needed.

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[2] "A golden copy – or golden record – typically serves as the official, master version of a record of data. It is an authoritative single source, sometimes referred to as the "single version of the truth", where "truth" is understood as that which users can ensure is the single correct piece of information which can then be actioned upon." *What Is a Golden Copy?*, (2017).

Furthermore, this team is responsible for managing the co-existence of the new and existing system.

"DevOps" is responsible for ensuring the handover of the application to the operational team. It, also, manages the technical readiness of the program for deployment of the new core banking system for each release. Furthermore, it leads and coordinates the deployment plan execution. This teams is also in charge of developing automation tools and scripts which are necessary for building, integrating, and deploying software releases. Lastly, "DevOps" is responsible for deploying to all environments and deployment process automation.

The next program team is the "Data Migration" team, which aim is to define specific migration strategies pes program stream. This includes principles determination, detailed design of the migration process, data mapping and conversions and controls. They are also responsible for developing the needed migration scripts and creating the migration plan, both the development and the rehearsal plan. Finally, reconciliation process, implementation, and reporting are also overseen by the "Migration" team.

"Data management and reporting" manages reporting requirements and consults on the new core banking system data model, combining the various data feeds. It is also responsible for defining the data needs from the new core banking system in order to cover regulatory, legal, and compliance requests.

The next program team is "Quality assurance and quality control". It defines the test strategy, which includes processes, procedures and standards and coordinates testing activities in all phases. It is also responsible for performing quality reviews and audits of the various system development life cycle processes. Test execution, automation, monitoring, and reporting is another of the team's responsibility. Moreover, it is in charge of synchronizing testing with peripheral systems and identifying testing tools that will be used.

Last program team is the "Change enablement" which is in charge of defining the Change Enablement Framework which aims at planning and preparing the operational readiness. The team also defines the program training strategy and plan, planning and coordination of training activities and creating a program identity. It is also responsible for communicating program achievements internally.

4.4.3 System Development Life Cycle

As mentioned earlier, choosing a System Development Life Cycle (SDLC) model depends on various factors. The Bank, taking into consideration a) the needs of the projects, such as the fast implementation, b) the need for regular tests, c) the skilled personnel, and d) the continuous change in technical requirements, came into the conclusion that the most suitable SDLC model is the Agile one and more specifically, scrum methodology.
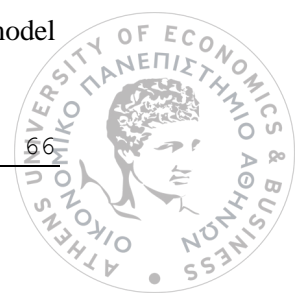
It is important that concepts such as the business requirements analysis, certain iteration activities and the system development roles are described before analyzing and describing the SDLC process.

Business requirements analysis is dived into smaller sections in order to facilitate management as following :

Epic is the outcome of the Gap analysis phase. The Epic describes a business need as detailed as possible, given the available time, resources etc. Still, it is not a necessity that an Epic should be such small that it can be implemented to its whole within one sprint, nonetheless epics must describe the need. Epics, during refinement phase, will be broken down to stories that will provide more details and clarity on the Business need.

Story is the minimum entity that describes a business need and it must be implementable within a sprint, which means that it cannot be big and complex. It should be testable and it should define the need detailed enough. The expected results and any other information that will affect the implementation must be also stated. Stories define the actual scope; thus it is essential that the design team working with the Stories, is a cross functional team with business and IT personnel from all domains that understand both worlds and add value on their domains. Stories will be owned by the Business Analysts through the whole implementation phase while the relevant linked DEV-Tasks and Test-Cases will be owned by the individual developers and testers who will work on them.

Features will be used to group multiple stories that accumulated and describe a specific functionality. While Epics and Features are both linked to Stories they differ in significant ways. Features are the sum of Stories after the refinement is completed, thus beside the fact that they might describe a set of relevant Stories with greater detail, they describe both the need and the solution and not only the need which is the main purpose of the Epics. In other words, Features will enhance Epics' analysis with post refinement findings plus a description of how the need will be covered.

New core banking system program will be implemented following agile methodologies. However, it is essential for the success of each stream and the overall program to be broken down into smaller pieces. **Scope**, is the collection of Stories that needs to be implemented and tested before it gets deployed for User Acceptance Test. **Drops**, are the intermediate milestones before final User Acceptance Test starts that break the project scope to smaller portions for early Bank visibility. During analysis phase of each stream, Analysis Team need to document all the Business Requirements to Epics and describe the need. Then the Design Team need to write the Stories that derive from each epic and business analyst need to ensure that all Stories get approved by responsible stakeholders so it can move to the next phase. Stories should describe beside the need, how the implementation will be done and have relevant acceptance
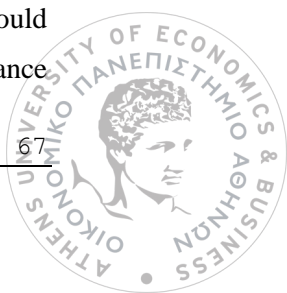
criteria. Designers and Developers, during refinements phase, must keep documentation. This way parallel development within Sprints from all teams can be achieved. Tests will initially be performed with mock data, till the actual APIs are available from all parties. Business analysts will create the required features and link them to relevant Stories. Features will describe both the need and the way the need can be covers by putting the stories in a meaningful sequence. Stream Lead overlooks the Scope and are responsible for the final story approval and prioritization of Stories. Engineering teams need to understand and enhance Stories with any detail required for the implementation. Quality Control needs to understand and enhance Stories with any negative scenarios. Release Management needs to provide the means in Jira so all stakeholders can see the status of product development for a specific stream. All involved teams must ensure that the deliverable will be according to the agreed scope, available on time and according to Bank's quality standards.

Iteration Activities

Development (DEV)/ System Test (ST): These are the actual implementation. During implementation, integration test will be feasible to some extend as DEV environments are expected to be partially integrated.

System Integration Testing (SIT): The goal of this phase is for all development teams, especially the Integration team, to verify that the Solution is working on an Integration level. One of the major KPIs to measure the value of SIT as a distinguished phase, is the number of bugs found compared to FTE (Feature Testing Environment) for the same software versions.

System Development Roles :

- Subject matter experts of a specific business unit are the go-to authority and domain expert in the business about a particular subject (BU)

- Designers are responsible for the architecture of the ecosystem on low level

- Architects are responsible for the architecture of the ecosystem on high level

- DevOps is "a set of practices that combines software development (Dev) and IT operations (Ops). It aims to shorten the systems development life cycle and provide continuous delivery with high software quality. DevOps is complementary with Agile software development." (Wikipedia Contributors, 2019). They are responsible for the operational readiness and deployments in all environments

- Developers (DEV) are responsible for the implementation of Stories

- Stream Leads (SL) are responsible for the story backlog and sprint prioritization of a program stream

- Business Analysts (BA) are responsible for analyzing and documenting the business requirements

- Component Leads are responsible for assigning tasks and issues within their development teams

- Quality Control (QC) is the bank's testing organization responsible for the testing activities on user acceptance environment

- Release Managers are responsible for the release and deployment plan

- Scrum Master is responsible for the sprints and assuring smooth operation of the scrum team (SM)

- System testing team is responsible for the test of implemented stories during sprints on development and system integration testing environment (ST)

Description of the System Development Life Cycle (SDLC)

The first phase of the system development lifecycle is the requirement analysis. In this phase, the business requirement document is analyzed, and business needs are turned into engineering problems. The gap analysis team needs to evaluate whether the new system can fulfill these needs, or some type of customization must be done. The participants of this phase are people from technological, business, and leadership segments of the organization. Specifically, in the requirement analysis need to participate system architects, business unit SME, business analysts and bank's quality control team. After the analysis is completed, the system gaps are prioritized and then they are translated into epics.

The epics are, then, studied by the designers, the developers, the business analysts, the stream leads and the bank's quality control team in order to evaluate the requirements for feasibility. In this stage, opportunities and risk of the agreed requirements are quantified, and evaluated, taking into consideration resources and strategies available. It is reasonable that not every single requirement is going to be marked as feasible. In order to cover all constraints, risks and opportunities the participation of the supporting functions is very important. After the requirements are studied and the feasible ones are decided, the epics are broken down into stories, which are then groups into features. The stories are distributed into the sprints according to their priority and their prerequisites. In this phase, the bugs that occurred due to logical gaps during the testing phase are redesigned.

Next phase is the implementation or, else, the development. In this phase the participants are the development teams, the development system test team, the stream leads, the business analysts, and the scrum master. After the stories distributed through the sprints, the scrum master need to assign each of the stories created to the appropriate development team, always keeping in mind the correct sprint. The development team then translates the requirement into the wanted form (ex. SSIS packages, APIs) and then proceeds to test the product in their test environment. Once the product is functional and gives the correct results, the development team
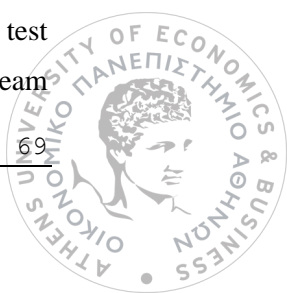
hands over the product to the system testing team in order to assure that the development is correct and that is also integrates with other components of the system. In case there is a problem with the product, the ST team returns the product back to the developers. In case the product is functional, the story is considered completed. Business analyst role is to make sure that the development team covers the business need of the story. The implementation follows the scrum architecture with a three-week iteration cycle in most cases. In case the workload is very heavy, the sprints can be extended to four weeks.

The next stage of the system development lifecycle is testing. Prior to the first phase of the tasting activities, DevOps team needs to make sure that the product created can be integrated with other systems or products (services and microservices) and that it indeed covers the requirements and deploy the product in all environments so it can be tested. During the testing phase, the product is testing regarding the integration level (SIT), rate of feature completion (FTE), quality of the product (QA) and the user acceptance test (UAT). The defects or bugs that occur during this phase are returned to the designer team for refinement.

The last stage of the SDLC is the release or go-live. As in the previous phase, the defects or bugs that occur during this phase are returned to the designer team for refinement.

4.4.4   *Legacy Systems Modernization*

As far as the existing core banking systems are concerned the bank mentions that development shall continue only for compliance and regulatory requests, since as mentioned earlier, non-compliance can result in hefty fines and penalties. On the other side, development of additional requests should be justified by a clear business case and must be approved by the Program Governance bodies. These new requests should be kept at minimum level and require as less resources as possible, due to the limitations on resources in working hours capacity, cost, and time.

However, although the transformation is targeted to the core banking system, all parts of the architectural framework are affected. The Bank intends to proceed to the modernization of the peripheral systems especially when it is needed for integration purposes. The changes applied to these systems pertain modernization, such as code cleanup which means dead code removal, interface cleanups and duplicity removal and code conversion from Cobol to Java. It also involves application modularization which is explained as breaking down functionalities into individual services in order to maximize functionality and reduce response times. Code also gets broken into smaller more manageable modules. Finally, the applications get rationalized in the level of functionalities they offer.

4.4.5 Controls

The Bank has established a number of controls in order to ensure that the project is being developed with respect to the resource limitations and ensure the performance quality of the deliverables.

Governance

The program governance aims to facilitate and speed up program execution. A set of Governance Bodies will be formed in order to control the schedule and the budget, to detect potential risks and escalations and to identify changes that might occur. In general, the role of the governance is to deal with any issues and ensure the achievement of program objectives.

Termination for convenience (go/no-go)

The bank has introduced the option of Termination for convenience (go/no-go), based on the outcome of the Gap Analysis and the progress of the first stream implementation (corporate loans). This will allow the bank to evaluate outcomes and fallouts in the very beginning of the project before committing to the rest of the program delivery.

Iterative /continuous delivery

Employment of modern delivery mechanisms will allow both IT and Business departments to get early view of the developed functionalities. This will enable the bank to be proactive in terms of expectations and reprioritize the functionalities that are being delivered according to the current business needs and landscape.

KPIs of Adopt vs. Adapt

The bank has decided to operationalize the "adopt" strategy instead of the "adapt". This means that instead of parametrizing the new system whenever there is a difference in functionalities, the bank opts for changes in its business processes. However counter intuitive this approach may sound, software programs used for such purposes, are developed by experts and follow best practices that have been proven to be effective. However, the bank is going to define certain KPIs at the beginning of the program which will be measured and evaluated periodically in order to examine whether the program is indeed successful for all stakeholders. According to the Bank, such KPIs can be metrices related to are customer satisfaction and specifically, overall customer experience and time needed to complete a transaction. KPIs related to end user bank employees are related to the ease of use of the new system, the completion rate of an intended task and the efficiency of the training strategy. The efficiency of the training strategy KPI uses
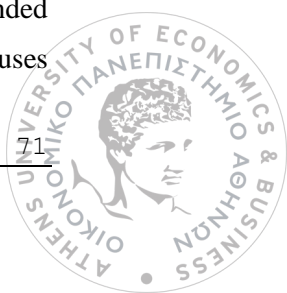
metrics such as skill and knowledge retention, employee engagement and training transfer and are going to be evaluated at the end of the training program.

Financial framework

A financial management framework will be established in order to monitor program budget, control costs, define the standards for change requests and partner with finance teams to confirm financial reporting is in place

Operational risk management

Operational risk team is involved since the first steps of the program. Program risk assessment will be running on a monthly/bi-monthly basis by the program teams to identify potential improvements.

Audit involvement

Foundations for common understanding with Audit team need to be established to ensure that program execution is in accordance to bank project delivery regulation. Early involvement of IT Audit will also ensure that the new core banking system solution will be covering audit requirements.

4.5 Review

In this chapter, using a business case framework, the case study of Greek Bank core banking transformation project was analyzed. The factors that led the Bank to the decision of replacing the core banking system were identified, the challenges and the mitigation actions during the project were examined and the modernization theme and the key factors that led to their selection were analyzed. Furthermore, other issues that were not included in the framework but were of high importance for the Bank were also examined. These issues are the architectural blueprint, the organizational structure, the system development lifecycle model selection, the modernization approach chosen for the peripheral systems and the controls that the Bank is planning on using to assure the quality and the monitoring of the processes and the resources.

5

Conclusion

5.1 Summary and conclusions

The increasing use of technology and digitalization have significant effects on businesses. The businesses are forces to reconsider their information systems in order to respond to the current trends and modernize their systems, if needed, to ensure their survival. However, system modernization is not an easy project. A business case framework has to be used as a guide in order to facilitate to modernization process. Foest (2019) has presented a framework business case that includes many actions and factors that need to be taken into consideration prior and during the transformation process. However, there are factors that are not included in the framework but need to be considered, especially in major projects, since they are of high importance in the modernization project.

Summarizing, the factors that can lead to a successful project are presented in the following table:

Success Factors	Key Actions
The project must be seen as an Enterprise Transformation Program and not as an IT project	• Establishing a clear connection between the project and the business strategy • Ensure ownership, contribution and alignment with business and support functions
Ensure strong sponsorship throughout the program	• Provide visibility in order to ensure Commitment from Board and Top Management during the Program duration

Avoid scope creep	• Creation of a detailed project plan • Detailed plan of Stakeholder management and communication
Effective management of changes	• Tackle resistance to change through a detailed training strategy • Establish a thorough change request management strategy and find the right balance so that the officialism will not delay the project activities
Organizational structure	• Selection of the appropriate organizational structure • Detailed definition of the roles and responsibilities
Quality management	• Establishment of a thorough quality management strategy with clear plan, roles and responsibilities
Governance	• Meticulous planning of a governance structure with detailed roles, responsibilities and communication plan
System Development life cycle	• Selection of the suitable SDLC according to the needs and the characteristics of the organization
Controls	• Selection and establishment of control points throughout the program
Modernization Theme	• Carefully select the transformation approaches, the acquisition Approaches, the vendor and the system Integrator

Table 8 : Key factors and actions for a successful transformation project

As far as system integrator selection is concerned, businesses tend to select existing partners over others, as long as they satisfy other criteria as well. So, it is important that contractors focus on establishing long lasting relationships based on quality and communication with their clients to increase the chances of becoming the system integrator of such significant projects.

5.2 Future Work

The framework used is limited to the planning of the project. It would be important and interesting to examine a framework that evaluates the overall success of the project after its completion. Specifically, a comparison between the provisions regarding the resource needed in the beginning of the project and the actual resourced used by the end of it could be very

useful. It is also very important to examine the level of success regarding the challenges and the mitigation actions planned. Whether those actions were sufficient and what other measures had to be taken if any and, also, whether other risks and challenges occurred during the project that were not predicted, and the actions taken to tackle these problems. Furthermore, since cloud adoption is one of the most popular trends, it would be very interesting to examine to what extent and in which ways the core banking replacement project facilitates the adoption of cloud technologies.

6

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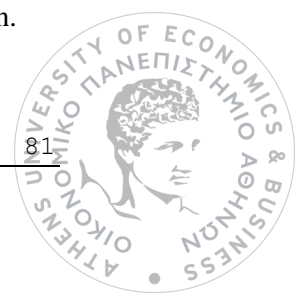Unhelkar, B. (2016) The Art of Agile Practice: A Composite Approach for Projects and Organizations. CRC Press

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