Agile Adoption Best Practices in Canadian Banking

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Abstract

This thesis examines agile software development adoption challenges in large Canadian banks. Canadian banks have adopted agile methods with varying success. The aim of the thesis is to develop an agile adoption framework, using a mixed methods research approach.

Research on agile adoptions in financial firms and other regulated industries was reviewed. The result was a list of best practice and challenges that firms experience in their agile transformations. These factors, along with data gathered from interviews, surveys and observations were triangulated to produce a list of best practices.

The research used mixed methods, treating the Canadian banking industry as a single case. Qualitative data were elicited through interviews and observation. Additional data was collected through an internet based survey. Chain referral sampling was used to increase the sample size. The population sampled consisted of executives responsible for agile adoptions, agile coaches and project managers involved in banking agile projects. Seven participants were interviewed and twenty seven completed surveys were received. A pilot study was conducted to test the methodology and research instruments prior to the main study.

The data was analyzed using the framework method to synthesize the best practices from the literature with the primary data. The result of the research is a set of best practices and a framework for agile adoption in banking. A validation study of the framework was conducted and indicated it was suitable for banking. The analysis concluded that agile practices and adoption strategies used in non-bank industries, with some exceptions, were equally applicable to large banks. The analysis also demonstrated that a phased adoption framework was well suited to the banking culture for facilitating an agile transformation rather than a holistic companywide adoption.

The theoretical contribution of this research is the identification of agile best practices and challenges experienced by practitioners within the Canadian banking industry. It is one of the first academic studies to be conducted on agile adoption in Canadian banks and contributes knowledge to the literature on agile adoptions. The practical application of the research is the proposed framework which provides a disciplined foundational roadmap for leaders initiating agile transformations in their own banks.

Acknowledgements

I would like to thank my very patient supervisors, Dr. Craig Robinson (current) and Dr. William Wallace (former) who were extremely patient in providing feedback on the many iterations of this lengthy thesis. This study could not have been completed without their excellent guidance.

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Academic Registry

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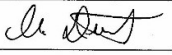
Signature of Candidate:		Date:	OCTOBER 2, 2019

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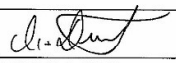
Signature of Individual Submitting:	
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Definitions

List of Abbreviations

Term	Definition
Agile	Rapid software development methodologies such as Scrum, Kanban, Lean, Extreme Programming and Test Driven Development.
AMRG	Agile Manufacturing Research Group, is part of the Centre for Research in Innovation Management (CENTRIM), University of Brighton, UK.
API	An application program interface (API) is a set of routines, protocols, and tools built into applications for enabling application to application interactions.
Boston Consulting Group	The Boston Consulting Group (BCG) is a multinational management consulting firm with 90 offices in 50 countries. The firm advises clients in the private, public, and not-for-profit sectors around the world. Canadian banks have consulted BCG for many aspects of strategy and organizational change management.
CEB	The Corporate Executive Board (CEB) provides analysis of best practices for technology solution, equip customers with the intelligence to effectively manage talent, customers, and operations. Access is by corporate membership subscription. Its members ranks among the Fortune 100 firms. https://www.cebglobal.com/
Chain Referral Sampling	This is a type of purposive sampling. Participants with whom contact has already been established use their social networks to refer the researcher to other people who could potentially participate in the study (Mack *et al.*, 2005).
DAD	Scott Ambler developed the "Disciplined Agile Development" process during his time as chief methodologist for IT at IBM. It was developed to provide a more cohesive approach to agile software development and is capable of enterprise-level scale. http://www.disciplinedagiledelivery.com/

Deloitte Canada	With over 150 years of experience, Deloitte is one of the leading professional services firms in Canada. Several banks consult Deloitte for strategy issues, coaching and organizational change management.
Efma	Efma is a non-profit financial services member supported organization formed in 1971 by bankers and insurers in retail financing, marketing and distribution. http://www.efma.com/
Extreme Programming	Extreme Programming is an agile methodology, similar to Scrum, for software development based on scenario-based requirements, test driven development and pair programming.
FinTech	Financial Technology. FinTech has been used in the context of startup technology companies entering the financial space with products that compete with traditional banking services, most notably payments with recent inroads into lending and Wealth Management.
Infosys	A third party services provider to financial institutions. https://www.infosys.com/
Intelliware	Intelliware is a custom software, mobile solutions and product development company headquartered in Toronto, Canada. http://www.intelliware.com
LOB	A "Line Of Business" in banking would be an individual division such as Credit Cards, Insurance, Wealth Management or Retail Banking.
PEST	Is a strategic management analytical framework for environmental scanning including the following factors: Political, Economic, Social, and Technological.
Purposive Sampling	This is one of the most common sampling strategies. It groups participants according to preselected criteria relevant to a research question. Sample sizes may or may not be fixed prior to data collection, depending on the resource sand time available as well as the study's objectives (Mack *et al.*, 2005).
SAFe®	SAFe is a knowledge base of proven success patterns for implementing Lean-Agile software development at enterprise scale. It is an emerging methodology for large organizations who wish to use

	agile at the program level. http://www.scaledagileframework.com/about/
Scrum	Scrum is a simple set of principles and practices that help teams deliver products in short cycles, enabling fast feedback, continual improvement, and rapid adaptation to change. https://www.scrumalliance.org/
The Standish Group	The Standish Group is a primary research advisory organization that focuses on software project performance. http://www.standishgroup.com/
VersionOne	VersionOne is a tools developer for Agile projects. Their website features a comprehensive set of documents for Agile adoption. https://www.versionone.com/resources/?utm_content=mega-nav
Waterfall / Plan-based methodologies	In the context of this research, waterfall refers to a plan-based project management approach. It is characterized by a sequential approach to managing projects as a series of defined activities. It is a traditional approach for project management having its origins in the product manufacturing sector.

Acronyms

Term	Definition
ACSS	Automated Clearing Settlement System
AI	Artificial Intelligence
AMRG	Agile Manufacturing Research Group
API	Application Programming Interface
AWRM	Agile Wheel Reference Model
BCG	Boston Consulting Group
BMO	Bank of Montreal
CBA	Canadian Banker's Association
CDC	Centers for Disease Control
CEB	Corporate Executive Board
CIBC	Canadian Imperial Bank of Commerce
CMI	Carnegie Mellon Institute
CMM	Capability Maturity Model
COP	Community of Practice
CPA	Canadian Payments Association
CPO	Certified Product Owner
CSM	Certified Scrum Master
D-SIB	Domestically Systemically Important Bank
EBA	European Banking Association
Efma	European Financial Management Association
FDA	US Food and Drug Administration
FDIC	Federal Deposit Insurance Corporation – United States
FinTech	Financial Technology Startup
GAO	Government Accountability Office - United States
HEC	École des Hautes Etudes Commerciales de Montreal
KPI	Key Performance Indicator

NAO	National Audit Office - United Kingdom
NFC	Near Field Communications
OBWG	Open Banking Working Group
ODI	Open Data Institute
OSFI	Office of the Superintendent of Financial Institutions - Canada
PM	Project Manager
PMI	Project Management Institute
PMO	Project Management Office
POS	Point of Sales Terminal
RBC	Royal Bank of Canada
SLA	Service Level Agreement
TD	Toronto Dominion Bank
XP	eXtreme Programming

1. Introduction

1.1 Research Motivation

This research subject was chosen as a result of the author's experiences as an agile Product Owner of an agile project at a major Canadian bank. The Product Owner's role is to guide the project's requirements. This was an infrastructure project whose requirements were defined by this author and the team's application subject matter expert (SME). Application enhancement and maintenance projects typically followed a waterfall based approach. The group executive wanted to build agile experience in his own area and after a brief assessment concluded that this project was a good candidate for following an agile Scrum methodology; an emerging rapid development practice adopted for small projects at this bank.

After presenting the business case, the project was approved to proceed for 18 months with funding of $600,000.00 CA. The project concluded twelve months later having delivered only 60% of the functionality. The sponsoring executive considered the project a failure for not delivering all the functionality. The product's reduced functionality was unacceptable for commercial clients.

During the project many challenges were encountered that consumed non-project related activities. The team had no prior agile experience and had to be trained on the bespoke agile Scrum practices the bank adopted. The project management tool used for sequencing and tracking user stories was based on a Rally product that some team members had prior exposure to. It was determined early on that to manage the large number of user stories and tasks, manage burn-down charts, calculate team velocity and produce KPIs for management reporting, the project needed an agile project management tool. As this was one of the first agile projects at the bank, it had oversight from the Project Management Office (PMO), which was interested in lessons learned from the project.

Concurrently, the bank was negotiating a strategic multi-million dollar, multi-year software and hardware agreement with a key vendor. The vendor offered the bank favorable terms if the bank was to pilot their new agile project management tool. This resulted in an executive directive to replace the Rally tool with the vendor's agile management tool for this project. User stories and tasks were moved over to the new tool. The new project management tool had many flaws; the ability to move stories on the backlog into sprints was flawed, the burn-down charts were not correct and the management reporting took more manual effort to create.

After two months, the pilot was terminated due to the high number of defects which the vendor could not resolve. The backlog reverted to the Rally application. To this day, the Rally product remains the standard agile project management tool at this bank. Although the team received training on agile methodologies, the team struggled with the application of agile practices and understanding the roles of each team member. Subsequently, an agile coach was added to the project to provide on-going guidance.

A post project retrospective indicated that several issues led to failure. The lack of agile trained and experienced staff was an impediment. Having switched project management tools due to organizational politics, hindered progress and increased project cost. The decision to run the project in an agile method with a steep learning curve and the added cost of iterative manual Quality Assurance (QA) testing increased project cost. Adding an agile coach was a further burden on the budget. The project characteristics were misaligned with the agile project methodology. The requirements were well known in advance, the prototype was already approved and there were no burning time to market needs or first mover advantages.

One flaw was the project funding; which remained fixed. It was inadequate to fund the training, additional staffing and coaching required to run the project. Further, internal political pressure regarding agile tools adoption consumed resources and time resulting in wasted effort.

Research Significance to Canadian Banking

This study contributes to the knowledge of implementing agile practices in Canadian banks. It also explores the state of agile in banking and how different banks have experienced cultural barriers to change. Limited to none, is the best way to describe the number of peer reviewed articles on the use of agile practices in Canadian banks. This researcher hopes this study provides a significant contribution to this knowledge domain by answering the question:

What are the factors that influence the successful adoption of agile practices in Canadian banking?

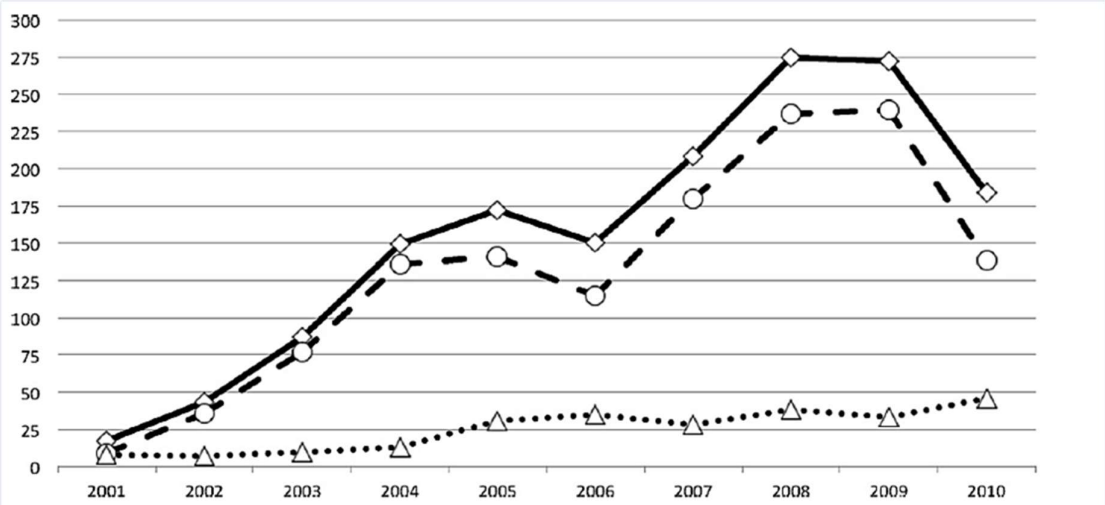
The aim of this study is to shed light upon challenges, best practices and strategies for agile adoptions in banking. It is hoped that readers contemplating or leading agile adoptions will benefit from the agile transformation lessons learned and the comprehensive implementation framework resulting from this research.

1.2 The Knowledge Base

An abundance of literature is available on the application of agile methodologies. A subset of that literature is from peer reviewed academic origin while others are from industry journals and press articles. However, no peer reviewed research papers were found on the application of agile within the Canadian banking sector. Expanding the literature review to multi-national banking increases the availability of publications on agile adoptions within global financial institutions. Appendix A lists the criteria used on the Heriot Watt Discovery site for various literature searches on agile adoptions and transformations. Searches for agile in Canadian banking did not yield any results.

A study (Dingsøyr *et al.*, 2012) of the number of agile publications in print, indicates that interest has continually increased since 2001 and peaked in the 2008/2009 timeframe with over 275 publication in 2009 before declining through 2010 (Figure 1.1). According to this study, 29% of the published literature originated from the USA and Canada alone.

Figure 1-1 - Publications on Agile Software Development: 2001 to 2010



Source: (Dingsøyr *et al.*, 2012)

Much has been published in the press on the benefits of agile over plan-based methods. There is also an emerging bimodal approach to product development where plan-based and agile based methods co-exist, sometimes as a hybrid methodology, recognizing that agile is not a panacea for all projects (Biswajeet, 2015; Mingay, 2015). Of 107 firms surveyed by CEB (Gibson, Woodruff and Barnum, 2016), 48% follow a hybrid model combining agile and plan-based, stage-gated practices.

The peer reviewed knowledge base for agile in Canadian banking is nonexistent when this research started in 2016. Due to the concentrated Canadian banking industry; there are five major banks adopting agile. The external consultants/coaches facilitating agile adoption at the banks are often working under non-disclosure agreements (NDA) and this restricts publications on agile adoption in Canadian banking. From the author's experience, most banks are still adopting agile practices in a quasi-experimental approach, often achieving low project success with sub-optimal use of resources. Publications from member participating financial associations such as Efma, CEB, OSFI, Bank of Canada and others, although not peer reviewed, were alternate literature sources.

1.3 Assumptions and Constraints

The assumptions relating to this research relate primarily to access of published literature. The author assumes that information available from other industries will have similar challenges and characteristics to the Canadian banking industry. Literature available on agile adoption factors from non-Canadian financial institutions was used to augment the knowledge base.

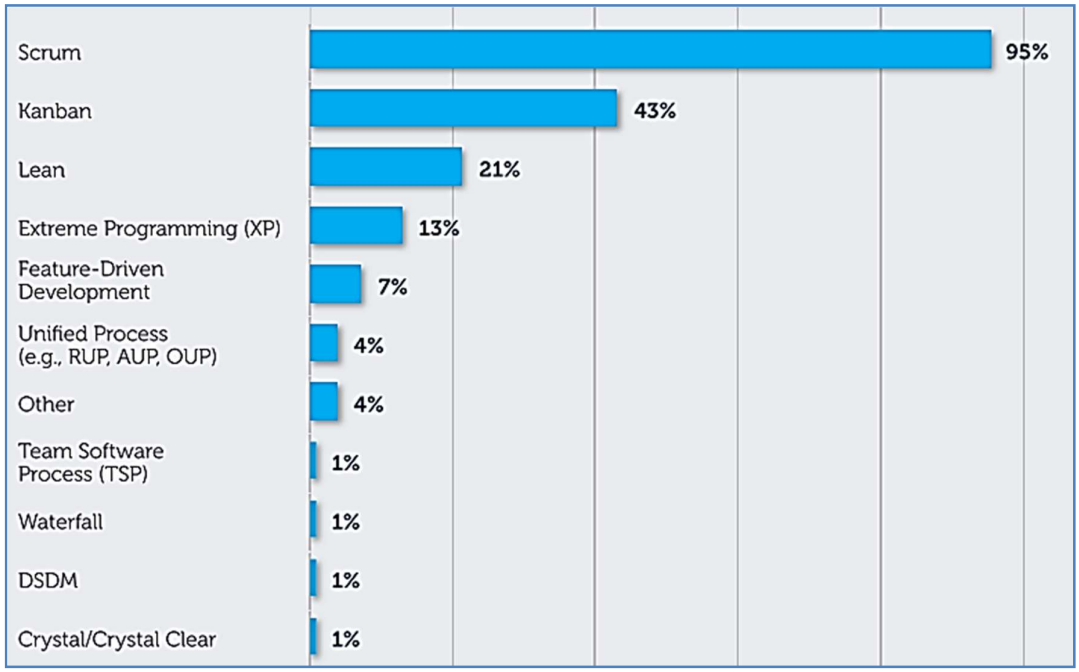
An underpinning assumption of this research is that it lists best practices and provides a framework that a bank can follow for adopting agile practices in a manner that causes the least disruption to the organization and encourages practice sustainability. It does not define the day to day running of an agile project but rather the organizational and management practices required to start and sustain an agile project delivery organization.

Although there are many agile approaches (Crystal, Disciplined Agile, Extreme Programming, Scrum etc.) the most commonly used agile methodology is Scrum as responded by 70% of firms surveyed by VersionOne (2016). A Scrum Alliance survey (ScrumAlliance, 2015) also indicated a high use of Scrum as their organization's agile approach with 52% reporting they use Scrum alongside other approaches while 42% reported using Scrum exclusively; Figure 1-2. Dikert's (2016) research indicated that Scrum was the sole agile method used in 25 out of 34 cases studied. References to agile practices will focus on those pertaining to Scrum. The SAFe framework has its foundation in "Scrums of Scrums" (Agile Alliance, 2015) and has gained popularity for large scale agile projects. It is used by 27% of firms surveyed by VersionOne (2016). Scrum is the dominant agile foundational methodology used in Canadian banks.

One challenge was the population size available for this study. The population of experienced resources who have worked on agile projects as coaches, Scrum Masters,

Product Owners and agile team members is small. A LinkedIn search of people in Canadian banking with agile experience is less than 100. Some of those approached through LinkedIn for participation on this research indicated that their agile experience was very light. This represents a small population to draw research data from.

Figure 1-2 - Type of Agile Practices in Scrum Alliance Member Firms Surveyed



Source: (ScrumAlliance, 2015)

The other challenge is access to data required for this study. Some practitioners do not want to discuss their bank's experience with agile, citing confidentiality concerns. Consent to participate in the research from some bank staff could only be obtained if the bank was not identified and participant anonymity was assured. Lastly, the author as an employee of a major bank, found it difficult to get the support of senior level employees from other banks as they consider their bank's agile practices to be intellectual property; not to be shared.

Positioning this research as independent, not bank sponsored, with assurances of confidentiality won over support from participants. Similar challenges were expressed by another researcher in his study of agile software development in European financial firms.

"It has proven to be a challenge to find interview partners from the finance industry who were willing to speak about their experiences with agile methods". (Wiss, 2008, p. 63)

The lack of peer reviewed literature on agile adoptions in Canadian banking is also challenging as it does not provide a basic foundation of peer reviewed research to draw from. Cross-industry case studies on agile transformation exist from vendors. They highlight the success of their methodologies and how they facilitated agile adoption in firms but these sources have vested interests in promoting their own practices. Several press articles focus on the use of agile in Canadian banks but they are not in-depth reports of the practices; are biased to providing a positive view of the bank's experiences and don't have the credibility of a peer reviewed publication. Dikert's (2016) research into large scale agile transformations concluded that case studies presenting insights into large-scale agile organizational transformations are very scarce.

1.4 Research Aim and Design

Given the challenges with agile transformations, the aim of this research was to identify and document challenges, best practices and to develop an agile adoption framework suitable to Canadian banking.

The discovery evolved through a literature review of other firms who have adopted agile practices, reviewing challenges faced by other regulated industries, interviewing agile practitioners who have participated on agile projects in Canadian banking and understanding what transformational strategies are successful. A subtle issue with adopting agile in banking is that a regulated environment may require differentiated agile practices. Another challenge is the sheer size of banks; their multi-divisional siloed organizational structures and their geographical dispersion. These factors may hinder firm-wide agile adoptions.

1.4.1 Research Questions and Objectives

As the research focus was on the best practices for agile adoption in Canadian banking, the research question was:

RQ1: What are the factors that influence the successful adoption of agile practices in Canadian banking?

The aim of the research was twofold:

A1: To explore the factors that influence the successful adoption of agile practices in Canadian banking.

A2: To develop and document an agile adoption framework inclusive of best practices that influences the successful adoption of agile practices in the regulated Canadian banking environment.

The objectives of the research were:

OB1: To leverage the results of the literature review for understanding the agile adoption success factors and challenges across several adopting industries.

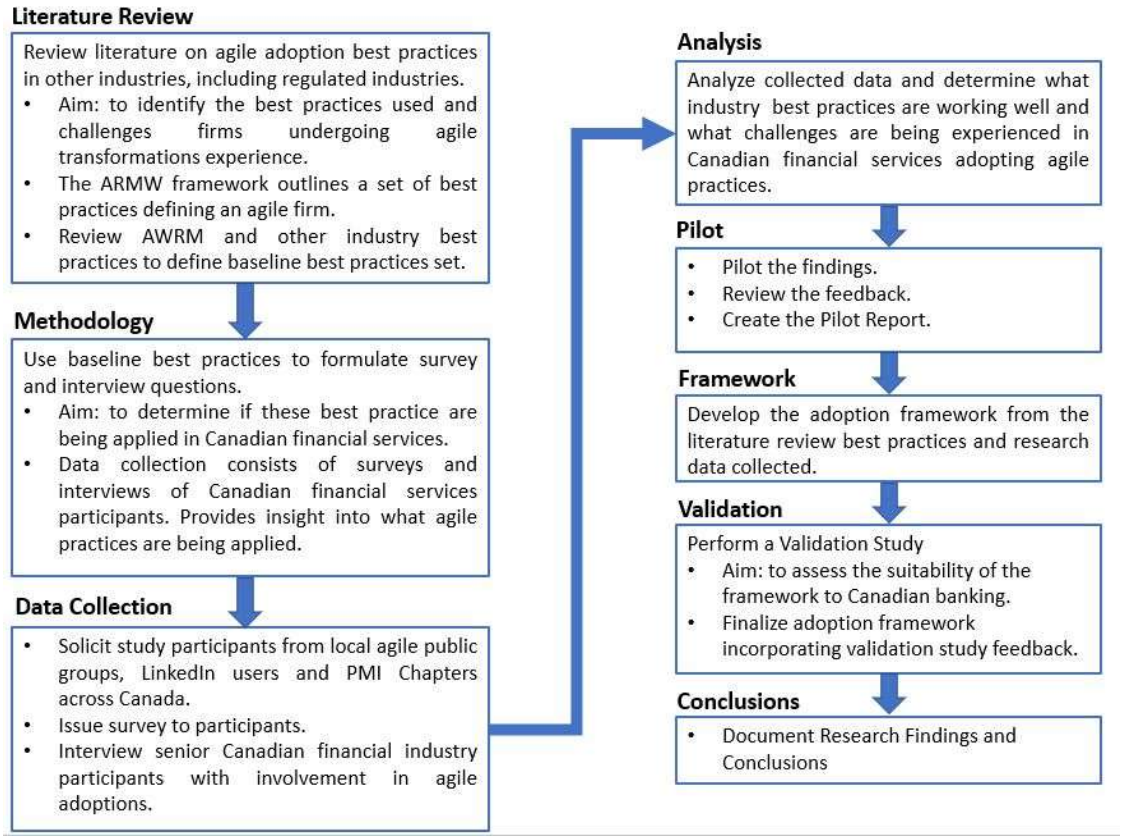
OB2: To identify the organizational and people challenges experienced in adopting agile practices in Canadian banking by collecting the experiences of current agile practitioners through interviews and surveys.

OB3: To understand if Canadian banks follow the same adoption strategies as other industries or whether a differentiated approach is needed.

OB4: To provide a best practice based framework suited for Canadian banks pursuing agile adoption strategies.

The best practices and impediments were evaluated by way of exploratory research to understand if agile practices identified in the extended literature review applied to Canadian banks. Field based research through interviews and surveys of participants involved with agile projects provided banking industry specific data. The methodology section explains the methods, research instruments and reviews the research methodologies other researchers conducting similar research have used. The research design is illustrated in Figure 1-3.

Figure 1-3 Research Design



Source: Author (2019)

In summary, the deliverables of this research are a list of transformational agile best practices applicable to Canadian banking and a framework for an agile adoption.

1.5 Thesis Structure

This section provides a summary of the thesis structure by chapter.

Chapter 1 – Introduction. The Introduction describes why this research topic was chosen, the challenges with the current knowledge base and the assumptions and constraints of the research. The chapter concludes with the research aims and objectives and diagram surmising the research design.

Chapter 2 – The Canadian Banking Context. This chapter provides a background into the growth and challenges of the Canadian banking industry. It discusses how FinTech startups are disrupting the banking industry, their strategies for challenging incumbent banks and how banks are responding.

Chapter 3 – The Literature on Agile Best Practices. A review of the literature on agile adoption best practices in banking and other industries is provided. The chapter concludes with an analysis of gaps in the knowledge base.

Chapter 4 – Methodology. This chapter outlines the methodology selection and fit for the research. The research design is outlined in detail herein including a review of the research instruments used.

Chapter 5 – Pilot Study – This chapter discusses the pilot study design including the recruitment of participants, research instruments tested and observations on the framework analysis method. The chapter concludes with a discussion of results and pilot study summary.

Chapter 6 – Main Study, Data Collection and Analysis. This chapter presents the main study data gathering approach including the participant selection for interviews and surveys. It provides insight into the number of study participants and the data gathering challenges.

Chapter 7 – Results and Findings. This chapter discusses the results of the main study analysis using the framework method. The analysis synthesizes the literature, interview, survey and observation data by AWRM dimension to identify which agile best practices are suitable for Canadian banks.

Chapter 8 – Discussion and Framework Development. Using the best practices from the previous chapter, this chapter discusses the findings and outlines a proposed agile adoption framework. A discussion on the framework's validation study concludes the chapter.

Chapter 9 – Conclusion. This final chapter summarizes the thesis findings, its limitations, the research contributions to theory and practice and concludes with a recommendation for future research.

2. The Canadian Banking Context

This chapter provides a brief introduction to the Canadian banking industry, the record of innovation in Canadian banking and the disruptive challenges posed by Financial Technology (FinTech) disruptors. This section explores what areas of banking are being disrupted by new entrants and the strategies banks are adopting to keep disruptors at bay. One strategy is to become more "digital" and adopt a "startup" like culture by creating fast innovation centers. This includes adopting rapid product development practices based on agile software development principles.

2.1 The Canadian Banking Sector

The Canadian banking sector is comprised of 80 nationwide banks of which 6 banks hold the majority of client accounts. In 2015 these six large banks contributed $7.3[1] billion dollars to the Canadian Government as tax revenues. Taxes paid by Canadian banks worldwide in 2015 amounted to $12 billion dollars. Banking contributes 3.3% to Canada's GDP (CBA, 2016a). The large six banks account for 90% of total banking assets in Canada. These banks are important to the Canadian economy by virtue of their size, flexibility (The Canadian Press, 2013), number of people employed and contribution to GDP. The six largest Canadian banks by assets and market capitalization (Table 2-1) account for the majority of domestic banking activity. Failure of these banks would damage the Canadian economy and the Canadian financial system.

Table 2-1 – Top Six Canadian Banks ranked by Net Income (2015)

Bank Name	Short Name	Number of Employees	Net Income (CA Million)	Market Cap (CA Billion)	Total Market Return[2]
Royal Bank of Canada	RBC	73,498	$9,004	$115.4	18.3%
Toronto Dominion Bank	TD	81,137	$7,883	$102.4	19.8%
Bank of Nova Scotia	BNS	86,932	$7,298	$84.0	12.9%
Bank of Montreal	BMO	46,778	$4,333	$53.0	16.8%
Canadian Imperial Bank of Commerce	CIBC	44,424	$3,215	$40.8	20.4%
National Bank of Canada	NBC	17,056	$1,538	$17.3	20.6%

Source: (PwC, 2015)

[1] All financial amounts in the research are in Canadian dollars unless otherwise denoted
[2] Calculated as change in share price plus dividends

The Office of the Superintendent of Financial Institutions (OSFI) designated these banks as domestic systemically important banks; D-SIBs (Koker, Kerr and Butterfield, 2013; Putnis, 2015). In 2017, OSFI also classified RBC as a global systemically important bank: G-SIB (OSFI, 2017). They are too big to fail and are subject to more stringent regulatory oversight of capital requirements. OSFI is the Canadian Federal Bank regulator and has the power to mandate regulatory change. OSFI provides oversight in regulating the activities of the Canadian financial services industry and exercises control over the operation of banks in Canada, their leverage and capital adequacy requirements as outlined by the Basel accord. OSFI also monitors and ensures prudential corporate governance by the banks.

The six major banks have their histories going as far back as the 1800s. The Bank of Montreal (BMO) is Canada's first bank, having opened for business on November 3, 1817 (Bank of Montreal, 2016). The Royal Bank of Canada (RBC) was incorporated in 1869 (RBC, 2016). The Bank of Nova Scotia (BNS) was incorporated in 1832 with a capital base of £100,000 (Bank of Nova Scotia, 2016).

The banks in their early days grew by mergers, acquisitions and expansion beyond their domestic markets. Both RBC and BNS expanded into the Caribbean. BNS merged with the Union Bank of Prince Edward Island and the Bank of Ottawa. BNS was one of the first banks to open a branch in Jamaica (1889) and a branch in London, England (1920). The Toronto Dominion Bank (TD) is today the second largest Canadian chartered Bank. TD Bank is the result of three bank mergers; The Dominion Bank, the Bank of Toronto (1955) and Canada Trust in 2000 (TD Bank, 2016).

Banks pursued growth through M&A activity of other domestic banks. Banks were restricted from expanding into other financial services such as insurance and securities and for many years banking activities focused on the traditional services of loans and deposits.

2.1.1 The Bank Act

Canada's Bank Act is a law passed by the Canadian Parliament to regulate chartered banks. The Bank Act is reviewed every five years to ensure the regulatory structure keeps pace with industry changes. Any changes to the Act, after passage by Parliament remains in force for 10 years (Government of Canada, 2016).

The Bank Act segments Banks into Schedule I, II and III banks. The Schedule I banks are domestic banks that are commonly held public corporations with the stipulation that no more than 10% of the bank's holding stock can be held by any one owner. Schedule II and III banks are largely foreign owned and the Bank Act allows the government to control their size.

Amendments to the Bank Act in 1992 continued the process of removing the barriers preventing banks from expanding into other financial services. This historically significant change opened the door for banks to provide services beyond loans and deposits. It allowed banks to provide securitization services, Insurance and Trust services (Daniel, 2003). These amendments gave financial institutions the permission to diversify into new lines of business. The result was an acquisition frenzy of smaller Trust and Securities firms by the large Canadian banks. As a result of the 1992 amendments, Canadian banks evolved into financial conglomerates providing a wide variety of financial services from loans, securities underwriting and insurance. Due to Canada's relatively small population, domestic growth is limited and banks have subsequently expanded into the United States and Caribbean.

2.1.2 Historical Industry Stability

A National Bureau of Economic Research study in 1993 compared Canadian Banking stability to its US counterparts. The study pointed out that the Canadian banking system was an oligopoly by design of policies established by the Canadian Federal Government (Bordo, Rockoff and Redish, 1993). The study posits that the Canadian Government has prioritized financial stability through regulation, over banking efficiency. This has resulted in an oligopoly in the Canadian financial industry dominated by the top six banks (Eggbert, 2012). The greater stability provided by the Canadian financial system is at the expense of undue concentration of power. High barriers to entry include minimum capital requirements that are many multiples of the requirement for a US bank and costly chartering provision resulting in a concentration of Canadian financial services in the hands of a few institutions. In the United States there exists a model of many small efficient banks, however, these smaller banks are more vulnerable to financial shocks as evidenced by the financial crisis of 2008 when many collapsed. Between 2008 and 2011 alone, 415 US banks failed (FDIC, 2017).

By contrast, the Canadian banking experience has been one of enviable stability. There was only one bank failure since World War I (the Home Bank 1923) and despite the

hardships of the Great Depression which saw the collapse of the US financial system in the 1930s, and the not so distant financial crisis of 2008, there have been no Canadian bank failures since (Bordo, Rockoff and Redish, 1993). For eight consecutive years the World Economic Forum has ranked Canada has having the most sound banking system in the world (CBA, 2016a).

A Canadian Banker's Association survey in 2015 (CBA, 2016b) indicated that 84% of Canadians have a favorable impression of their Banks and 87% give banks high marks for being stable and secure. Canadians are well served by their banking system with 6,348 national bank branches and 18,776 Automated Banking Machines (ABMs) across Canada. Banks finance 1.6 million small and medium sized Canadian businesses. Canadians are also conservative borrowers and as of May 2016, only 0.28% of bank mortgages were in arrears.

Banks employ 280,115 (2015) Canadians domestically, with an additional 99,365 in other countries. Salaries and benefits paid in 2015 to employees in Canada were $26.6 billion. Likewise, dividend income paid in 2015 by Canadian banks to shareholders was a staggering $15.9 billion (CBA, 2016a).

The Canadian financial system has proven itself more stable than its US counterparts, however, this stability comes at a cost; a concentrated and regulated financial system that is slower to innovate, slower to invest in emerging sectors and provides services at monopoly prices (Bordo, Redish and Rockoff, 2011). Whether industry efficiency or monopolistic stability is the right model for Canadian consumers, stability of the banking system is pivotal to the stability of the Canadian economy.

2.1.3 The Case for Banking Innovation

Canadian banks are conservative firms by the nature of their business and have traditionally been slow innovators. Banking has been a staid and conservative industry; institutional change comes slow and changes are implemented measurably (Intelliware, 2015). For example, the Canadian payments and mobile infrastructure lags that of many other countries. The electronic payment system known as the Automated Clearing Settlement Systems (ACSS), managed by the Canadian Payments Association (CPA), is ill equipped to move the country to electronic bill payment and presentment; an innovation that other countries have already made headway (Armstrong, 2013). Despite the rise of new disruptive technologies, bankers today run their business as they did at the height of the 2008 financial crisis (Osak, 2014). Bankers continue to rely on the traditional

profit drivers; fee based services, exchange rate volatility and economic growth. Banking continues to be a stable and staid industry.

The same risk averse culture that averted the Canadian banking oligopoly from financial disaster in 2008 is also the same barrier to innovation (Intelliware, 2015). Innovation requires taking risks on new technologies and processes that may fail. Banking by its nature is focused on avoiding failure. No other industry has the high profile executive role of Chief Risk Officer (CRO) reporting into the CEO. This conservative culture permeates into operating processes, decisions, level of innovation and services, resulting in slow corporate inertia to change. Innovation becomes a victim of this inertia. Subsequently, banking has been slow to adopt digital technologies as compared to other industries (Osak, 2014). An innovation driven mindset and shedding the reliance on an increasingly obsolete banking model is required (Armstrong, 2013) by incumbents to challenge new nimble disruptors.

By contrast, banking in other parts of the world are adopting a more innovative mindset. The European Commission in 2015 passed the directive on payments services (PSD2) that requires European banks to open up their client's payments account information to trusted third parties. Over 3,700 European banks are impacted by this directive and it will come into force in the 2018/2019 timeframe. PSD2 opens the payments market to greater competition and encourages greater FinTech innovation (EBA, 2015; European Comission, 2015; Trulioo, 2015). This integration between banks and third party financial service providers is possible through banks creating Application Programming Interfaces (APIs) that will enable trusted third parties to integrate their products; mobile and other web based applications.

One leader in this space, and the 2016 Efma innovation award winner for the best financial services innovation, is Brazil's Original Bank (Efma, 2016). Original Bank launched in April 2016 as Brazil's first branchless fully digital bank. To keep pace with innovations in the market the bank opened up four payment APIs to its developers. Through APIs, Open Bank can integrate the bank's financial services with third party applications in a fast and secure manner.

"Since the beginning, we've been committed to being ahead of the curve and want to be able to innovate fast and often. We are working to be the first bank in the world to offer our services in car systems, smart TVs, smart refrigerators, activity trackers and many more. All of these scenarios are not possible without open APIs." (Efma, 2016, p. 1)

In the UK the Open Banking Working Group (OBWG) has recommended the creation of an Open Banking Standard to enable the secure sharing and handling of data by third parties (ODI, 2016). At the request of HM Treasury the OBWG convened in 2015 to explore how access to customer data could help customers engage financial services in better ways. The OBWG recommended the creation of an Open Banking API base service that provides read only access to customer personal transaction data. The OBWG recommended that bank data, including information about bank products and services be available as open data, so new services can be created. In response to OBWG's recommendations, the UK Economic Secretary to the Treasury, Harriet Baldwin stated:

"I am determined to ensure that our financial services remain at the forefront of technological evolution. That's why I asked the Open Banking Working Group to explore how an open standard for Application Programming Interfaces (APIs) – or an Open Banking Standard – could be designed to increase competition in Britain's banking sector, give customers more control over their finances, and provide FinTechs with a globally unrivalled opportunity for innovation in the UK." (ODI, 2016, p. 1)

By contrast, Canadian banks have no publically exposed APIs at this time nor is there a regulatory body examining open standards for banking. Yet, future innovations will require the type of access that Open Bank has established and that the European Bank is mandating through PSD2. KPMG (KPMG, 2016) indicates that APIs, artificial intelligence and cloud services are the building blocks of tomorrow's innovations. KPMG's report on the Invisible Bank, featuring "Meet EVA" (KPMG, 2016), envisions a not too distant future where artificial intelligent (AI) based virtual assistants are the new consumer interfaces to financial services. However, to achieve this vision, banks must provide access to their payment applications to trusted third parties. A vision of that future can be seen at this link: https://www.kpmg.com/uk/meetEVA .

A firm that is poised to enter this space is Apple. Apple has already established a foothold in the payments space. As well, it already has as an AI virtual assistant, Siri, which most consumers are already using. It is conceivable that with the advent of open APIs, Apple can make the leap to become an alternate consumer interface to banking that will leapfrog the telephone and web user experience. Apple is a company that has the deep pockets to change a business landscape that it targets. Its entry into the music distribution and sales through the iTunes service and iPod hardware was a major disruptor to bricks and mortar distribution channels and to the portable MP3 player market. Unlike smaller FinTechs,

Apple has the financial resources and is not at the mercy of venture capitalist funding. Google and Amazon already have consumer ready interactive voice assistants and have the financial resources to leverage their virtual assistants as AI based banking interfaces.

No monopoly, duopoly or oligopoly is immune from disruption. Examples of failures due to technology disruption exist in other stable industries. A classical case is Kodak, which was founded in 1888 and after operating for 124 years, filed for Chapter 11, bankruptcy protection on January 19, 2012. The duopoly of Kodak and Fuji Film dominated the photographic film industry. Despite Kodak having developed the first digital camera in 1975, it never commercialized the technology, favoring the profitable consumables products instead. The disruption brought on by digital imaging technologies from new entrants with established electronics expertise decimated the photography film industry. Kodak underinvested in digital technologies as its profitable business was based on film manufacturing and chemicals for the film processing industry. Despite leveraging its brand recognition to enter digital imaging thereafter, the photography industry shifted from chemicals and film intellectual property leadership to electronic design and manufacturing (Lucas and Goh, 2009).

The best run companies are susceptible to disruption, as operational excellence is insufficient for survival. What made a company great in the past does not guarantee that it will be great in future. The brands that are recognized in today's business may not be the brands of tomorrow's business. Survival requires innovation (Anthony, 2009).

A 2013 PwC survey of 246 global CEOs on corporate innovation indicated that 57% of respondents felt that having the right culture to support innovation was a key ingredient (PwC, 2013). Corporate culture was also indicated as a key barrier by 41% of the respondents. The PwC study suggested that a change adopting culture may be more important than leadership for creating an innovative organization. Nearly a third (28%) of board level respondents in Canadian finance indicated that it was very challenging to build an innovative culture (Hicks, 2013). A recent survey by Capgemini indicated that 40% of the respondents noted that the biggest factor holding financial firms back from developing FinTech capabilities is the lack of a conducive culture for innovation (Capgemini, 2016). This correlates closely with the PwC survey findings from 2013. Leading innovators have well defined innovation strategies in place. By contrast, few Canadian financial institutions have formal structures in place to drive and sustain innovation (Hicks, 2013), yet firms with a culture of innovation can do much better

financially. Canadian industries do not have a strong competitive culture of innovation commercialization and financial supremacy (Good, 2014).

A survey conducted by Efma and Infosys indicated that 49% of financial institutions proclaimed their innovation objective was to be a leader while 38% proclaimed they were fast followers (Nicols, 2015). Less than 40% of the traditional financial services firms surveyed by Capgemini (2016) believed they were effective at applying innovation while only 10% were effective in achieving innovation results. Financial institutions are lagging innovators, letting other industries innovate first before they adopt.

R&D spend as a percentage of a firm's revenue is regarded as a measure of a firm's innovation culture. It is noteworthy that the top three Canadian banks (who are also the top three Canadian firms by revenue) with combined annual revenues in the billions are not on Canada's top 100 corporate R&D spender's list (Research Infosource, 2015). RBC, as the largest Canadian bank by market capitalization, in 2015 had a profit of $10 billion dollars yet no qualified R&D spend is evident in RBC's annual report (RBC, 2015). A review of CIBC's annual report also does not mention R&D spend (CIBC, 2015). KPMG (KPMG, 2016) estimates that global banks invest only 1-2% of revenues into R&D. By contrast, technology firms spend 10-20% of revenues on R&D. Yet, a recent analysis revealed that firms with above average R&D spend undergoing transformations had a higher rate of success than firms which underinvested in R&D (Reeves, Faeste, *et al.*, 2018).

Canadian financial services lag behind their global counterparts when it comes to innovation (Hicks, 2013). Competitive intensity in the banking industry has increased significantly within the last six years as market disruption becomes a reality. Customer needs are more divergent and varying due to a more diverse population, thereby being more difficult to cater to a large client base with standard service offerings (Galaski *et al.*, 2014).

The banking industry in the United States has been equally slow to innovate. Most industry studies find that legacy systems and infrastructure, lack of leadership commitment, regulatory compliance, organizational silos and lack of budget inhibit innovation (Efma, 2017). JP Nicols, the Managing Director at Fintech Forge (https://www.ftforge.com/), comments that bankers have been trained throughout their career to identify and avoid risks. Innovation requires taking small risks and failing fast and learning from these early mistakes. The banking culture is at odds with an agile

culture and this is a considerable barrier to innovation. JP Nicols comments that *"Innovation is simply not in the DNA of most bankers"* (Efma, 2017). Bradley Leimer, Santander Bank's head of fintech and innovation, commented that *"While there are many reasons why US banks are laggards, I think legacy technology, regulation, compliance and risk aversion have to top the list of reasons why we're not seeing more movement"* (Efma, 2017, p. 18). Meanwhile, technology is democratizing the customer, while new entrants into the finance industry are disrupting the incumbents.

2.2 Disruptive Forces

2.2.1 What is Disruption?

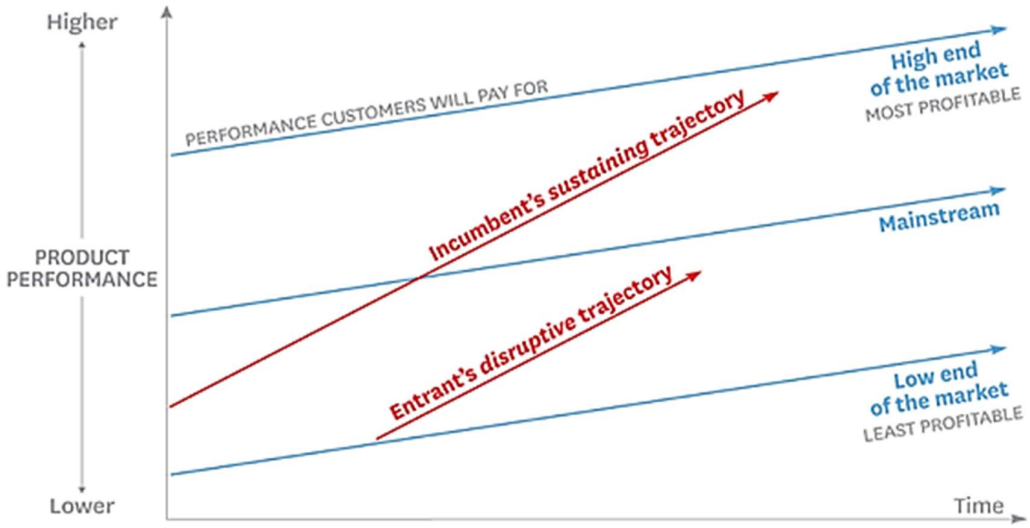
Christensen (2015) describes disruption as a process whereby a smaller firm with fewer resources successfully challenges established industry incumbents. As incumbents focus on improving their products and services for their most profitable customers they exceed the needs of some while ignoring the needs of others. Disruptors begin by successfully targeting those overlooked segments, gaining a foothold by delivering more appealing functionality at a lower price point, or delivering a better client experience. The incumbents, while chasing growth in higher revenue markets, don't tend to respond to the entrant's threat. Entrants then use their established base of servicing the lower-end clients to move up-market, now delivering functionality that the incumbent's mainstream customers require. When the incumbent's mainstream customers adopt the entrant's offerings then the incumbent's business is disrupted (Christensen, M. and McDonald, 2015).

Christensen posits that entrants establish themselves through two strategies; low-end footholds and new-market footholds. The low-end strategy allows a new entrant to focus on delivering products or services to less demanding customers. Christensen argues that the incumbent's products often overshoot the requirements of this customer base. New entrants start by providing these customers with products that adequately, not overly, meet the customer requirements at a lower cost. The new-market strategy creates new markets. They tap unrealized opportunities and create new consumers for their products.

Figure 2-1 illustrates Christensen's disruptive innovation model. This figure contrasts *product performance trajectories* with *customer demand trajectories*. As incumbent companies introduce higher quality products or services to satisfy the high end of the market (where profitability is highest), they overshoot the needs of low-end and mainstream customers. This leaves an opening for entrants to find footholds in the less

profitable segments that incumbents neglect. Entrants on a disruptive trajectory improve the performance of their offerings and move up-market (where profitability is higher for them too) and challenge the dominance of the incumbents (Christensen, M. and McDonald, 2015).

Figure 2-1 – The Disruptive Innovation Model



Source: (Christensen, M. and McDonald, 2015)

2.2.2 How Disruption Impacts Canadian Banking

Apple Pay is an example of a low-end foothold entry into the payments space. Apple equipped their new mobile devices (iPhone 6, 7 and iWatch) with Near Field Communication (NFC) capability as an entry strategy into the digital wallet payments ecosystem. Blackberry, once the incumbent cell phone manufacturer in Canada, also pursued an NFC payments strategy but lacked mobile market dominance, having been usurped by Apple. Consumers of Apple's technology, in association with their banks, now have the ability to easily pay for goods using mobile devices. Consumers no longer have to hold a collection of credit cards in their wallets or use PIN numbers to authorize purchases. Apple mobile devices are the choice for many millennials; a demographic with a higher consumption rate of goods and services than the previous generation. Introducing Apple Pay to a generation that has been brought up with smart mobile technology and where Apple enjoys market dominance, guarantees perpetual payment revenue for Apple.

For the banks, the payments space is only one of many revenue sources. On any transaction using Apple Pay, Apple receives 0.15% of the transaction fee while the incumbent banks take the lion's share of the 2-3% transaction fee. Currently, Apple is a

minor threat to the bank's payment revenues as their percentage of the transaction revenue is small in comparison to their own. However, the concern is that having established a user base, Apple can move up the product performance curve and threaten the bank's mainstream revenue sources.

Another example of an entrant that fits into the disruptive innovation model is Square Inc., a FinTech startup established in 2009. It launched its first payments application in 2010. It achieved significant growth in the payments space and has since gone public in 2015 (NYSE listing is SQ). Square's first product was a small device that attaches to an iPhone's ear piece connector and adds the capability to take credit card payments. Small merchants, sole proprietors and other small businesses, who could not afford a bank's merchant terminal and service costs, quickly adopted the free Square product. The small Square cube atop an iPhone provides the same functionality, at no initial cost, than the bank's commercial offering. These small merchants were underserved by banks who deemed their revenue potential to be small.

The bank's target market for merchant services are the medium to larger business where transactional payments revenue is higher. The small merchant was largely underserved as the revenue potential was small and the high cost for the bank to serve these clients made this unprofitable. As well, Canadian banking being an oligopoly; small merchants did not have many other alternatives for payments and simply did without. Small merchants cannot afford the bank's payments services that provides them with a credit card scanner. However, most can afford an iPhone, or already have one.

As Square gained dominance in the small merchant space, they expanded their offering with a POS terminal based on Apple's iPad. The POS product features a credit card scanner, an iPad and software that allowed payments to be taken through the Square ecosystem. The POS product allows Square to expand their footprint into yet more merchants, by offering a lower cost alternative to established POS products, while capturing yet more merchant payments.

Square charges the merchant only the 2.65% transaction fees on every payment. The funds are available in the merchant's bank account within two business days. By contrast, banks will charge approximately 3% in transaction fees for a small merchant. A merchant can buy the Square POS stand and iPad at three Canadian nationwide electronics retailers and be up and running in a day without ever visiting their bank. The low cost of the POS stand, $99.00 (requires an iPad as well), indicates that Square's business model is to

practically give away the POS stand and bundled sales management software as a way to entice merchants. Every merchant needs a way to capture sales, manage inventory, perform reporting and collect payments. The Square POS software offers these features at no cost. Transaction fees is Square's business model and keeps it cash positive.

As with Apple, Square is another example of a low-end disruptive entrant. It started by servicing an underserved payments niche. It is now expanding into the merchant space by moving up the payments ecosystem and disintermediating the banks. Both Apple and Square's strategy is to capture transactional fees through payments intermediation. Apple has targeted the mass consumer segment whereas Square's strategy is the small merchant niche.

Uber is another technology disruptor that within a few years has threatened the long standing Taxi industry. Incredibly, these alternative services were started by a newer generation of entrepreneurs with technical savvy, who identified underserved markets and used digital channels to reach a mass audience. None of these founders had financial services or transportation exposure, yet these entrants, in less than a decade were able to disrupt established incumbents.

The financial resources to compete with the banks are no longer barriers for deep pocketed competitors such as Google, Apple, PayPal or Square. These firms have modern infrastructure capabilities and innovative technologies that position them for competing with the banks. They are also free from the compliance burdens of financial regulation. Accenture research indicates that retail banks could lose 35% of their market share to technology competitors by 2020 (Galaski *et al.*, 2014).

PayPal's strategy to offer new startups $1.5M US in free payment processing has enabled them to lock-in new clients which dis-intermediates banks for merchant payments. The Uber ride sharing service was one startup that subscribed to this offer and continues to process its credit card payments today through PayPal APIs. This is another example of how disruptive innovators can erode traditional banking revenue sources by interjecting themselves as payments intermediates.

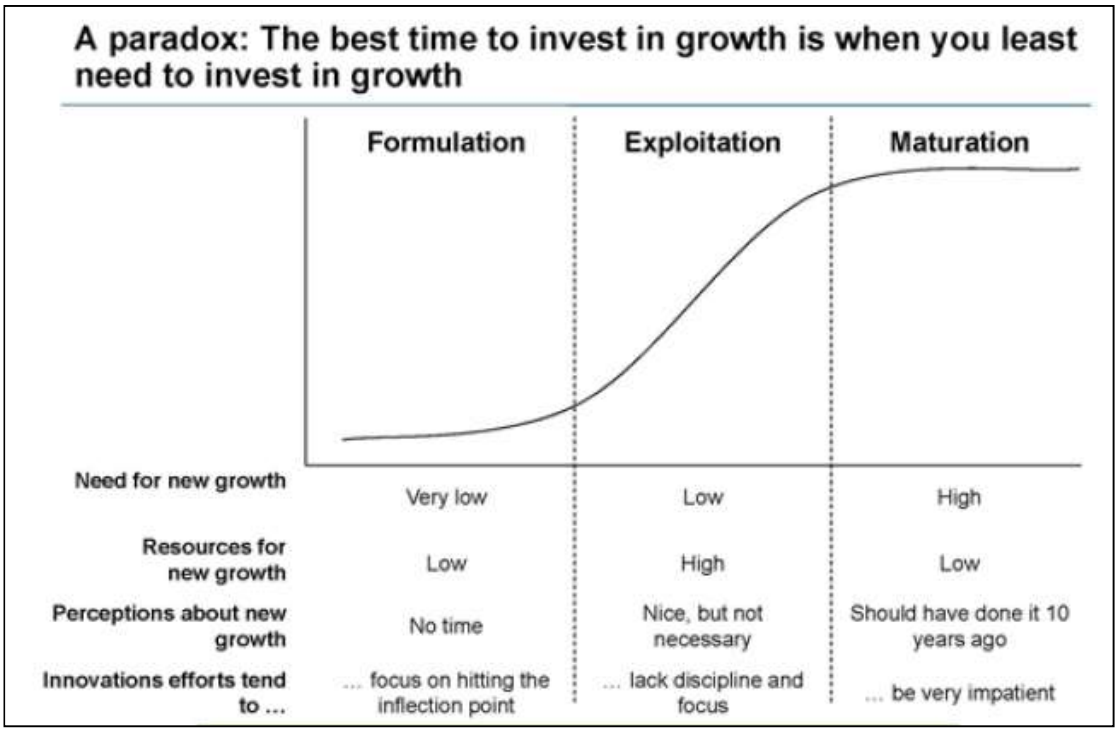
The time for banks to disrupt the FinTech disruptors has passed and they now find themselves defending established revenue sources in payments, lending, deposits and wealth management. As Canadian banks become victims of the innovator's paradox; they adopt defensive market strategies rather than innovation driven growth strategies.

2.2.3 The Innovator's Paradox

The term, innovator's paradox (Figure 2-2), was coined in a Harvard Business Review article (Anthony, 2010) on the collapse of Microsoft's business. The paradox is that when a firm does not need to grow it acts in ways that lead to not getting the needed growth. When the growth is needed, the firm can't act in ways to deliver it. For the Canadian banking industry, the question is what should banks have done five or ten years ago to establish digital leadership before today's FinTech disruptors were still in their infancy.

Research on how the internet disrupted the newspaper industry has many similarities to the disruption of Canadian banking by FinTechs (Gilbert, 2001; Silverthorne, 2002). There are similarities to the defensive strategies taken by Canadian banks when faced with disruption. The research was also the basis for Anthony's article on the Innovator's Paradox (Anthony, 2010).

Figure 2-2 – The Innovator's Paradox



Source: (Anthony, 2010)

Canadian banks are very profitable. Annual profits are in the billions of dollars; RBC alone had a record **profit** of $10 Billion in 2015 (CBC, 2015; RBC, 2015). The financial resources for innovative growth are not a barrier for Canadian banks. During the exploitation phase, banks did not perceive new entrants as a threat. Their impact on

revenues was insignificant. Banking revenue continues to be in the billions. The resources necessary to implement growth were in abundance but as banking did not perceive a threat, it did not take advantage of a resource abundance to fulfill future growth.

This author posits that the maturation phase of the innovator's paradox is perhaps where Canadian banks find themselves today with new disruptive entrants. FinTech entrants have begun encroaching into the mainstream customer base (Figure 2-2). New innovations take time to become dominant. Some innovations don't survive and die off. When they are successful they quickly capture a market.

As new entrants mature, the need for growth by Canadian banks intensifies. However, resources with the skills for innovative growth are scarce at this stage of the curve. The banks develop defensive strategies such as acquisitions and partnerships. The increasing market valuation of FinTechs makes acquisitions costly and leaves partnerships as the only option. Acquiring the scarce innovation resources the banks need for growth becomes challenging.

A recent strategy adopted by Canadian banks in response to the FinTech disruption is to act more like a FinTech. Banks hope that by changing their culture to resemble that of a startup, they will attract the young innovators that will help them grow their business through digital technologies. Every major Canadian bank has established digital incubators or digital labs in an attempt to grow that startup culture and attract the entrepreneurial spirit into banking (Singh, 2016). Activities, hitherto unknown to banking, such as bank sponsored Hackathons, evolved in 2016 as a way to attract new talent into banking. Scotiabank was the first Canadian bank to sponsor a Hackathon. Every other major bank followed suit.

Banks desperately need these skills and are willing to change their culture. RBC's Investor and Treasury Services opened a permanent agile laboratory in 2016 with 100 employees. It touts this laboratory as the first dedicated technology workspace designed specifically to support the agile development methodology. The laboratory enables business and IT teams to work more collaboratively and transform how traditional teams work. TD in 2015 also created a new technology innovation center with 120 employees. The small and nimble TD laboratory setting takes a startup approach to developing improved customer focused products through innovative technologies. It leverages its close proximity to the rich startup area of the Waterloo region, also known as Silicon

Valley North and home to globally recognized brands such as Blackberry, to attract local engineering talent (TD Bank, 2015; Singh, 2016).

2.2.4 The Case for Agility in Financial Services

One process innovation from the FinTech world that has captured the attention of Canadian banks is agile practices for software development and project. Traditional waterfall based methods have been the mainstay of software development methodologies in Canadian banking. While agile promises to deliver products to market quicker and with higher quality, adoption of such practices in banking has been slow. An empirical study conducted to analyze if agile projects were successful, whereby success meant meeting the triple constraint of time, quality and scope in addition to client satisfaction, concluded that agile methods were positively correlated with improved success (Serrador and Pinto, 2015).

However, the author observed that when agile practices are adopted in banking, inconsistent approaches to institutionalizing agile practices may have limited success. Some divisions within Canadian banks have adopted an approach that all new projects must follow agile methodologies. Others have adopted a mix of waterfall and agile methodologies in an effort to leverage the best of both worlds. All banks have admittedly been challenged with cultural change issues and in sustaining agile practices (Shore and Warden, 2007).

Notwithstanding the challenges, agile practices hold promise to achieve the rapid product delivery that banks seek. While agile practices are an innovative approach for providing value earlier to bank clients through the availability of new products, it does not by itself create new innovations. A risk taking culture similar to the FinTechs that can attract young talent with fresh ideas is a key factor. When this talent cannot be acquired through recruitment or acquisitions, this leaves the banks with no other option but to partner with FinTechs.

Changing the bank's culture from risk avoidance to risk acceptance may be the biggest impediment to cultural change. Establishing innovation laboratories with their own startup culture is one strategy for establishing a fast startup sub-culture within the larger corporate culture. In this author’s view, it is unlikely that a bank with 70,000 people and over 100 years of corporate history could holistically change its culture overnight. Establishing a startup sub-culture in contained innovation laboratory areas shields disruption to the wider bank while providing the necessary setting for innovation growth

(Deschamps, 2018; CIBC, 2019; Scotiabank, 2019; TD Bank, 2019). This also shields the bank from systemic failure of these new practices. If they do not live up to expectation, the self-contained innovation laboratories can be shut down without impacting the wider bank.

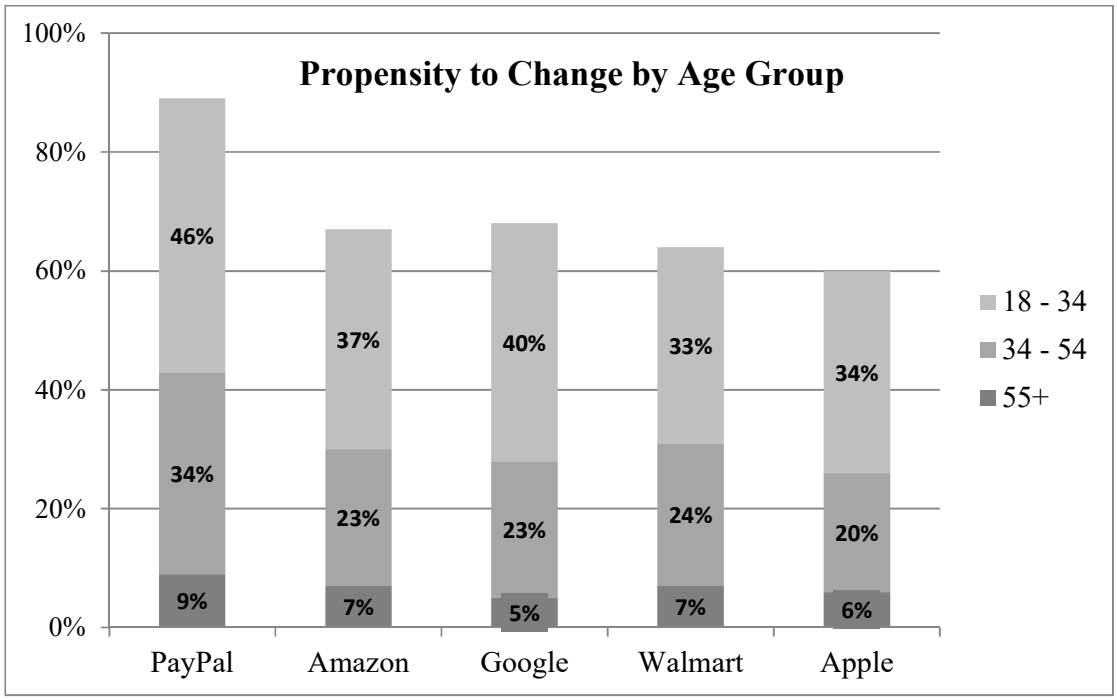
2.3 Summary

Due to the confluence of fast changing client needs and nimble competitive offerings by well-funded FinTechs, banks are required to be more innovative, effective and productive. Multiple disruptive forces are converging on the banking industry; both endogenous and exogenous forces creating a volatile, complex and dynamic future environment (Busch, 2013). The Canadian banking incumbents were slow to innovate with new financial products for their clients and now find themselves at the peak of the maturation curve battling new entrants.

To make matters worse, recent research (Accenture, 2016a; Ernst & Young, 2016) indicates a change in customer's banking loyalty due to the rise of alternatives to traditional banking. Lack of innovation on client access through new digital channels and industry scandals has eroded trust in banks. Consumers no longer consider banks as their primary option for managing their financial services (Figure 2-3). By 2020 new business models can impact existing bank revenues by up to 80%.

A recent bank customer study (Accenture, 2016b) indicates that a younger customer demographic is likely to bank with non-traditional banking services providers. Millennials (18 to 34 year age segment) are the most likely to seek banking services from alternates. Those aged 34 to 54 years of age are also likely to switch to non-traditional financial services providers, while Boomers (aged 55+) are the most reticent to move away from traditional banks. A survey by Accenture (2014) asked consumers if the companies in Figure 2-3 offered banking services, would you bank with them (Likely or Very Likely agreement)?

Figure 2-3 – Alternate Banking Services Survey Results



Source: (Busch *et al.*, 2014)

Incumbent Canadian banks are challenged to keep disruptive FinTech innovators at bay. The literature review indicates that new entrants will usurp incumbents with innovations that provide differentiated financial services experiences at lower cost. Canadian banks have reacted by establishing innovation centers that mirror the environment of the FinTechs; thus attracting the same talent that is responsible for disruption. The paradox is that FinTech innovators, producing easy to use financial products for a younger audience have founders in the same age demographic (18-34) as their clients (Wealthsimple, 2016; Hardbacon, 2018; Square Inc., 2019). By contrast, the large Canadian banks have senior executives who are in the (34-55) age demographic, who make strategic decisions for all client segments. There is a risk that banking executives, who over the years came up through the ranks, may be out of touch with the needs of a younger demographic: a demographic dissonance.

Banks, understanding their limitations to react aggressively to disrupters are partnering with FinTech firms for leveraging the innovation talent they lack. FinTechs can innovate much quicker, with better user experiences (UX) and a better understanding of the needs of their own cohort.

Alternatively, banks are shaping their cultures to look more like startups. This includes changing the traditional product development methodologies by adopting new practices for rapid product delivery. Introduction of agile Scrum practices is a major product development shift. Agile has fundamentally changed the manner in which business and technology groups interact and redefines the roles of project participants. The requirement to build products using these methods has brought with it radical cultural change which is not the norm for the staid Canadian banking industry.

Whether Canadian banks can adapt to a faster pace of innovation driven change and compete with FinTechs remains to be seen. The change journey has just begun and it is too soon to conclude what strategies are successful in the long term. The evidence to date indicates that partnerships and acquisitions are the norm (Badour, Lynde and Firestone, 2017).

3. The Literature on Agile Best Practices

3.1 Introduction

Whereas the previous chapter examined the drivers for adoption of agile practices by Canadian banks, this chapter reviews the literature for what factors influence successful agile adoptions in firms.

Peer reviewed publications referenced in the literature use the lower case “agile” (Syed-Abdullah, Holcombe and Gheorge, 2006; Inayat *et al.*, 2015; Stettina and Hörz, 2015) notation whereas others use the upper case “Agile” notation (Morien, 2005; Tengshe and Noble, 2007; GAO, 2012; NAO, 2012; Gandomani and Nafchi, 2015; Serrador and Pinto, 2015). The lower case “agile” notation is used within this document when referring to agile methods or practices. There is no accepted naming convention in research publications.

Another point observed in the literature is that "agile adoption" and "agile transformation" references describe the same principles: the strategic, cultural and process changes required for an organization to adopt and sustain agile software development principles. These terms are used interchangeably in this research and should be considered as equal.

3.2 Plan Based and Agile Product Development Methods

This literature review makes references to both plan based and agile methodologies used in software project management for product development. This section introduces the differences between agile and plan based projects as it applies to development of software based products and services. This is a brief introduction for the reader and by no means a comprehensive discussion of the merits and characteristics of each methodology. Agile and plan-based methodologies each have their strengths and weaknesses. A methodology may be well suited for one type of project and ill-suited for another.

3.2.1 Plan Based Methodologies

Plan based product development is based on a set of sequential phases or gates, that the product evolves through before being made available to a client. Most products and services in use today have been created using this sequential phased approach. Project managers are well versed in this methodology as it has been long established.

It starts with the client describing what they want. A project manager (PM) is assigned to the client who oversees the client’s needs from requirements inception through product delivery. Some of the PM’s responsibilities are to manage the project resources, ensure

the schedule is met, produce status reporting for management and the client, resolve project issues, constraints, risks and track financials. The project manager leads the project team and is the liaison between the client and the team.

Meetings between the client and the project team take place to understand the client requirements at a high level. The project team produces a high level estimate of scope, time and cost for the client. Once the client accepts the high level estimate, the project begins. The first step is for a Business Analyst to work with the client to elicit more detailed requirements. The functional and non-functional requirements are collected into a Business Requirements Document (BRD) that represents the scope of the project. Once the client agrees that the BRD is a complete representation of their needs, then the project team creates a Technical Design Specification (TDS) which provides more detail for developers into how the product will be built. At this stage, the requirements are frozen and the client interaction is typically minimal.

The team proceeds to build the product which in some cases may take several months or years, with oversight and direction from the project manager. Quality Assurance (QA) is performed at the end of product development to ensure that the product functions without errors and within the performance parameters defined by the client.

Once QA completes, the client is contacted to test the product ensuring the project requirements are met; this is the User Acceptance Testing (UAT) phase. If the client agrees the product meets all requirements set out in the BRD, then the client signs off on the product acceptance and the project is closed.

This step-wise approach is often referred to as a "Waterfall" method as one phase of the project flows sequentially into the next. Gartner Inc. refers to this approach as a Mode 1 methodology (see 3.3.3 Agile Processes, Bimodal Methods). This approach features extensive client interaction at the start of the project in planning and at the end of the project during UAT. As the product is built there is little, if any, client interaction. The measures of project success are the delivery of all scope, on time and at the agreed upon cost.

The challenges with this approach are that although there is a process to accommodate changes during the project, the fact that the client only sees the product at the last phase of the project can lead to a disconnect between what the client expected as a product and

what the team delivered. As well, with long delivery cycles, there is risk that the product may no longer meet the intended market requirements when it is ready.

The plan based software project management methodology was adapted from manufacturing and is characteristic of how hardware products are built. Please refer to Appendix L for a summary of this methodology's strengths and weaknesses.

3.2.2 Agile Methodologies

Agile product development methodologies such as Scrum and XP have been used for over 15 years in the creation of software based products. SaFE and DAD are recent agile methodologies which have their foundations in Scrum. Agile methodologies espouse incremental product creation and delivery principles.

An agile project begins with the client requirements expressed as user stories. The product team works with the client to translate the client's requirements into user stories; these are requirements stated from the perspective of the client. In effect, the client is the actor in the story. For example a user story may be stated as *"after I deposit funds into my savings account the new balance is displayed on the ATM screen so that I can view my account balance"*. Each user story should be testable. If the story cannot be testable then it is likely stated at a too high level and needs to be further decomposed into more granular stories.

Each user story is added into a list called the "Backlog": effectively an ordered requirements queue. Each story is given a priority and effort estimate in the Backlog. Stories are then grouped together for development within a sprint. A sprint is a fixed time block during which the project team will build and deploy a portion of the product. Sprint duration does not change through the life of the project; two weeks is typical. If the team has adopted a sprint duration of two weeks, then the number of stories in the sprint should be no more than what can be completed in two weeks. Each story has an effort estimate and the project team can therefore estimate how many stories can fit within the sprint.

In an agile project the client or their proxy is referred to as the Product Owner. On Scrum based projects the Product Owner works with a Scrum Master which in most cases replaces the Project Manager. The Scrum Master is a leader servant who is on the project to remove obstacles that the team encounters. On agile projects, the project teams are often self-managed, have all the skills required to develop a product and are more empowered than on plan based projects.

During the two week sprint, the team codes the functionality defined by the selected stories. The code is unit tested by the team and upon sprint completion, the completed functionality is demonstrated to the client. The Scrum concept of Minimal Viable Product (MVP) espouses that if the product functionality developed within the sprint can be used by the client, then it should be deployed into production and available to the client(s) for use. A product in production and available to clients therefore starts to gather feedback on its usability and functionality. This feedback can be used in subsequent sprints to improve the product for its audience as it evolves to completion.

Subsequent sprints continually develop more code and functionality is released to the client as it becomes available. Hence, each sprint incrementally adds more and more functionality to the product until all user stories (e.g. all functionality) have been addressed by the project. As well, each MVP cycle provides an opportunity to gather feedback from the client and improve the product further.

The agile Scrum principles define that any defects found within a sprint should be carried over as a priority into the next sprint for remediation. Defect remediation takes priority over new stories in sprint planning. Defects are addressed at every sprint as opposed to a protracted defect remediation exercise at the end of a Waterfall based project. Agile projects thereby deliver products quicker and with higher quality.

At every sprint the client reviews the work done by the project team and has an opportunity to correct any missed requirements or add any new requirements; perhaps the market the product was intended for has changed and new features are needed. The client should also be available to the project team for any clarifications on user stories. Using the ATM user story example; the team may ask the client where on the ATM screen they want the account balance displayed, in what font size and in what color. Agile projects have an important requirement for the client, or their proxy, to be available to the team throughout the project. In some cases projects do not qualify to be run using agile methods if the client cannot commit a percentage of their time to the project team.

Agile product development principles emphasize short lines of communications to facilitate collaboration and communication among teams and clients. One agile practice states that teams should be co-located to remove any communication impediments. Ceremonies such as daily standups, retrospectives and client demos encourage transparency through frequent communication and feedback with the client. The client demo is a feedback loop allowing the client to continually tailor the product to their needs

as it evolves. Hence, agile projects can adapt to changing client requirements much faster than can traditional plan based methods.

The measure for agile project success is primarily client satisfaction, although most firms use more quantitative KPIs. Plan based projects may satisfy the triple constraint of scope, time and cost as a measure of success, yet leave a client dissatisfied with the finished product.

Agile projects are characteristic of Gartner's Mode 2 methodology (see 3.3.3 Agile Processes, Bimodal Methods) which is suited to client facing applications whereby requirements change frequently due to changing client expectations and for situations where time to market (first mover advantage) is critical. As Waterfall methodologies originated in manufacturing product development, similarly, agile methods borrow concepts from lean manufacturing. Please refer to Appendix L for a summary of this methodology's strengths and weaknesses.

3.3 Agile Adoption Frameworks

The agile Scrum software development movement was influenced by the lean manufacturing approaches documented by Takeuchi and Nonaka. These lean approaches were used by Fuji-Xerox, Honda and Canon for bringing products to market quicker. Takeuchi (Takeuchi and Nonaka, 1986; Rigby, Sutherland and Takeuchi, 2016b) referred to these approaches as "lean" thinking and being similar to playing rugby. Influenced by Takeuchi's and Nonaka's work, the agile Scrum approach was codified in 1995 (Rigby, Sutherland and Takeuchi, 2016b). Software development methodologies have their roots in manufacturing and this research leverages the AWRM manufacturing model to identify agile adoption best practices for software development projects.

There are several views on agile adoption best practices in firms. One view is that a readiness assessment for cultural change be performed to ensure the firm has the culture that is accepting of the change that agile practices bring (Sidky, 2007; Blackman, O'Flynn and Ugyel, 2013) to the firm. The premise is that change is difficult and not all firms have a change embracing culture. The readiness assessment is a gatekeeper step, go/no-go check, before proceeding with an agile implementation. An alternate approach is to assume that change will be enacted, regardless of cultural readiness for change (Misra, Kumar and Kumar, 2006; Lal, 2011).

Several frameworks were examined for assessing best practices. None of the research on agile adoption best practices use analytical frameworks, such as PEST analysis, to evaluate how agile practices impact the firm's environment and if the environment is out of alignment with the agile principles. Yet, a recent survey indicated that 42% of agile adoptions fail due to the firm's culture being at odds with agile practices (VersionOne, 2015).

One article does touch upon the application of the McKinsey 7S framework as a way to evaluate a firm's culture (Tracey and Blood, 2012). The 7S framework identifies a firm's factors necessary for effective strategy execution. It identifies hard (Technical, Organizational) and soft (People) factors that must be aligned for strategic change to be successful (McKinsey & Company, 2008). Although this mature framework can be applied to an agile transformation, there were other more suitable frameworks.

Research into success factors of agile software development was undertaken by Carleton University (Misra, Kumar and Kumar, 2006) and resulted in the development of a conceptual framework that outlined the success of agile software development and its predictors. The framework considers agile practices within three key factor groups; Technical, People and Organizational. Similar to the McKinsey 7S framework, it considers soft and hard factors. People and culture are critical factors in the successful implementation of agile methods (Bermejo *et al.*, 2014). None of the research reviewed took into account exogenous industry factors or the involvement of third-party service providers.

Sidky (Sidky and Arthur, 2007) proposed a four stage framework for agile adoption which mimics the five levels of the Capability Maturity Model (CMM) (Paulk *et al.*, 1993) used to assess traditional software development practice maturity. However, the framework requires an assessment of 300 indicators. Despite the novelty of this approach, the framework has been criticized for its inconsistency with the flexibility promised by an agile approach (Gandomani and Nafchi, 2015). Four years after being published, one of its authors criticizes the framework for compromising the flexibility offered by agile methodologies.

Gandomani (Gandomani and Nafchi, 2015) used a grounded theory study with the participation of 49 agile experts to create an agile transition and adoption framework. The framework analyzes firm prerequisites, facilitating factors, transition challenges and issues. The framework also encompasses the sustainment of agile practices, but as with

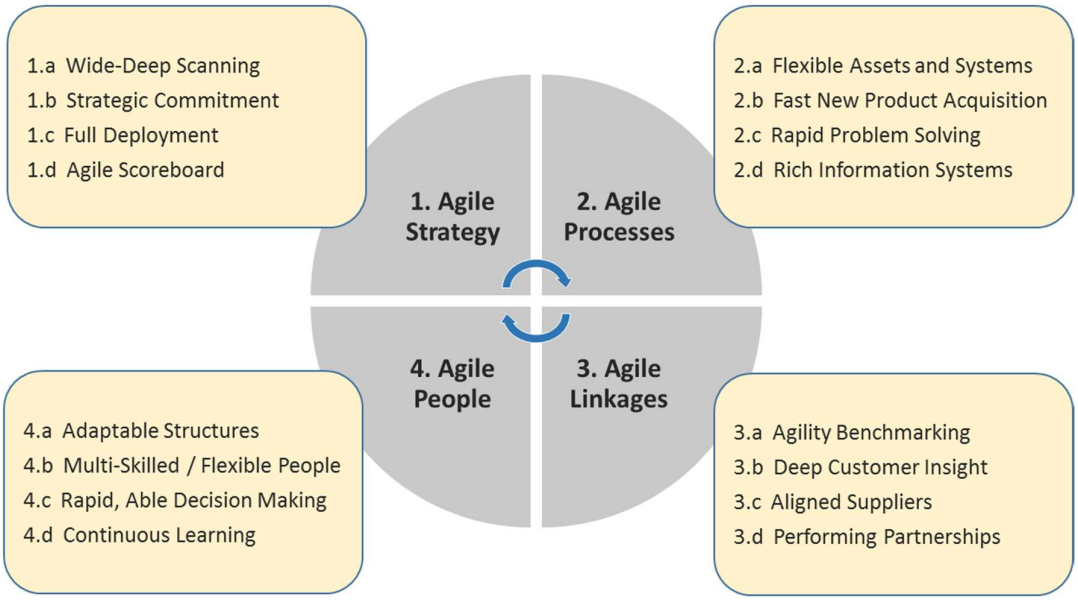
others it is internally focused and does not consider exogenous factors such as the dependency on third parties.

A framework from a manufacturing industry study is the Agile Wheel Reference Model in Figure 3-1. It was intended for auditing agile practices in manufacturing but could be adapted for assessing agile adoption factors in software development firms. As with other frameworks, it also addresses hard (Strategy, Process, Linkages) and soft (People) factors. AWRM examines 16 dimensions of agile practices considering both strategic and operational factors. The AWRM is represented as a circular process, emphasizing that all 16 dimensions are interdependent. If any of the 16 dimensions are lacking, then the firm's agile capability is weakened.

The AMRG research posits that the reference model provides a framework for managing focused organizational development (Meredith and Francis, 2000). It identifies priority areas for organizational development and lays the foundations for deployment of an agile strategy.

The AWRM framework therefore provides a readily available structure to identify and classify agile best practices. Unlike other frameworks, it is specifically focused on agile best practices and considers exogenous factors for agile adopting firms. This framework was therefore used in the literature review as a basis for understanding agile adoption best practices in the software development industry.

Figure 3-1 – Agile Wheel Reference Model (AWRM)



Source: Author (2017), adapted from AMRG (Meredith and Francis, 2000)

3.3.1 Agile Adoption Factors

This section examines key publications on agile adoption and transformation for software development. The literature review uses the sixteen dimensions of the AWRM model as a framework for classification of best practices. Literature on Canadian banking agile adoption best practices, the best practices of other financial firms and a review of publications on other software development firms making the transition to agile was undertaken.

3.3.2 Agile Strategy

This quadrant encompasses the strategic aspects of agility and consists of wide-deep scanning, strategic commitment, full deployment and the agile scoreboard. This quadrant is significant as it addresses the agile drivers, the firm's strategic commitment to change and how the firm measures its agile adoption success at the strategic organizational level and project level. Full firm agile deployment is discussed herein and although it is an AMRG recommendation, other literature on agile adoptions for large firms does not support this approach (Dikert, Paasivaara and Lassenius, 2016; Ambler and Lines, 2017; Catlin *et al.*, 2017; Deloitte, 2017; Aghina, Ahlback and Jaenicke, 2018).

3.3.2.1 Wide Deep Scanning

This encompasses the firm's procedures for understanding its exogenous environment and understanding change drivers that may impact it. Multiple exogenous factors should be tracked, such as competitor's strategies, customer needs, changes in economic conditions and emerging technologies. AMRG recommends that change drivers should be examined deeply before the firm commits any resources to change. Without a deep understanding of exogenous disruptors that may impact a firm's operating environment, it is impossible for firms to develop appropriate defensive strategies (Meredith and Francis, 2000).

This dimension focuses on external drivers that influence strategies within the firm. These drivers could be economic conditions, a competitor's new product or new manufacturing methods. In the context of agile adoption for software development, the exogenous influencing factors could be new practices for leading agile software development, new frameworks supporting enterprise scale agile projects and understanding what competitors are doing regarding their own agile best practices. Both Citigroup, ING Bank and Standard Bank developed their agile practices from established practitioners (Tengshe and Noble, 2007; Fortune, 2016; McKinsey & Company, 2017).

This dimension can have many facets depending on the lens applied. From a firm strategic sales lens it could be the scanning of the competitive environment to understand a competitor's strengths, weaknesses and product offerings. In banking, this would be to gather an understanding of early stage venture funded FinTechs, their product offering and market entry strategies. This would allow a bank to formulate defensive strategies to minimize FinTech disruption in its markets. Examples are CIBC's partnership with the MaRS Discovery District FinTech cluster (CIBC, 2015), TD's presence in CommuniTech; an early startup incubator (TD Bank, 2015) and Ryerson's DMZ startup Hub partnership with Bank of Montreal (Ryerson University, 2019). Participation in these startup clusters provides the banks with fresh talent that can drive new ideas but also gives the banks a view into emerging competitive products.

Scanning of the competitive environment for setting strategy is not unique to agile development. It is an annual process followed by every bank as they attempt to differentiate themselves from their peers and capture market leadership positions.

Summary

From an agile adoption and sustainment lens, scanning of the external environment would be the practices associated with examining the environment for new frameworks, agile tools and processes that can be adopted into the firm's practices. It is the on-going adaptation and optimization of the bank's agile practices by examining trends in the industry, best practices, impediments and successes of other firms. This requires a culture of continuous improvement and a willingness to look beyond the bank's four walls for fresh ideas.

3.3.2.2 Strategic Commitment

Strategic commitment refers to the executive willingness to commit and support agile practices within the firm starting at the highest levels. Senior executive commitment is required to navigate the political turmoil that such cultural and organization changes entail. This includes changing the annual financial planning cycle to be hypersensitive to changing customer needs by developing products and services much quicker to ascertain a first mover advantage (Meredith and Francis, 2000).

For firms adopting agile software development, practices, this entails a large cultural change to attitudes and roles regarding how software based products are created. This level of cultural change requires continued extensive executive support throughout the adoption or the firm can fall back to its comfort zone of creating products through traditional methods. This dimension is as important in manufacturing as it is in banking. Senior leadership commitment, position power and political savvy are needed to navigate the change journey away from long established practices (Burkner *et al.*, 2017).

Adopting agile practices poses a significant change to all aspects of a firm. Due to the extent of this change, companies are faced with a wide variety of barriers and challenges. Gandomani's study notes that process, people, management issues, cultural and technical problems are main categories of adoption barriers (Gandomani *et al.*, 2015). A longitudinal study of agile transformation at Nokia (Korhonen, 2013) concluded that the most important factors for success in a software development organization are culture, people and communications. The people factor is key in that appropriately trained, resourced and empowered project teams are critical for successful agile adoptions. The Salesforce.com agile transformation experience confirmed the same factors (Greene and Fry, 2007).

Recent articles on embracing agile, point out that when a team chooses to adopt agile methodologies, leadership may need to press those non-adopters for cooperation or replace them outright with people more accepting of change (Rigby, Sutherland and Takeuchi, 2016a; Danoesastro, Rehberg and Freeland, 2018). As an example, ING Bank in an effort to change its culture to agile (McKinsey & Company, 2017), made over 3500 staff re-apply for new organizational roles. Only those staff that were deemed to have the "right mindset" were retained, the remainder were made redundant. ING's CIO explained that although knowledge is important, selecting the right people that can adapt to a new culture is more important. Rigby (Rigby, Sutherland and Takeuchi, 2016a) posits that it is better to build champions for change than to coerce resisters.

Executive Support

The literature indicates that top management support is one of the most important factors for successful agile adoptions (Stettina and Hörz, 2015; Danoesastro, Rehberg and Freeland, 2018). Although top management recognizes that participation is important the study participants noted that it was often lacking. Dean Leffingwell, the founder of the Scaled Agile Framework (SAFe), noted that there is a point at which the organization cannot be effective without leadership taking a role (Leffingwell, 2007). Capital One's Auto Finance division's agile adoption was initiated by the CIO (Tengshe and Noble, 2007). The CIO met with the PMO's agile coaches every quarter to understand progress and impediments and how he could help remove them. The article concluded that Capital One's agile adoption was successful as measured by a 100% customer satisfaction rate on over 40 completed agile projects (Tengshe and Noble, 2007). Executive support was a key factor in adopting agile practices. Identifying champions who supported the agile culture was also important.

The agile transformation at Saleforce.com, in their lessons learned, noted that executive commitment was crucial to make a change. The author stated that without executive support the transformation would have failed as there were times in the transformation when boundaries were tested (Greene and Fry, 2007).

An article (Rigby, Sutherland and Takeuchi, 2016a) on embracing agile, notes that because executives have not undergone training they don't really understand agile approaches. Unwittingly these executives continue to manage in ways that counter agile principles and undermine the effectiveness of agile teams reporting to them (Rigby, Sutherland and Takeuchi, 2016a). This article is critical of executive involvement on agile

transformation initiatives citing that with the best of intentions, they erode the benefits of agile innovation by becoming overly involved in the individual teams, launching too many initiatives concurrently, spreading their resources too thin, promoting marginal ideas and routinely overturning team decisions. The need for training "all" stakeholders, particularly those in upper management, was also echoed by another study (Chandra M., Kumar and Kumar, 2010).

Recent research from PMI indicates that various project success metrics are likely to be achieved when executive sponsorship is involved. An executive sponsor's engagement is the top driver of project success (Project Management Institute, 2016). When more than 80% of projects have executive sponsorship, the success rate as measured by five indicators, rises to 65%. Yet, only three in five projects have engaged executive sponsorship. This observation is similar to that mentioned in other literature; executive sponsorship, although critical, is often lacking.

Summary

Executive support is a key ingredient in agile adoption. In manufacturing and software development, the literature supports the view that lack of executive support is an impediment to adopting agile due to the transformative impact that such practices will have on culture, people and processes.

3.3.2.3 Full Deployment

Full deployment is characterized by the level of penetration that agile practices have been embedded into the firm's processes. This includes the adoption of agile practices by every department and project team. The premise is that agility is more effective when the entire firm is operating with the same level of values and processes (Meredith and Francis, 2000). A recent survey indicates that agile adoptions have been slow with only 25% of software development organizations surveyed having used agile methods for five or more years (VersionOne, 2016).

In banking, a holistic agile transformation is not possible due to the level of culture change and process instability that rapid change would impose. Whole organizational adoption is difficult and often some teams remain non-agile (Gandomani and Nafchi, 2015; BCG, 2018a).

A deployment is considered successful if it occurs at the Line of Business (LOB) level. For example, at TD Bank the Wealth Management LOB has adopted agile practices, yet

TD Bank is not holistically agile. Standard Bank in adopting agile, first established the practices in an application development and maintenance group before taking the practices to other groups within information technology (Blumberg and Stuer, 2016). Stephen Bird, CEO of Global Consumer Banking for Citi, understood that he could never hope to change the culture of a banking behemoth such as Citi. As with other banks, Citi started small with an elite group of 40 developers that could operate with startup like speed and agility (Fortune, 2016). Bird concluded that to push change at a large bank one would have to start small; a paradox insofar that the larger the organization, the more gradual the adoption process should be. This is echoed in a recent article on embracing agile (Rigby, Sutherland and Takeuchi, 2016a) which notes that firms typically launch change programs as massive efforts. However, the most successful introduction of agile practices start small and often begins in IT groups where developers may already be familiar with agile.

Corporate Culture Impediments

One common impediment of agile adoptions is the culture change that agile imposes on the organization. This is a dimension that is not addressed by AMRG, but is mentioned in several publications including the VersionOne annual surveys (VersionOne, 2016). The 2016 survey on the state of agile indicates that the key barriers to further adoption by firms continues to be a culture that resists change and lack of management support. Respondents indicated that a change resisting culture is to blame for agile project failures (VersionOne, 2016). Chandra (2010) points out that one of the most important but extremely difficult to achieve classes of change is that of changing the firm's culture. This observation is also echoed by another study (Gandomani, Zulzalil, Ghani, Ziaei Nafchi, *et al.*, 2013) which concludes that the roots of most adoption barriers experienced are organization culture and structure which are entrenched in traditional organizations. One article comments that changing complex systems while also keeping them running is difficult (Reeves, Levin, *et al.*, 2018). Simplicity and singular change approaches are often used. One proposed approach is to acknowledge the organizational complexity, risks and unknowns through change strategies tailored to each stage of change.

The banking culture is one of risk aversion. It permeates into operating processes, organizational structure, decisions, level of innovation and services, resulting in slow corporate inertia to change. As a result, banking has been slow to adopt digital technologies as compared to other industries (Osak, 2014). A recent survey of 246 global

CEOs on corporate innovation indicated that 57% of respondents felt that having the right culture to support innovation was a key ingredient, while 44% of respondents indicated that strong visionary business leadership was secondary to culture (PwC, 2013). Corporate culture was also indicated as a key barrier by 41% of the respondents. The study suggested that a change adopting culture may be more important as a change factor than good leadership; culture trumps leadership.

Other articles suggest that changing the leadership improves the odds of transformation success (Burkner *et al.*, 2017; Danoesastro, Rehberg and Freeland, 2018; Reeves, Faeste, *et al.*, 2018). One article suggest the best leaders to lead a transformation are those from inside the company who have maintained detachment from local traditions and ideology to maintain the perspective of an outsider while being an insider. They know the company and its people but also those who will have to change (Bauer, 1992). Nearly a third (28%) of board level respondents in Canadian finance indicated that it was very challenging to build an innovative change accepting culture (Hicks, 2013).

A CEB (2012) survey on barriers to agile adoption conducted on 20 firms indicated that three top barriers accounted for 65% of the impediments to adoption:

- 30% - Availability of developers that can be successful with agile
- 25% - Cultural resistance to agile methods from business partners
- 10% - Cultural resistance to agile within Information Technology (IT)

The availability of the right skill sets, cultural resistance from business partners and IT are the greatest impediments to unlocking the benefits of agile. Having developers in the organization who already know agile is a ready source of champions to draw from (Blumberg and Stuer, 2016). The CEB survey quoted one Senior VP of a Health Care provider who expressed that;

"Agile will be key to improving our efficiency, but we're unclear how we can change minds and existing behaviors to fully take advantage of it." (CEB, 2012, p. 1)

Culture change and the associated organizational change management practices are key factors in agile adoptions.

Gradual, Iterative and Continuous Adoption

A successful transition to agile methods should be iterative; this was the finding of a study on frameworks for agile transition (Gandomani and Nafchi, 2015). Other factors

identified were that a transition to agile should be gradual and continuous. Gradual, so that people in the organization are given time to adapt to the changes. A gradual transition also reduces the risk and challenges of the change process. Sustaining change in an organization is difficult and requires on-going support.

A study (Korhonen, 2013) of an agile transformation at Nokia observes that in large distributed organizations, making a complete agile transformation can take a few years. The same study also concluded that the smaller the organization, the easier and faster it was for implementing an agile transformation. Another article comments that an agile transformation can take two to three years (BCG, 2018a). Benefits for adopting agile methods could be realized much sooner in smaller firms.

Yahoo started with an agile pilot in which four teams were migrated to Scrum as a starting point before expanding the adoption to other teams (Wiss, 2008). Lessons learned from the early adoption were used to further expand the practices. Among the challenges experienced by Yahoo in adopting agile Scrum, were:

1. Teams would drop Scrum practices after the first sign of failure, usually after the first sprint.
2. The daily standup meetings were not held as required by Scrum.
3. Most teams would abandon Scrum practices when they found it difficult to adapt.
4. No sprint retrospect sessions were held, making it difficult to learn, adapt and improve.
5. Multiple Product Owners were involved on a project, thus creating chaos and confusion.
6. Tasks were changed during the sprint execution, contrary to Scrum rules.
7. Lack of training on agile Scrum.
8. Distributed teams required special procedures.

Issues arise when deliverables are required from other internal divisions who don't operate with agility. The result is that agile projects waste time, miss sprint deadlines, until such deliverables are completed. The same issues surface when external vendors, who are not agile are engaged to deliver project components. At RBC, the Investor & Technology Services group is fully agile, whereas RBC holistically is not. Agile adoptions are more effective when linkages between departments, groups and individuals are highly integrated (Meredith and Francis, 2000). However, this is not always feasible in large multi-divisional firms.

On the Salesforce.com agile adoption, Greene acknowledges that the best practice from other firms was a gradual organizational transformation; start with a pilot project and then slowly roll out the practices to other teams practices (Greene and Fry, 2007). Greene felt that adopting agile only in a few groups would cause organizational dissonance. Subsequently, agile was rolled out in a big-bang approach to the entire R&D division. However, this approach required more visibility and over-communication. For example, the new agile process and its benefits were documented and communicated in 45 one hour meetings to all levels of staff within the R&D organization before the transformation began in earnest. Over communication is key to socializing a new methodology and promoting the need for change.

Summary

AMRG recommends that a firm should implement a full agile adoption to prevent friction between those areas that are not yet agile and those teams that are. Agile works best when the entire firm is following the same practices. However, the literature also indicates that for large banks it is unrealistic to believe that holistic firm wide change can be implemented. The larger the firm the more difficult it is to implement a full agile adoption and the longer it will take (Dikert, Paasivaara and Lassenius, 2016). Pilot projects help firms hone their agile practices gradually before committing to wider deployment (Burchardi *et al.*, 2016). A gradual, measured transformation is preferred for agile adoptions (Catlin *et al.*, 2017; Deloitte, 2017; Aghina, Ahlback and Jaenicke, 2018).

3.3.2.4 Agile Scoreboard

The agile scoreboard indicates the degree to which a firm's performance management system supports the firm's policies and practices on agility (Meredith and Francis, 2000). For example, Human Resources (HR) practices in place to reward teams versus individuals. Organizational changes directed to remove levels of hierarchical management decision making and move decision making further down to team leaders. Changes to employee selection; select candidates who exhibit the characteristics required for agile teams. Develop new career paths for technical staff who don't want to manage people but wish to be compensated for the specialty skills they possess.

People Indicators

In banking, hierarchical decision making through several management layers is the norm. An agile team based approach requires non-traditional new approaches for performance measurement. Borland's agile transformation efforts point out that the old culture was to

reward heroes for saving the day and the micromanagement of staff was the norm. As a result of the agile transformation, management had to learn new behaviors that were aligned with agile principles of trust and ensuring management didn't revert to the traditional micromanagement behaviors (Maples, 2009).

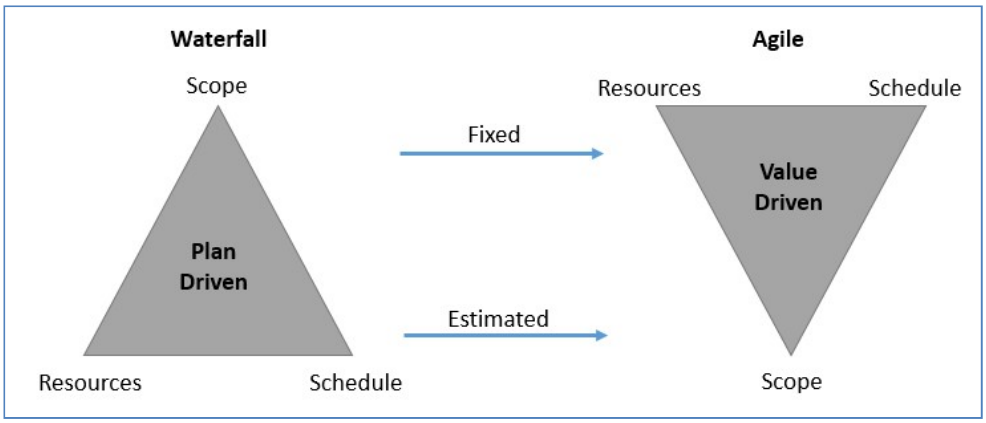
Project Indicators

An agile scoreboard also needs to focus on how the organization is adopting agile practices beyond just the organizational changes for staff performance management. Key indicators can be time to market delivery, project initiation to completion cycle time, quality of the product as measured by the number of defects at delivery, client satisfaction indicators, number of staff trained on agile, number of projects delivered using agile practices; these are some indicators for an agile scoreboard.

The VersionOne (2016) tenth annual survey indicates the most widely used measures for assessing agile initiative success is customer satisfaction, on-time and quality of delivered product. Providing business value and delivering the product scope are also key measures. In the case of Capital One's agile adoption (Tengshe and Noble, 2007) the measures aligned with the aim of faster time to market, customer satisfaction and cost control. Customer surveys were used to measure the level of project satisfaction.

The CEB literature (Thune *et al.*, 2013) for implementing iterative methods in large enterprises states that the measures for success in agile and plan-based projects are different. In plan based projects, the triple constraint of scope, resources and schedule are used. The scope infrequently changes while resources (staff, funding) and schedule are adjusted to ensure the full scope completion. For agile methods the traditional triple constraint pyramid is flipped on its head. The scope is dynamic, often evolutionary, but the resources and schedule are fixed, meaning that lower priority scope may not be implemented (Figure 3-2).

Figure 3-2 – Waterfall and Agile comparisons of triple constraints



Source: (Thune *et al.*, 2013)

Success on plan based projects is measured quantitatively by meeting on-budget, on-schedule and requirements constraints. Agile methods may not deliver all the scope due to resource and schedule constraints, but the client may still be satisfied with the product. In agile, the triple constraint may not be met, yet the project may still be considered successful. Hence for agile projects, the emphasis should be on qualitative versus quantitative measures of success.

Hartman and Dymond's (2016) paper on agile measures suggested the following diagnostics as examples of metrics to be measured:

- Agile practice maturity.
- Obstacles cleared per iteration.
- Team member loading.
- Obstacles carried over into the next iteration.
- User stories carried over into the next iteration.
- Iteration mid-point inspection.
- Unit tests per user story.
- Builds per iteration.
- Defects carried over to next iteration.

Summary

The AMRG research indicates that very few companies have implemented any metrics for measuring agility performance as they did not know what to measure. Metrics are important for measuring the project improvements in using agile and measuring the

organizational level of adoption. Metrics are required for a bank to measure the transformational progress at an organization and team level. Without metrics it is impossible to measure progress.

3.3.3 Agile Processes

This quadrant focuses on organizational policies and practices that support agility. This quadrant encompasses four policies; flexible assets and systems, fast new product acquisition, rapid problem solving and rich information systems. These are practices that improve communication and collaboration for faster decision making. In agile this could be the physical arrangement of working spaces to promote in-person collaboration with agile teams and business representatives, tools that provide transparency into project progress, tools for continuous testing and integration of software products.

3.3.3.1 Flexible Assets and Systems

Flexible assets entail facilities, systems and tools that support agility. In manufacturing this relates to buildings, radical restructuring of shop floor layouts, reduction of crew change-over times to reduce waste and the purchase of multi-use machinery (Meredith and Francis, 2000).

In the context of agile software development this relates to the physical layout of team rooms, co-location of staff, project management tools that support agile practices, tools supporting automated testing and continuous integration, wireless networks and laptops; enabling mobility of project teams.

Team Co-location

Co-location of agile project resources is equally applicable to (4.a) Adaptable Structures. Team co-location is a dedicated space where teams reside in close proximity to improve communications by reducing communication distance. Some banks have created dedicated agile working spaces that improve communications by removing physical barriers (Cockburn, 2006; Blumberg and Stuer, 2016; Fortune, 2016) and creating open spaces that are more conducive to collaboration.

Agile Supporting Tools

In a software development context this dimension addresses the tools that facilitate team collaboration, testing automation, tools for tracking agile tasks, progress and tools that support test driven development and frequent code builds. One study (Gandomani, Zulzalil, Ghani, Ziaei Nafchi, *et al.*, 2013) mentions the need for tools that can supply

incremental evolution, continuous integration, refactoring and version management. Using inflexible tools is a barrier to adopting agile. The 10th annual VersionOne (2016) survey indicated that among the factors for successfully scaling agile, was implementing common tools across teams (40% favorable response) and consistent processes and practices (43% favorable response).

Wiss (2008) noted that test driven development and continuous integration allows developers to validate the business logic quicker. In one firm, the entire application is re-built on development servers twice a day. Wiss also comments on the usefulness of prototypes as a tool for assisting clients with defining requirements. Prototyping as a requirements elicitation method supports agile principles of early feedback and rapid development.

Bimodal Methods

Bimodal methodologies were first coined by a Gartner article and are defined either as Mode 1 or Mode 2 (Mingay, 2015). The Mode 1 methodology is predictable and relies on pre-defined plans and is characteristic of traditional waterfall methodologies. Mode 2 is a sense and respond methodology as it relies on short iterations and constant client feedback to ensure the delivered product meets the client's expectations. Mode 2 is ideal when the client's requirements are either not well known, time to market sensitive or highly dynamic and is characteristic of agile practices. Agile practices are better dealing with customer satisfaction, lower defect rates, dynamic requirements and faster development times whereas plan-driven methods (Mode 1) are better in ascertaining predictability, stability and high assurance in the development processes (Chandra M., Kumar and Kumar, 2010).

In banking, full adoption of one methodology over another may not be practical. Both agile and plan driven methodologies have their strengths. The literature review points to an emerging recognition that both methodologies can co-exist to address different product requirements. Chandra et al. (2010) points out that no one methodology can be regarded as a "silver bullet". Instead of adopting a singular methodology, a mix of agile and plan-driven methods could be successful (Chandra M., Kumar and Kumar, 2010). Research (Mnkandla, 2008) on framework selection for agile practices also concludes that using the same methodology for all applications is a weak approach.

Banking has been reluctant to change plan-based methods that have worked well for them in the past and adopt new unproven methodologies at the risk of impacting project success. David Gillespie, Vice President (VP) of Distribution Technology and Channel Strategy at CIBC commented in an interview that:

"Our online and mobile programs have been largely developed in Agile but we are cautious, particularly with legacy and large release projects. We've continued to win awards for work we've done using a waterfall method, so it's not that bad of an approach. And we have something to lose if we change to Agile and don't get it right" (Smith, Header, A. McKeen, 2015, p. 4):

For projects with high client impact and a high number of integration points (higher risk and complexity), CIBC developed a hybrid agile-waterfall delivery framework. The hybrid model allows CIBC to experience the benefits of agile while maintaining required security and regulatory controls. TD has also adopted a hybrid approach for larger projects with the aim of leveraging the best practices from both methodologies.

Luxoft, a Russian software development firm to global clients, states that large enterprises usually know their requirements and have the resources to document them. The application being built is often to satisfy a long-term need and does not face the risk of obsolescence upon completion. For such projects, Luxsoft suggests the waterfall based approach is a better fit. However, for new product development, where the requirements are in flux, it uses agile methods (Wiss, 2008).

At a Gartner conference (Mingay, 2015), participants groups were asked about the barriers experienced by firms in adopting a bimodal model. Six out of seven groups indicated that cultural barriers were the biggest threat to agile success. Mingay stated that;

"The antibodies that pervade traditional organizations can suck the life out of Mode 2 (Agile) initiatives and effectively kill them. As such, Mode 2 usually needs organizational room and political cover". (Mingay, 2015, p. 12)

Inertia due to past success with plan-based methods and cultural rigidity, may be factors holding back faster adoption of agile in banking. The other factor is the regulated environment that banks operate in which demands a tailored approach to agile projects. One tenth of the participants in the research conducted by Wiss (2008) indicated that financial services firms are not using agile methods due to the regulatory environment and they don't see themselves in crisis; hence no reason to change.

Summary

The literature on agile focuses primarily on practices. However, tools are required to augment the agile practices. The need for tools in the areas of automated build and testing is mentioned in the literature. Tools that facilitate collaboration and rapid development are beneficial to large organizations adopting agile practices. The literature is lacking examples of how such tools have been applied and the lessons learned from these deployments.

This agile dimension is valid for manufacturing as it is for software development but the specific tools required for each industry is different. Common to both software and manufacturing are the restructuring of floor layouts to accommodate agility. In the software development context this would be the creation of new working layouts or team rooms that facilitate face to face communication through co-location. In manufacturing the reduction of crew-change time is equivalent to the need for dedicated development teams which are not disbanded after each project. Where the recommendations diverge is that multi-use machinery in manufacturing is very different from software tools used in software development.

The discussion on bi-modal methods were included in this dimension as the methodology selection is an important aspect of agile success. Not all projects are served by a singular methodology (Cockburn, 2000; Khan, Qurashi and Khan, 2011; Thune *et al.*, 2013). A methodology selection process should be part of an agile adoption strategy. A key issue addressed in CEB's survey (Gibson, Woodruff and Barnum, 2016) but not addressed in any other literature is who in the organization decides on the project's methodology. CEB's research indicates the PMO decides in 42% of firms and the PM decides in 40% of firms surveyed (113 firms surveyed). Surprisingly, in some cases the project sponsor and line of business were also decision makers on the methodology; 23% and 21% respectively. A more suitable title for this dimension is "Agility Supporting Assets and Systems".

3.3.3.2 Fast New Product Acquisition

This practice relates to product improvement. In manufacturing, shorter product development life cycles provides the firm with speed to match market opportunities quickly. This is a key principle of agility; shorter product development cycles allow products to be delivered to market quicker (Meredith and Francis, 2000) and capture a first mover advantage.

Small Batches

Shorter development cycles refers to using small batches to match market opportunities. Success in the global marketplace requires firms to produce small batches of tailored products on a tight schedule to meet changing market demands (Hass, 2007). The same concept in agile software development where short sprints, frequent client demos followed by frequent product releases allows a product to better match the client's requirements.

The manufacturing concept of producing work in small batches to quickly meet client demands aligns with agile software development practices (Stuart, 2008). The literature (Sidky and Arthur, 2007; Stuart, 2008; Thune *et al.*, 2010; Lal, 2011; Moniruzzaman and Hossain, 2013) indicates that short sprint cycles not exceeding more than four weeks allows for limited functionality to be released to the market quicker to meet market demands as opposed to having the entire product built and then released into the market; by which time the product may no longer match the market needs. Short iterations and providing value to clients by getting products released faster is a fundamental aspect of agile practices.

Summary

For banking, the ability to quickly react to new client demands and competitive pressures is a key benefit of using agile. This dimension is aligned with the principles of agile development; iterative and incremental value delivery. This is a tenet of agile practices and is a must for agile adoptions in any industry. Although AMRG has emphasized "acquisition" for fast new product development, a better title in the context of software development is "Fast New Product Development".

3.3.3.3 Rapid Problem Solving

AMRG identified the ability to solve problems rapidly as an aspect of agility. The premise is that if a firm is slow in identifying and solving problems then much effort is required later on to remediate the problem. Rather than channeling the effort to new product development, creative energy is squandered remediating the problem. The AMRG research finds that "Symptoms of problems need to be identified quickly and sufficient resources allocated to find an effective solution that can be quickly implemented" (Meredith and Francis, 2000). The research indicated that very few firms, from their study sample, learned from their mistakes.

This practice is very relevant for agile software development and is a tenet of agile principles. Short sprints, daily standups and retrospect meetings after each sprint provide a way to examine what has worked well and what needs to be improved upon. Problems are quickly solved and the product is continuously optimized by receiving corrective and frequent client feedback. Sprints are typically of 2 to 3 weeks duration (Sato *et al.*, 2006; Wiss, 2008; Rigby, Sutherland and Takeuchi, 2016a). Some banks use a longer sprint of 4 weeks at agile adoption inception but sustaining it thereafter is an exception (ScrumAlliance, 2015).

A longer sprint introduces more risk as several weeks of work may be wasted due to flawed interpretation of client requirements. A Scrum Alliance (2015) survey suggested a positive correlation between team size and sprint length, suggesting that the larger the team the longer the sprints.

Summary

Rapid problem solving is achieved through frequent client feedback and is an agile foundational practice. It applies to any industry adopting agile practices including banking. Sprint durations of 2 to 4 weeks are a best practice for banking and account for 79% of the sprint lengths used by other firms.

3.3.3.4 Rich Information Systems

As with the rapid problem solving this practice relies on having the rich information systems to provide information for decision making. AMRG's research indicates that an agile firm requires policies and practices to allow for rapid and frequent decision making. The research also points to the need for senior management to be involved in frequent decision making (Meredith and Francis, 2000).

Agile Practices

In the context of agile software development, rich information is implemented by the agile practices of tracking progress through burn-down charts, Kanban boards, and frequent client demos of product progress. Frequent product release cycles elicit stakeholder feedback throughout the development process. Agile software development practices have inherent frequent stakeholder participation and rich communications.

Summary

Rich information systems comprise the practices for rapid decision making and management support. These practices overlap with the (1.b) Strategic Commitment and (2.a) Flexible Assets and Systems dimensions which also support rapid decision making. It also entails the tools used to provide rich information on project status such as Kanban boards.

3.3.4 Agile Linkages

This third quadrant focuses on external linkages to vendors. Four practices comprise this quadrant; agility benchmarking, deep customer insight, aligned vendors and performing partnerships (Meredith and Francis, 2000).

Agile practices for software development such as Scrum or XP rarely refer to vendors. The focus is often on in-house product development without the involvement of external vendors. Therefore, agile adoptions often struggle with how to work with vendors on projects. Should vendors participate alongside the firm's daily meetings and follow the sprint schedule, or should an external firm simply be concerned with meeting its scheduled deliverable commitments regardless of the methodology used to create those deliverables?

The approach chosen may depend on the level of uncertainty of the product requirements. High uncertainty and dynamic requirements may require vendors to be more closely aligned with the agile project team and participate alongside on product development. Where requirements are well known there may be no need for integrated collaboration with vendors.

3.3.4.1 Agility Benchmarking

In manufacturing, benchmarking is important as it allows a firm to understand where it stands in comparison to its competitors in terms of flexibility, responsiveness, market position, technological innovation, application of technology and human resource capabilities. AMRG's recommendation is that a firm understand the best practices of others and evolve its own practices to be a first mover and not a follower. AMRG states that benchmarking provides sources of new ideas and exemplars (Meredith and Francis, 2000).

Benchmarking is the first step that firms involved in business process re-engineering and continuous process improvement undertake (Underdown and Talluri, 2002).

Benchmarking is a process that examines and utilizes the best practices from other firms for improving a firm's own practices. For agile software development there is no certification process equivalent to the Capability Maturity Model (CMM) (Paulk *et al.*, 1993) to indicate how well a firm is aligned with agile practices compared to its peers. How a bank is benchmarked on its agile adoption in comparison to its industry peers is often through informal knowledge gathering of public (press) and private (consultants) sources. One consultancy uses a five stage agile maturity model with its clients but it is not an industry wide accepted standard (KPMG, 2015).

Knowledge on the best practices of other banks can be obtained through networking; forming business contacts in a social setting. This involve engaging in conversations with peers for the purpose of learning about others and what firms have done to improve their processes (Underdown and Talluri, 2002). The literature indicates that banks have reached out to agile practicing firms for their experience but this has been frequently during agile adoption inception (Tengshe and Noble, 2007; Fortune, 2016).

Summary

This dimension is less impactful for banks in the initial phases of adopting agile processes than it is for those sustaining agile practices. Benchmarking compares a firm's set of practices or processes against its industry peers. This dimension is significant for improving agile practices once a bank has reached a level of agile maturity. This is more relevant for agile practice sustainment than inception. However, banking is a closely guarded industry and understanding the best practices from other Canadian banks could be challenging.

3.3.4.2 Deep Customer Insight

AMRG defines this practice as the ability for agile manufacturers to adapt to rapidly changing customer needs and work with customers to develop products and overcome problems. Deep customer insight requires a very close relationship with customers (Meredith and Francis, 2000).

This dimension aligns well with current agile practices for software development. Agile practices are characterized by frequent client feedback loops, iterative reviews and close customer contact resulting in an adaptive feedback driven development approach that continuously matches the product to evolving client needs (Stettina and Hörz, 2015).

Co-location of agile teams, including the Product Owner, supports a deeper understanding of the client requirements. The difference between manufacturing and banking is that the client in manufacturing is often an external client who pays directly for the product. The client is often not available to the manufacturer on a daily basis to ensure the product matches the client's expectations. Yet, agility demands knowing the client's changing requirements and adapting the product's features to match.

By contrast, in banking, the external client is represented by an internal LOB which proxies for the client. In many cases the products created are to support the bank's own needs and the bank is the client. When using agile practices in banking, the dynamic requirements of a new product or service are represented by a Product Owner who proxies for the client's needs. In this model, there is a risk the intended product may not satisfy the needs of the client because the client is too far removed from the product development. The Product Owner is an intermediary between the end client and the development team and this arm's length relationship can lead to misunderstanding the requirements.

Wiss (2018) in his case study of FINACE, commented that clients need to collaborate closely with developers. However, a developer on the study expressed that an on-site client is a utopian dream. The fact is that most clients don't have the dedicated time to be on-site full time. Although clients are willing to pay for the project they are reluctant to communicate daily. Wiss posits that the success of agile methods is heavily dependent on three key success factors: communication, skilled and enthusiastic people, and processes.

Summary

In manufacturing the deep customer insight enables the firm to meet the needs of its external client. In the context of banking the agile teams that build the products rarely interact with the actual end user client. The client's needs are represented by a business Product Owner which can lead to gaps in understanding the product needs. Agile practices demand that the Product Owner be available to the team and ideally co-located with the team. Hence, the agile team can take the pulse of the client as needed.

In reality, such arrangements are rarely possible as the Product Owner cannot dedicate the time to be fully allocated (Dubé, Roy and Bernier, 2008). Yet, this is a key ingredient of agile project success. Part of a project methodology selection criteria; whether to use an agile or plan-based approach for a given project, a determining factor for methodology

selection must be the Product Owner's availability. Deep customer insight may only be possible with deep business engagement.

3.3.4.3 Aligned Suppliers

Suppliers who are also working with agility are required to ensure the supply chain demands of manufacturers and their supplier are aligned (Meredith and Francis, 2000). Any delivery delays caused by suppliers will have an impact on the speed at which the manufacturer can deliver product. Waiting for supplier delivered components incurs time waste.

In agile software development where vendors are involved co-operating on product creation, there is a dependency on the timely delivery of their components for integration into the final product. Any delays by the vendor will result in a sprint not meeting its timeline. With vendors, Service Level Agreements (SLAs) are common to ensure external products and services are provided at the time and frequency negotiated between the bank and its vendors.

In banking there is also a high dependence on internal service groups. Due to the size of the banks and their divisional organizational structures, products are not created and delivered by a singular group. Departments and groups who are not yet agile can negatively impact product delivery schedules by not meeting their Operational Level Agreements (OLAs). This issue often causes conflict as agile teams operate at a different speed than the rest of the organization. Scrum Alliance's research indicated that more than 70% of agile practitioners reported tension between their agile teams and the rest of the organization (Rigby, Sutherland and Takeuchi, 2016a). When external vendors provide components of a product that provides a regulated product or change, then fast product/service acquisition policies are needed to reduce third party risks to the bank.

Alignment with agile practices is therefore important for both in-house groups and vendors. However, it is not always possible to have the same alignment as firms use different methodologies for product development. As well, vendors are not always willing to commit to SLAs and, due to the small size of some vendors, commitments to on-time delivery is not always adhered to. This poses a major challenge for agile projects where a vendor's components must fit into a time box within the bank's sprint cycle. When project components depend upon a vendor's contribution it places the sprint at risk of slippage. Schedule slippage incurs waste and places risk on agile principles.

The literature on managing suppliers within an agile software development project context is lacking. One conference report examines the use of subcontractors on agile software development projects (Mikkonen and Pentinnen, 2012). The report examines several subcontractor scenarios and the impact on the productivity of the agile project team. Scenarios considered are; standalone in-house subcontractor teams, mixed teams whereby contractors work alongside full time project staff and virtual teams where the subcontractor team is not in the same location as the core project team; the norm for off-shore development.

The report raises some excellent points on how to manage subcontractors within agile projects. This is a topic that has not been covered by any other literature reviewed and yet it is quite a significant dimension of software development given the intensity of off-shore development in banking. The report concludes that for large projects, subcontractors may be an impediment on team dynamics. The report outlines six challenges when using subcontractors;

1. Lack of agile knowledge.
2. Lack of cross-functional skills required to operate effectively within the agile team.
3. Contractual issues related to role, scope of work and time to perform the work (note that this is counter to a philosophy of partnering versus a contractual agreement).
4. Inability to meet face to face for virtual teams.
5. Communication difficulties due to distance.
6. Tacit knowledge transfer to full time staff.

"Results reveal that often the agile team's performance is significantly hurt by having non-agile subcontractors participating to the development and that frameworks used for defining contracting structures are far behind from today's needs, leading to many problems in practice." (Mikkonen and Pentinnen, 2012, p. 195).

Likewise, CEB (Thune *et al.*, 2013) observed that implementing agile practices with third-party vendors, with no background in agile methods, can increase the complexity and delivery time of a project. The CEB's suitability assessment scorecard for agile development rates a project as having a low suitability for agile when vendors without experience are involved.

A study on using agile software development practices with two independent software development organizations was undertaken (Dubé, Roy and Bernier, 2008). The study explored the challenges of software development in a contractual-client/supplier relationship at a distance. The challenges with using suppliers on agile projects are those imposed by the agile practices of co-location, adapting to shifting requirements and light documentation. These are not conducive for contract negotiations between two independent organizations (Dubé, Roy and Bernier, 2008).

The issue of light documentation recommended by agile practices poses a problem of how to preserve knowledge through time. When the contractor creates the product, their tacit knowledge is no longer available to the client, yet the client is required to maintain the product thereafter. A stipulation could be required in supplier contracts to ensure knowledge transfer through documentation. The "no documentation" principle should not be applied to contractual agreements. The challenge is establishing the minimum documented requirements for defining the work to be done and capturing the knowledge once the work is completed (Nerur, Mahapatra and Mangalara, 2005).

In the case study of FINACE Inc. Wiss (2008) points out that detailed requirements specifications are replaced by the source-code and unit test cases. Functional tests substitute for requirements documentation as the focus of agile development is working software not extensive documentation. The only documents produced are release notes and user manuals for the client. This author's experience with using source code as a way to understand the functional requirements and business rules implies that only developers and not the business will have an understanding of the requirements. One study (Stoica, Mircea and Ghilic-MICU, 2013) indicated the lack of documentation in agile projects is one of the challenges to making it work. Lack of documentation makes it difficult to maintain an application due to staff turnover and subsequent loss of tacit knowledge. FINACE mitigated the loss of tacit knowledge by using pair programming and code reviews to ensure application knowledge is distributed amongst team members (Wiss, 2008).

CEB's recommendation for implementing projects in large enterprises (Thune *et al.*, 2013) is that an agile methodology does require documentation, but it may not be the same artifacts as used in a waterfall project. The documentation required is at the discretion of the team. Minimally, it is the release and iteration plan, backlog and acceptance criteria. The team only documents what is of value to the project.

One study (Dubé, Roy and Bernier, 2008) observed the case of a company using agile practices to outsource code development to another firm located 3,000 miles away. The challenges observed with this outsourcing arrangement were primarily related to the traditional method that professional services operate under. In traditional software development, the functionality to be delivered is well known in advance, estimated, and delivered. The vendor has clear contractual traceability from the requirements specified to the functionality delivered. In agile projects, the requirements are often unknown at the start and evolve gradually as the project progresses.

The study indicated that a key success factor was the change in vendor relationship from contractual to a partnership. A high level of trust between the client and vendor/partner is required for these relationships to be effective. In this case, each sprint was treated as a small services contract with the vendor. The vendor required a level of traceability to demonstrate what was asked at the beginning of the sprint was delivered to the client. One interesting aspect of the HEC case study was a stipulation in the contract that the client's business representative must be available at least 50%-75% of the time to the team for face to face working sessions. The vendor also stipulated that the client's business analysts and IT staff dedicate at least 75% of their time to support the vendor engagement (Dubé, Roy and Bernier, 2008). It is noteworthy that although the engagement was a partnership, it was still bound by traditional contractual terms to reduce the vendor's financial risk.

In agile projects, contracts with vendors are expected to be dynamic, informal and continuously negotiated. This is in contrast to traditional vendor contracts whereby the contract is awarded on a fixed set of requirements and a fixed price (Dubé, Roy and Bernier, 2008). Some agile practitioners are skeptical if agile projects can be contracted under fixed price, fixed scope contractual arrangements (Wiss, 2008; Office of the Inspector General, 2018). There is risk with fixed price and fixed scope contracts under agile as requirements are constantly changing and changes will impact scope and cost. In the FINACE case study, customers often signed contracts with a defined cost cap (Wiss, 2008), a practice which worked well for most projects.

Andrena Objects, a German software development firm whose clients include financial firms proposed "Use Cases" for tracing accountability on fixed price agile projects (Wiss, 2008). One of the challenges the firm experienced was that customers often were

unwilling, or unable, to exactly specify their requirements before the project started. This caused challenges with the initial completeness of use cases.

Regulated Industries

The literature for regulated environments indicated that a pure agile approach was inconsistent with the needs of a regulated industry. The review indicates that a tailored methodology using best practices form agile Scrum, XP and plan-based methods is the norm (Mc Hugh *et al.*, 2013) with 46% of the literature reviewed indicating an "Agile-Planned" approach was best suited for the development of regulated products. These tailored methodologies (Pikkarainen *et al.*, 2012) are documented to have benefits such as adapting to changing product requirements and getting products to market quicker. McHugh's research indicated that although 59 agile practices were identified in their review, only 13 were immediately applicable to the development of medical devices software.

The literature indicated that there are cases in the medical devices industry where waterfall may make more sense. Projects involving third parties, inexperienced teams or using legacy systems may not be suited to agile. Marcus Glowasz a senior IT PM with Credit Suisse, Zurich, (Burba, 2015) observes that fixed price contracts with third party vendors are often incompatible with agile methods.

There may be a misconception that agile practices in a regulated environment cannot be used due to the compliance documentation required by auditors and regulators. Agile practices are perceived as eliminating all documentation from the development process. However, medical device software development requires extensive documentary evidence to prove their devices are safe for use to obtain regulatory approval (Mc Hugh *et al.*, 2013). A finding from Mc Hugh's research was that regulatory controls introduce a large amount of overhead. For example, the FDA mandates that requirements traceability be an integral part of a development process. Agile proposes to minimize unnecessary documents, but if compliance requires documentation, then the documentation creation needs to be built into each iteration and included in the project's definition of done (Burba, 2015).

The Association for the Advancement of Medical Instrumentation (AAMI) released a Technical Information Report (TIR) (AAMI, 2012) to provide guidance on the use of agile in the development of medical device software. The medical devices industry is one

of the few regulated industries that have taken an approach to standardize agile practices for its members. The United States Government Accountability Office (GAO) and the United Kingdom's National Audit Office (NAO) have recommended the use of agile practices in building software based products for government, promoting the budgetary savings these approaches can bring. Both governing bodies have issued reports on the use of agile in government (GAO, 2012; NAO, 2012).

Summary

The literature on the role of suppliers in agile product development is lacking. The majority of the literature on agile software development is inwardly focused on the firm's own practices. The cultural, humanistic and process aspects internal to the firm are well documented. The literature notes there are conflicts when vendors/contractors are on the agile team. It is a paradox that banking is dependent on partnerships and suppliers for producing components of their products, yet as banks adopt agile, the evidence for successful co-development of products using agile methods with third parties is lacking.

The case study led by HEC points out that agile co-development with an external vendor requires a different type of relationship than the traditional contract and fixed cost driven statement of work practices that are the mainstay of agreements today. However, the study points out that very few firms examine the contractual issues of agile co-development relationships with third parties and how to make them work (Dubé, Roy and Bernier, 2008). This dimension is an important aspect of agile adoption in banks as outsourcing of software development to vendors is common.

The HEC research indicates challenges with vendors accustomed to fixed price and scope engagements. In product development where a vendor is creating the entire product for the client, and the client has uncertain requirements, there may be no other alternative but negotiate a partnership based on a contractual agreement. A leaner approach, suggested in the literature is to create a fixed price contract with a "not to exceed" cost cap. Price capped contracts are already in use by Canadian banks for projects where the effort is uncertain. For projects where a vendor is delivering a component to integrate into the client's own in-house project, the traditional fixed scope and cost arrangement may be better suited. Fixed cost and scope contracts between vendors and banks are the norm.

Vendor contractual agreement strategies for agile product co-development is underserved and could be a topic for future research. The current literature points out more challenges

than benefits for involving vendors on projects. Firms using vendors in their agile projects require a differentiated approach to managing contractual agreements due to evolving and unclear requirements that can increase cost and scope.

3.3.4.4 Performing Partnerships

In manufacturing, partnerships enlarge a firm's capabilities through co-operation with other firms to form virtual enterprises. The partnerships may be temporary, ad-hoc arrangements to enhance a firm's capabilities. Partnerships are an effective way for firms to develop new technologies, procure critical resources that the firm has no access to, augment core competencies and investigate new market opportunities. AMRG states that the development of partnerships is a core component of agility but it depends on trust between partners. There was little evidence of this in the firms studied (Meredith and Francis, 2000).

In manufacturing not all firms have the resources to develop the finished product in-house. This applies to small and medium firms who don't have all the capabilities to create a finished product. They may depend on components of their product or service to be provided by suppliers. Firms may also depend on licensing intellectual property from other firms. Hence, AMRG has emphasized that acquisition of out-sourced components must be fast to match the firm's need for fast product delivery (Meredith and Francis, 2000). The ability to acquire products quickly is highlighted in dimension (2.b) Fast New Product Acquisition, but this also is a facet of (3.d) Performing Partnerships. Partners must be able to quickly deliver the work contracted to them on time to match the customer's schedule.

As applied to agile software development, the performing partnerships would be using vendors to augment skills or provide products that the firm does not have or would take too long to develop. As an example, consider TD Bank's partnership with Moven (https://moven.com), a FinTech, for the integration of a spend tracking application into TD's mobile product offering (PwC, 2015; Bergan, 2016). As TD wanted to capture more clients into the mobile space, it partnered with Moven to quickly deliver a spend tracking capability, which would take longer and cost more if developed in-house.

The differentiator with partnerships, is that the partner provides a service, component or intellectual property under a licensing agreement to the bank. These are areas of expertise that the bank lacks and cannot build either due to cost barriers, time constraints, intellectual property barriers (patents) or lack of access to scarce resources. Partnerships

fill gaps in a product offering much quicker than developing them in-house and enhance a bank's early mover advantage.

Summary

Canadian banks have well developed practices for managing partnerships through contractual and legally binding agreements. Dedicated groups within the bank such as Strategic Sourcing, Vendor Relationship Management, Technology and Legal Counsel are involved in partnership engagements. Not all firms can fully produce a product on their own. Critical to the bank is the partner's on-time and quality delivery, of their components. As slippage impacts sprint completion and subsequent sprint planning timelines, SLAs and remedies for slippage should be defined contractually and enforced between the customer and its partners.

When external vendors provide components for a regulated financial product or service, fast product/service acquisition policies are needed to reduce third party risk. The CEB research on agile transformation suggests that regulatory projects are better suited to a plan-based methodology (Thune *et al.*, 2013).

There is a level of overlap between this dimension and (3.c) Aligned Suppliers, insofar as SLAs should be put into place to exercise a level of control over product expectations. Whereas "Performing Partnerships" applies well to a services arrangements and implies a long term relationship, "Aligned Suppliers" suggests a more contractual and transactional relationship.

3.3.5 Agile People

This fourth quadrant examines the Human Resources practices and processes of an agile firm. The four subject areas considered are; adaptable structures, multi skilled and flexible people, rapid decision making and continuous learning.

3.3.5.1 Adaptable Structures

These practices refer to the organizational structures that support agility. AMRG observes that traditional bureaucratic organizational structures are inherently non-agile as they depend on established rules to guide behavior. New work structures need to be established to promote agility (Meredith and Francis, 2000).

Adaptable Structures is also a relevant principle for agile software development. The agile methodology demands a different decision making model than traditional waterfall

methods. Decision making is a team effort. The role of the PM is subjugated as a governing role and replaced with the Scrum Master; a facilitator and a barrier removing leader-servant.

A study on moving from traditional to agile software development on large distributed projects identified four organizational factors to consider when scaling agile projects (Papadopoulos, 2015). The four factors are Organizational Design, Decision Making, Collaboration / Coordination and an Agile Culture. A study (Gandomani, Zulzalil, Ghani, Ziaei Nafchi, *et al.*, 2013) observed that changing process models from plan-based to agile faced significant organizational impediments due to impact on strategies, tools and roles of people. The study noted that altering attitudes and processes is challenging, especially for firms mature with Capability Maturity Model Integration (CMMI) processes.

Empowering Organizational Structures

In TD Bank's Wealth Management agile transformation, the organizational structure was flattened to remove layers of management and bring decision making closer to the teams who execute the work. Agile teams are self-managed, autonomous and take over many of the traditional project management tasks (Aghina *et al.*, 2018). They coordinate and plan their own tasks, pull work from story backlogs, estimate and plan iterations. Whereas higher management were in control of projects, they now have to trust the agile teams to get the work done (Stettina and Hörz, 2015) with little supervision. Adopting agility implies that a different organizational structure and culture is required to support rapid communication and decision making. Trusting staff to do their work as self-managed teams with minimal supervision (Aghina *et al.*, 2018) is a significant culture change for banking.

A study (Papadopoulos, 2015) indicated that small Scrum teams of five to nine cross-functional, self-organized members, are sufficient for small projects. However, as projects scale up in complexity and size, new structures are required. For example, the structure may include multiple Scrum development teams, a product team, a central coordinating body, architecture and Quality Assurance (QA) teams. As these small teams grow in numbers the challenge becomes coordination, communication and collaboration among teams (Papadopoulos, 2015). The study recommends how to structure multiple small teams to deliver larger agile projects by defining the role of each team. This

observation is in line with Cockburn's comment that small teams and face to face communications are tenets of agile development (Cockburn, 2006).

Large project teams exist in traditional plan-based projects and require more extensive up-front planning, scheduling and budgeting due to the size of the team and complexity of projects. However agile methods are well suited to small and medium projects utilizing small teams and don't require comprehensive up-front planning. The study mentions that some agile projects may require more up-front planning (Gandomani, Zulzalil, Ghani, Ziaei Nafchi, *et al.*, 2013).

Team Co-Location

Adaptable structures also applies to the concept of team co-location to improve collaboration. Whereas staff were previously assigned to specific seating locations, often floors or cities apart, the concept of co-location requires all staff working on an agile project to be located within the same premises. At Standard Bank the application development and maintenance (ADM) team are co-located with the business to enable collaboration and faster decision making on product development (Blumberg and Stuer, 2016). Cockburn also stresses the importance of co-location as a way to have richer communications (Cockburn, 2006). Cockburn noted that communication efficiency increases as personal contact distance decreases (Cockburn, 2000). At TD Bank, agile project teams are generally co-located at head office, meaning that some team members travel form their home office daily to participate on projects.

A recent study (Papadopoulos, 2015) also emphasized the importance of collaboration and coordination. Face to face communication is ideal but challenging on large projects with multiple teams. The study stresses the importance of using web conferencing tools to provide a virtual presence for face to face communications (Papadopoulos, 2015) of dispersed team. Although the literature on agile development stresses the importance for co-location, the reality for most firms is that either partial or full software development is outsourced to third parties or at different geographic locations. A recent survey indicates that 82% of respondents use distributed agile teams (VersionOne, 2016). Contrast that with only 35% of firms using distributed teams three years prior. This indicates that although team co-location is preferred, video conferencing technologies can be used to bring external team members closer. The same survey also indicated that 70% of respondents are outsourcing software development projects (VersionOne, 2016).

Research conducted on financial firms (Wiss, 2008) noted that FINACE Inc. successfully uses an off-shore development partner. FINACE recommended, as a practice, to have a customer proxy every two weeks meet with the off-shore team. Team collaboration and video conferencing tools eliminate the geographical distance between distributed teams. Despite advances in telecommunication technologies, research (Dikert, Paasivaara and Lassenius, 2016) concluded that distributed teams still experienced negative effects such as missing meetings, reduced feeling of proximity and difficulty in arranging frequent meetings due to time zone differences.

The research (Chandra M., Kumar and Kumar, 2010) indicated that agile development teams require a different development process. They require a shared team room, they need to perform continuous development and integration, use prototypes to gather feedback sooner from the client, use test-driven development methods to drive out quality issues earlier and employ tools to facilitate collaboration among stakeholders.

Dedicated Resources

In addition to the co-location of teams, another recommended organizational change is the concept of dedicated software development teams (Stettina and Hörz, 2015). In traditional plan-based methodologies, the frequent switching of resources in and out of projects is the norm. By contrast, agile teams have dedicated developers who develop and maintain the product thereafter. Frequent switching of resources between projects is considered waste from a lean perspective. In the agile practices research conducted by Stettina (Stettina and Hörz, 2015), 9 of the 14 case study organizations had dedicated staff assigned to project teams. Some organizations allocated staff to no more than two concurrent agile projects. An article (Rigby, Sutherland and Takeuchi, 2016a) on embracing agile also notes that dedicated teams are 60% more productive and 60% more responsive to customers than teams who rotate staff.

Summary

This dimension has a high component of culture change and humanistic factors that are natural to agile practitioners but challenging for a traditional bank culture. It addresses organizational structures that enhance the humanistic aspects of collaboration and communication.

3.3.5.2 Multi-skilled / Flexible People

AMRG states that agile firms are less dependent on systems but more dependent on the intelligence and opportunism of people. Firms have traditionally focused on processes for improvement, such as establishing ISO standards, Management-By-Objectives (MBO) and Total Quality Management (TQM). However, multi skilled and flexible people are the cornerstones of an agile enterprise (Meredith and Francis, 2000).

In agile software development, the multi skilled flexible people dimension is also applicable. These are cross-functional agile project teams. The recommendation for Scrum teams is that the size of product development teams should be on average no more than 7 people, plus or minus two (Wiss, 2008). This demands that for product creation and delivery a variety of skills are required by the core project team; database specialists, User eXperience (UX) designers, application coders, quality assurance specialists, architects, production deployment specialists, etc. Any one member of an agile team may take on tasks that are not their defined HR roles. For example, a Java developer may also assist with UX design or perform QA work. Because agile dictates that small teams be employed, it requires multi-skilled staff to complete all the requirements of a project. These practices apply equally to manufacturing and software development.

Self-Managed Teams

Research was conducted (Syed-Abdullah, Holcombe and Gheorge, 2006) on the impact of an agile methodology on the well-being of development teams. The study addressed the humanistic aspects of programming teams using XP agile practices. Studies have demonstrated that control, variety and the demands placed on employees are important factors of well-being. High job control is positively associated with well-being. As well, a low level of job monitoring and having supportive management are the most significant factors for employee well-being (Holman, 2002).

High levels of job monitoring or micromanaging have a negative effect on employee well-being. Syed-Abdullah's findings concluded that constant testing, pair discussions and client reviews resulted in constant feedback to the team and were considered a treatment for countering depression. Individual communication and personal skills are important for modern software engineering teams (Syed-Abdullah, Holcombe and Gheorge, 2006).

This author posits that recognizing the importance of human factors should influence a differentiated approach for hiring agile team resources. Changes suggested (Chandra M.,

Kumar and Kumar, 2010) included having management accept change, having transparency in management activities, trusting their developers, having transparent radiators of project and status reporting and eliminating micro management. Chandra also noted the need for change in personal characteristics of the team members to be more responsible for understanding their client's business, take ownership of developed solutions and have a high degree of tenacity. Personal characteristics are more important in agile teams due to close working proximity and frequent interaction with fellow team members.

An article (Rigby, Sutherland and Takeuchi, 2016a) co-written by two leading proponents of agile methods indicated that increased team productivity and employee satisfaction were documented as benefits of agile methods. Waste inherent in redundant meetings, repetitive planning, excessive documentation, high defect rates and low-value features are hallmarks of traditional methods. By continually adapting the product to the customer's changing priorities, agile methods improve the client experience and bring products to market quicker (Rigby, Sutherland and Takeuchi, 2016a). The article noted that high collaboration among team members also builds mutual trust and respect.

The requirement for skilled staff in agile projects is mentioned in several publications (Wiss, 2008; Browaeys and Fisser, 2012; Standish Group International, 2013; Ahimbisibwe, Cavana and Urs, 2015; VersionOne, 2015). The literature emphasizes the need for training of the project team before starting an agile project. As well, team dynamics come more into play in agile teams due to the intense nature of collaboration and communication. Whereas in plan-based projects, subject matter experts are brought in at different stages of the project and then move out to other projects, agile requires the core project team to remain together for the duration of the project. Agile teams tend to be cross-functional, represent a complete work unit who can deliver a project to a client from start to finish; from ideation to inception (Browaeys and Fisser, 2012).

Although certain roles are common between plan-based and agile projects, for example Quality Assurance, Business Analysis or Software Development, the role of the PM changes from one of ensuring the plan-based process is followed to one of a leader who is there to remove barriers (Chandra M., Kumar and Kumar, 2010). For agile Scrum based projects, the role of the PM is often replaced by a Scrum Master. PMs experience challenges in transitioning from plan-based methods to agile as agile principles challenge the PM's authority and role on projects. Changing the mindset of PMs requires more time

and mentoring (Gandomani, Zulzalil, Ghani, Ziaei Nafchi, *et al.*, 2013). Not providing sufficient transition support to PMs could have them falling back on previous traditional practices. One study (Gandomani, Zulzalil, Ghani, Ziaei Nafchi, *et al.*, 2013) points out that some traditional PMs could not adapt to the new agile methods.

In the case of Nokia's transformation to agile, after twelve months of using agile methods, there were more Scrum Masters than PMs (Korhonen, 2013) highlighting the diminished role of the PM on agile projects.

Client Centricity

The client's role in a plan-based project requires high involvement at the beginning for requirements elicitation and at the end to validate and accept the product. In agile the client's role is as the Product Owner and is expected to be available to the team for the entirety of the project. Client centric people are critical on agile projects as the project team must work closely and frequently with the client (Chandra M., Kumar and Kumar, 2010).

These agile principles represent different ways of working and some organizations may have cultures at odds with such practices. Hierarchical organizations whose project members want to maintain their position and power may not be open to collaborating as team members. These strong personalities can derail project success (VersionOne, 2015). Having teams with the right skills and behaviors for collaborating are key factors for agile success. On agile teams, collaboration and team skills are more important than titles (Minorov, 2015). A report (Ahimbisibwe, Cavana and Urs, 2015) on a comparison of agile and plan based methodologies, noted that agile projects need highly skilled and senior people throughout the entire project to adapt to changing client requirements. There is a need for a change in management mindset from command and control to leadership and collaboration (Chandra M., Kumar and Kumar, 2010). Mindset is ranked as the most important change required.

A study on agile project team staffing practices (CEB, 2012) indicated that 58% of the developers on initial agile projects were chosen from internal experienced and high performing staff. Only 5% of developers on new agile teams were external developers with agile experience. The study noted the value of having developers with the right mindset and who have experience on similar projects in a waterfall environment.

Wiss (2018) proposed that Scrum teams should be cross functional. The Scrum team should have all the skills to meet the sprint goal. Wiss noted that at least one senior engineer should be on the team to mentor more junior members. The Scrum team is responsible for testing what it builds. Some teams have dedicated QA resources whereas others have developers performing testing. Wiss comments that regardless of the team composition, the team is responsible for doing all the analysis, design, coding, testing and user documentation.

Summary

The literature reviewed indicates the importance of having experienced developers on early agile projects. The firm should be staffing the teams with their best development resources to ensure success. A more apt name for this dimension in the software development context is “Cross-Functional Teams”.

3.3.5.3 Rapid, Able Decision Making

The AMRG research indicates that one of the main characteristics of an agile organization is its ability to make decisions rapidly. An agile integrated organization assisted by rich information systems and skilled decision makers are the ingredients for robust decision making processes (Meredith and Francis, 2000).

In the agile software development world rapid decision making is facilitated by short development sprints and retrospects. Frequent product demos ensure that decisions regarding the progress of any agile project are made frequently to prevent the project from going off-side with functionality not aligned to client needs. This practice also avoids requirements "gold-plating"; the scope creep of features the client never asked for. Frequent decision making and planning between the project owner and the team is a foundational agile principle. A study of 1002 agile projects (Serrador and Pinto, 2015) indicated that significantly more planning occurs in an agile project. The planning is spread across the entire development cycle rather than occurring one time, up-front as in waterfall projects. On an XP agile project, the research (Serrador and Pinto, 2015) noted that 42.8% of the client’s total effort was spent in planning.

Mike Murphy, Chief Technology Officer for Standard Bank, stated that co-development and joint problem solving between business and developers accurately captures the business requirements for the application and builds-in accountability from all parties

involved (Blumberg and Stuer, 2016). Agile methodologies demand more client participation throughout the project to facilitate rapid decision making.

Decision making was identified as a critical element in agile adoptions (Papadopoulos, 2015). The focus of this study was on scaling up agile. Papadopoulos identified the need for deciding at the onset which teams are involved in the decision making process, which teams are impacted and who tracks task execution, which teams are requested to review and provide input on decision making and which teams only need to be informed (Papadopoulos, 2015). This implies that a RACI (Responsible, Accountable, Consulted, Informed) matrix (Doglione, 2016) used in plan-based projects is equally important for agile projects.

Summary

Rapid decision making is natural to agile software development practices such as Scrum and XP. Agile short sprints, co-location of staff to reduce communication lines, frequent client feedback and the requirement for the business to be part of the project team are practices that enable rapid decision making. One recommendation is to use a RACI matrix to define who is responsible for decision making on agile projects.

3.3.5.4 Continuous Learning

This practice refers to the rate at which people in the organization are open to change and adopt new practices. AMRG states that capturing knowledge and learning from experience are important facets of an agile organization. Formal training and education are ways in which organizations can support new skills development, but learning requires individual and organizational development (Meredith and Francis, 2000).

In a study of dysfunctional training practices on agile transformations (Gandomani *et al.*, 2015), the authors emphasize the importance of training as a critical factor for adapting new methodologies. The study, however, refers to agile Scrum as a project management method whereas other literature sources have referred to agile as a set of practices and not a project management methodology. The lack of a PM role on agile Scrum further emphasizes the point that this is a different approach for product development.

The research found that agile transformational training is provided to developers while excluding other stakeholders. The researchers suggest that training should be tailored to the audience such as agile teams, management and business owners. Insufficient management buy-in for promoting agile practices is often due to a low understanding of

agile values (Gandomani *et al.*, 2015), an issue that can be solved by training. However, in many cases, managers were simply not interested in participating.

Partial training was observed to be a problem. The scope of the organizational change is not only limited to one group of participants. Lack of a comprehensive training approach is a barrier for culture change. The training needs to encompass all participants and the training package needs to cover all agile adoption related issues. The study observed that theoretical training sessions exhausted people and led to frustration. Some participants found the classes boring. In one case, six people attended a Scrum training class and after applying the principles on a project they abandoned Scrum. The problem being that the training did not provide them with any practical experience. Training needs to be experiential. Lack of encompassing and participative training is a barrier for agile adoption (Gandomani *et al.*, 2015).

One study participant suggested that continuous training should be instituted for all people as the culture for agile adoption is significantly different. The enabler is continuous training and coaching. Another participant, an agile coach, explained that lack of participation in training is a challenge. A training program didn't perform as well as expected due to low participation from developers and managers. The fear of losing jobs and false role perceptions, due to a changing culture and roles brought upon by agile transformations, contributed to low participation. These fears need to be overcome through change management and over communication for removing barriers to adoption.

Agile training prior to starting an agile project was also identified as a success factor (VersionOne, 2015) by a survey. Insufficient training was blamed by 30% of the survey respondents as a contributor to agile project failure. The need for coaches embedded into an agile project was identified as a way to mitigate this risk. The same survey indicated that 33% of the respondents identified the unwillingness of the team to follow agile principles as a cause of failure.

"In order to have significant and lasting Agile success, there's no getting around the need for strong executive leadership, solid training and capable coaching" (Cunningham, 2015, p. 1)

The agile transformation effort at Salesforce.com emphasized the need for training, coaching of stakeholders and obtaining executive support early in the process (Greene and Fry, 2008). One study (Papadopoulos, 2015) noted that embracing an agile culture

requires an investment in training and education. Agile coaches embedded into projects and an experienced Scrum Master were observed to be positive factors for agile adoption by Telematicum Inc. in the 2015 study. Gandomani's study of obstacles in moving to agile software development mentions the need for managers to assign experienced and professional agile coaches to project teams.

Sufficient training, coaching and mentoring of staff is critical for success (Gandomani, Zulzalil, Ghani, Ziaei Nafchi, *et al.*, 2013). This emphasizes the need for experienced staff and coaches to participate in early stage agile projects. A survey (VersionOne, 2015) indicated that 26% of respondents indicated lack of support for cultural transition as the reason why agile projects failed.

Experience from the Salesforce.com agile transformation noted the need for extensive training (Greene and Fry, 2007). Large groups of program and functional managers were trained as Certified Scrum Masters and Certified Product Owners. Two hour agile training sessions were available for every team. The agile transformation was supported by a wiki-based intranet site that contained all information relating to agile transformation. One of the recommendations from the Salesforce.com lessons learned is to leverage established external agile trainers and coaches early on in the transformation. The external training and coaching exposed everyone inside the organization to quick wins, best practices and lessons learned from previous organizations (Greene and Fry, 2007). Coaches helped drive the agile adoption. As coaches were from outside the organization, people felt more comfortable taking constructive advice from industry experts.

Communities of Practice

The Salesforce.com transformation identified that Special Interest Groups (SIGs), also known as Communities of Practice (COPs), were effective at promoting agile adoption (Greene and Fry, 2007) best practices. The literature (Thune *et al.*, 2013) on implementing agile in large enterprises observes that agile COPs enable developers to share learning and offer support to others.

Summary

Training was identified as a key factor for agile transformation. The lack of training could derail an agile transformation by having staff revert to previous product development practices. The level of training and approaches varied among firms from extreme training of an entire division to an incremental approach of training individual LOB teams.

Training and coaching are important enablers in banking agile transformations where traditional project management methods prevail and cultural rigidity can impede change. The literature supports COPs as a way to share knowledge and to support others (Paasivaara and Lassenius, 2014).

3.4 A Sample of Companies and their Agile Adoption Journeys

The literature review examined agile adoptions at several firms and how the best practices of these adoptions aligned with the AWRM best practices. The adoption practices of the following firms were reviewed; Standard Bank (Blumberg and Stuer, 2016), Capital One (Tengshe and Noble, 2007), Citigroup (Fortune, 2016), Cisco Systems (Chen, Ravichandar and Proctor, 2016), ING Bank (Arooni and Verheyen, 2012; Meijs, 2014; McKinsey & Company, 2017), Borland Software (Maples, 2009) and Salesforce.com (Greene and Fry, 2007).

This section summarizes the review on challenges, strategies and results of adopting agile practices at Standard Bank, Citigroup, Capital One Auto Finance and Borland Software Inc. The drivers for agile adoption had common themes across all firms. Standard Bank commented that to serve a technology savvy generation of consumers through digital channels, it needed quicker time to market for their products and services. Citigroup noted that multiple facets of traditional banking services were being disrupted by a wave of new FinTech startups. They needed to match the speed of FinTech product creation and delivery. Citigroup felt they had to adapt rapidly or become extinct. Borland's driver for adopting agile practices was to reduce development costs, boost efficiency and quality (Maples, 2009).

Both Citigroup and Standard Bank leveraged agile practices from Silicon Valley. All firms benefitted from executive support on their agile transformations. Firms also followed an incremental adoption model similar to the phased adoption approaches from the literature (Ambler and Lines, 2017; Catlin *et al.*, 2017; Deloitte, 2017; Aghina, Ahlback and Jaenicke, 2018). Borland planned to gradually transition to agile over a three year period. These firms were previously using waterfall methodologies prior to adopting agile. One challenge cited by all four firms was the change that agile ways of working would bring to the existing culture and the difficulties of getting buy-in from incumbent stakeholders. For some, the lack of buy-in resulted in underfunded, inadequate training and poor attendance at training sessions.

The sections below summarize the challenges, strategies and results of adopting agile practices at the four firms.

3.4.1 Challenges

1. Culture: difficult to get buy-in. Very challenging to change behaviors, town halls, re-enforced change through evidence based actions such as co-locating teams. Large change in mindset. Business leaders understood the benefits of agile but were reluctant to compromise stability for innovation's sake.
2. Training: cost pressures limited the number of experienced agile practitioners to hire.
3. Training provided for CSM, CPO and Agile Manager roles. Initial classes were not full. It was difficult to get people to attend for a full day resulting in low training attendance.
4. Breaking down silos and getting people out of their comfort zones.
5. Difficult to get buy-in from business units.
6. High amount of time taken away from the business sponsor was a concern due to more active project participation. One of the first projects reverted to waterfall due to sponsor's unavailability.
7. Determining who in the business is a Product Owner.
8. Challenges in how to scale agile and make the practices stick. Challenge of any change effort is to make it stick. Cannot change the culture in the entire bank at once. Large organizations need to think small when adopting agile.
9. Technology team members were not fully allocated to the project; 25% to 50% allocations. As a result low collaboration with the Product Owner occurred. In some cases the technology teams didn't show up for meetings with the Product Owner.
10. Managers mandated that traditional waterfall documents be used on agile projects; Business Requirements Documents, System Spec, Design Spec and Test Plans. Result: more work on agile projects than waterfall due to maintaining old artifacts and new artifacts.
11. One universal impediment for Agile in a large organization is the change it brings to people's roles and the authority they exert in the organization. A challenge is getting buy-in that agile is a good methodology to follow. Leadership roles are challenged and resistance becomes a barrier for adopting agility.

3.4.2 Strategies

1. CEO and CIO support for making the change to agile.
2. Leveraged agile practices from Silicon Valley firms.
3. Gradual adoption approach: start with agile adoption by one group. One firm's transition to agile practices was planned gradually over a three year period.
4. Plan to ramp up other members in several months through incremental adoption.
5. Constantly re-examine the team culture as it interfaces with external groups, scaling out processes and adding new influential team members.
6. Focus on client facing applications; mobile and internet application development.
7. Change the organizational structure: break large development teams into smaller agile teams. Improve collaboration through business and technology co-location.
8. Train the trainer strategy; train existing employees on agile practices. Multiday training provided to each member. Ensure all levels of the organization are trained.
9. Coaches are available and participate on retrospect meetings.
10. To encourage training participation, 3 PMI credits were awarded to PMI certified PMPs.
11. Full day training classes were replaced by two half day classes.
12. Hire an agile expert to serve as an evangelist; guide, coach and mentor all teams to ensure scalability and evolvement of agile practices.
13. Ensure that methodology tailoring made to Scrum practices don't stray from core agile principles.
14. Develop agile "evangelists" as champions for change.
15. Started small with handpicked developers, from various divisions and startups.
16. Setup new team away from the corporate head office in its own facility that promotes a startup culture of collaboration and agility.
17. Provided teams with autonomy in how to execute agile on the condition ground rules were followed.
18. SIGs met every two weeks to exchange knowledge.
19. Created a newsletter, a web page and regular town hall meetings to show quick wins and get buy-in.
20. Time boxed sprint activities; rapid prototyping and 2 week sprints.
21. Implemented a Scheduled Release process every 2 months. Customer can prioritize what they want in each release. Customer decides when they have sufficient functionality to implement a release. Scheduled releases also eliminated

the need for creating new projects every time there is a release. Paperwork was kept to a minimum. This incremental product strategy is recommended for small application enhancements.

22. Established an Agile PMO to create training, mentor and train current PMs. The PMO has the authority to reduce unnecessary documentation while ensuring adequate controls and governance practices are satisfied. PMO has the authority to get rid of project schedules and Gantt charts. Project participants can best adapt to new agile processes through guidance from the Agile PMO. The PMO put processes in place to provide executives with the project reporting they needed.
23. Create an agile coach career path. Staff start as a CSM and then through monitoring and certifications progressed to a coach. Experienced and senior coaches are staffed at the PMO.
24. CIO meets with the PMO agile coaches once a quarter to review progress and help to remove impediments.
25. An "Approval Matrix" was created to outline who makes decisions. The decision process is lighter than in waterfall projects as only the Product Owner or Scrum Master has decision authority.
26. Core agile teams were fixed resources. Only a few resources were brought in as needed from outside. Fully cross-functional teams with analysis, development and testing all self-contained within the team.
27. To avoid management comparisons of team productivity as measured by "agile velocity", different teams used different scales for story points. This deterred management from using velocity to compare one team's productivity against another.
28. Metrics: customer satisfaction was the best metric to use. Also used to time to market and value delivered. One firm used the Nokia Test (Sutherland, 2010) and agile manifesto principles to create a self-assessment tool for identifying areas for improvement.

3.4.3 Results

1. Previously, mobile tablet application development took 2,500 pages of documentation. The waterfall methodology resulted in thousands of defects and a post-test failure rate of 38%. After agile: 100 defects and a 3% test failure rate.
2. Tangible benefits: productivity increase of 50% and unit cost reduction of 70% per function point.

3. After 40+ agile projects, a customer survey indicated a 100% satisfaction rate. Satisfaction survey metrics measured project planning, execution, cost management, collaboration and results.
4. Projects are delivered 50% faster than with waterfall methods. A new mobile application is released in a record 10 months.
5. Agile practices yielded excellent early results.
6. Company-wide excitement around the products developed using agile practices.
7. Teams could respond to change quicker and resulted in more trust among stakeholders.

3.4.4 Benefits and Challenges in Adopting Agile Practices

The literature review outlined benefits and challenges associated with adopting agile practices (Tengshe and Noble, 2007; Wiss, 2008; Maples, 2009; Blumberg and Stuer, 2016; Chen, Ravichandar and Proctor, 2016; Crosman, 2016; Dikert, Paasivaara and Lassenius, 2016; Gibson, Woodruff and Barnum, 2016; Rehberg and Danoesastro, 2018).

These are summarized below:

3.4.5 Agile Practices Benefits

1. The client can define and change requirements throughout the project but only before each iteration. Suited for projects with initial ambiguous requirements.
2. Iterative software development provides working software to the client quicker.
3. Light documentation practices: only produce the minimal documentation thereby freeing up the team to focus on communication.
4. Project progress is more transparent due to the use of burn down charts, frequent planning, daily stand-up meetings and retrospectives.
5. Because the software is implemented incrementally the client has more opportunities to provide feedback on the product earlier and correct any requirement gaps.
6. Product quality is improved as assessments are performed at each sprint. Defect remediation should be prioritized over new features on any sprint thereby ensuring quality remains high throughout product development. Defects are caught earlier and don’t accumulate until the end of product development as is the case with waterfall approaches.

7. Requirements cannot change during a sprint thus allowing the team to remain focused on developing those user stories and tasks planned at the beginning of the sprint.
8. Delivering software sooner provides the client with an opportunity to achieve ROI quicker.
9. Ideal for time to market critical projects where the client needs to establish a market foothold.
10. Requirements can change throughout a project. This provides clients with more flexibility to adapt the product to changing market conditions as it is being developed.
11. Agile teams are more motivated to use incremental development.
12. Clients are more satisfied with a product that matches their requirements.
13. Agile projects deliver products with a high degree of quality.

3.4.6 Agile Adoption Challenges

1. Resistance to change; deeply rooted organizational cultures, processes and ways of doing work are difficult to change and often hinder agile adoption (Dikert, Paasivaara and Lassenius, 2016).
2. People may perceive agile methods as a challenge to their authority and project role. People worry about their roles and responsibilities in an agile transformation.
3. Mixing the role of PM and Scrum Master often leads to role conflict as PMs would police the teams instead of supporting them; a change in leadership role to a "servant leader" is required for agile.
4. Skepticism by all levels of staff that agile practices may not work in the organization.
5. Top-down management mandate to adopt agile practices may lead to lack of buy-in. A sense of purpose and clear goal setting by management is often lacking.
6. Lack of middle management support for change and a disinclination to change management culture were seen as some of the most serious problems (Dikert, Paasivaara and Lassenius, 2016).
7. Agile requires software developers with a high degree of communication, teamwork, inter-personal and multidisciplinary skills to work in self-organizing teams. Developers with these traits are difficult to find. Interpersonal dynamics become more important on agile projects than on waterfall projects where staff participate for their portion of the work and then move on.

8. New agile teams struggle with creating requirements as user stories and breaking down these into tasks that can be individually estimated.
9. Agile methods lack focus on non-functional requirements such as performance testing. User stories are ill suited for QA activities.
10. In organizations where plan-based methodologies have prevailed and where teams are defined by functional roles, it is difficult to change the organizational structures in place to accommodate agile practices, such as cross-functional teams.
11. It is difficult to sustain agile practices over the long term. Some initiatives suffer from the second adopter syndrome (Shore and Warden, 2007; Maples, 2009) whereby much support is provided for the initial projects but support languishes thereafter. The change effort lacks focus and resources to sustain the change. The subsequent agile projects may fail unless the same intensity for change management, resourcing and executive support is provided.
12. Scaling agile to enterprise level adoption is difficult to achieve. Of 132 firms surveyed (Gibson, Woodruff and Barnum, 2016), 85% claimed to be using agile, however only 15% of these firms used agile in more than half of the projects in their portfolios.
13. Executive sponsorship is required to drive the level of organizational change that agile adoption requires. However, executive support is often lacking.
14. Lack of training to all stakeholders. Reluctance of management to invest in training leaves agile teams unprepared for projects.
15. Lack of senior coaches on teams. Training and reading about agile is insufficient; coaches need to be embedded in agile teams.
16. Management pressure to deliver projects on schedule despite the lack of team experience causes the team to abandon agile practices.
17. Co-location of teams is not always possible due to global dispersion of teams in large financial firms. A distributed agile organization will impose additional burden on communication and require additional care (Dikert, Paasivaara and Lassenius, 2016).
18. Co-location brought its own resistance issues as some team members resisted the move from office spaces (cubicles) to team spaces (Dikert, Paasivaara and Lassenius, 2016).
19. Product Owner deep participation is not always possible on agile projects due to other day to day work commitments.

20. New processes and tools are required for automated regression testing, collaboration, test driven development and continuous integration. Lack of automated testing causes excessive manual QA effort and late discovery of defects (Dikert, Paasivaara and Lassenius, 2016).
21. Impact on established HR policies of compensation and rewards for individuals versus teams. In agile teams there are no heroes, a project's success is attributed to the team. Rewards tied to personal performance undermine an agile team-centric approach.
22. Clients feel less in control of the outcomes since scope and requirements are not created up-front. The evolutionary approach of requirements elicitation and iterative agile development is uncomfortable for most clients.
23. Stakeholders at every organizational level are not educated or trained on agile practices.
24. Agile principles emphasize working software over comprehensive documentation. This poses challenges for knowledge retention as tacit knowledge needs to be transitioned into codified knowledge.
25. Projects often have linkages to other teams and vendors who are not agile. This can lead to project delays due to dependencies on teams who don't understand the impact of late delivery on agile sprints and time boxed delivery.
26. Clients prefer fixed scope and fixed price contracts which is not always possible with agile approaches.
27. Clients need to review and accept the results of every sprint and this clashes with other day to day priorities. Projects where there is limited client availability are ill suited for agile.
28. Some projects are not well suited for agile delivery. Executives, in the search for a silver bullet to cure their project woes have rushed to adopt agile practices for all projects regardless of fit. Early successes may be declared prematurely but may not be sustained over the long term.
29. Agile practices define the team size of five to nine people at most. This constrains the size of projects that can be undertaken by an agile team. Agile has been more successful on small projects.
30. Inflexible governance processes and unnecessary documentation are major sources of delay for agile teams (Gibson, Woodruff and Barnum, 2016).
31. Financial services firms are conservative, highly regulated and don't see a need to adopt new methods.

32. Corporate culture, trust and the general structure of financial institutions are impediments to adoption (Wiss, 2008).

A report (GAO, 2012) on the use of agile practices for federally funded projects noted similar factors. The report identified the following successful agile adoption practices:

1. Start with agile guidance and an agile adoption strategy.
2. Enhance migration to agile concepts such as user stories.
3. Continuously improve agile adoption at both the project level and organizational level.
4. Identify and remove impediments at the organization and project level.
5. Obtain frequent stakeholder feedback.
6. Empower small cross-functional teams.
7. Include non-functional requirements and progress monitoring in the product backlog.
8. Gain stakeholder trust by demonstrating value at end of each iteration.
9. Track progress using tools and metrics.
10. Be transparent; track progress daily and provide visibility.

As well, the report identified challenges to adopting agile in a government environment.

1. Teams had difficulty collaborating closely.
2. Procurement practices are not aligned with agile projects.
3. Teams had challenges transitioning to self-managed work.
4. Lack of stakeholder trust with agile iterative practices.
5. Stakeholders had difficulty committing to more timely and frequent feedback.
6. Teams had difficulty managing iterative requirements.
7. Agencies could not always commit staff.
8. Compliance reviews were difficult to execute within the sprint.
9. Timely adoption of new tools was difficult.
10. Federal reporting practices do not align with agile methods.
11. Technical environments were difficult to establish and maintain.
12. Traditional documentation reviews do not align with agile practices.
13. Traditional project status tracking does not align with agile.
14. Agile guidance was unclear.

The GAO challenges were similar to those identified in the review of other literature and serves to emphasize the importance of addressing these issues in regulated industries. As with the previous literature, the GAO report indicated more challenges (14) than best practices (7). Firms cannot underestimate the challenges faced by agile transformations.

3.4.7 Agile Organizational Adoption Best Practices

The literature review identified several best practices for agile adoption at the firm level and the team level. Each best practice in Table 1 is coded to denote whether the practice is at the organization level or team level. The pre-amble "OP" denotes an organizational level (macro) best practice, whereas "TP" denotes a project team (micro) best practice.

Table 1 – Organizational Best Practices

ID	Best Practice
OP1*	Obtain executive commitment and support for changing established practices to agile. Agile adoption is an impactful culture change for agile adoption and executive support is necessary to navigate through political challenges that will ensue.
OP2*	Create a sense of urgency. The executive should provide a compelling and convincing reason for the change. Urgency can act as a catalyst for change that people can rally behind. For example, persistent project failures, late project delivery or competitive threats from nimbler FinTechs are compelling catalysts for change. Executives must make it clear that change is non-negotiable.
OP3	Focus on culture change methods. Cultural change management processes for transitioning to agile should be implemented for all internal stakeholder groups. Ensure audit, risk and governance groups are involved in the change.
OP4*	Communications strategy; over communicate the agile adoption journey focusing on the benefits, objectives and outcomes. Create a communication plan for adoption and sustainment of agile practices, e.g. town halls, newsletter, quarterly seminars, social media, wikis, etc. Intensive communication was emphasized in a number of studies (Dikert et al. 2016).

	Establish regular town halls for communicating successes. Invite external speakers to explain their use of agile practices.
OP5	Define new roles and responsibilities for agile staff. This will involve job descriptions for new roles of Product Owner and Scrum Master. Identify who in the business assumes the Product Owner role. Set expectation on level of involvement required for agile projects. Business partner engagement is critical to success. A survey (Gibson, Woodruff and Barnum, 2016) indicates that 60% of firms struggle to engage their business partners in agile projects.
OP6	Identify which area of the organization is first to adopt agile. Agile success depends on engagement of both technology and business stakeholders. Select a vertical slice of the bank, be it a line of business or region that is open to adopting new practices. Information Technology areas are prime candidates for agile adoption as they may be more open to change.
OP7*	Use pilot projects to experiment what practices work best and which ones need to be tailored to the organization. Pilots help increase the confidence in agile practices and improve management confidence. Using pilot projects was reported as a significant success factor (Burba, 2015; Dikert, Paasivaara and Lassenius, 2016; Danoesastro, Rehberg and Freeland, 2018). The projects should start with small teams (5 to 9 staff) and be self-contained, with few external linkages before applying agile practices to larger project teams. Develop the culture and best practices on small projects before considering scaling the practices (Burba, 2015).
OP8	Develop guidelines for a minimal level of project documentation based on project complexity, risk and regulatory environment. Engage stakeholders in determining what level of documentation is suitable for the bank.
OP9	Performs frequent agile adoption assessment and correction; agile adoption is a continuous improvement practice (Rehberg and Danoesastro, 2018). Tailor the methodology to the culture of the bank. Banking may require a differentiated agile approach due to the needs of other groups such as compliance and audit. Use a fail-fast model to tailor and continuously improve on an ongoing basis (Valade, 2008).

OP10*	Use experienced staff. Identify champions that are accepting of agile practices and can act as early stage agile evangelists and mentors. If possible, develop evangelists from staff that are already trained on agile practices. Use experienced agile coaches to assist with agile practices adoption and to provide methodology leadership on projects from the onset. External coaches are best to spot where corrections in the agile approach are needed. Their advice is also better received as they are considered impartial. Ensure that experienced developers are engaged on initial agile projects. If the level of experience is not available internally, consider bringing that skill from outside (CEB 2012).
OP11*	Establish an "Agile Centre of Excellence" (CoE) to provide enablement and support of the agile transformation. Implementation of an agile CoE and transparency of resources are key to agile project management (Stettina & Hörz 2015). Almost 90% of agile teams surveyed (Gibson et al. 2016) believe that PM governance and resource management processes mandated by a traditional PMO impedes project progress. One study (GAO, 2012) suggests using an "Agile Centre of Excellence" instead of a PMO.
OP12	Establish processes to benchmark a firm's agile project success against firms developing similar products. Examine how other financial firms are adopting agile practices. For example, understanding and adapting rapid development best practices from FinTech startups (Blumberg and Stuer, 2016; Fortune, 2016; McKinsey & Company, 2017).
OP13*	Training on agile principles. Provide comprehensive training tailored to different organizational stakeholders. Differentiated curriculum for executives, managers and developers. Several studies stated that training improved the chances of success for agile adoptions (Dikert et al. 2016). Ensure multiple opportunities exist for taking training; a continuous delivery model (e.g. class based, on-demand web based, etc.).
OP14*	Tooling for Agile; establish tools and processes for automated regression testing (Mathaisel, 2013). Implement tool suites for DevOps that support

	frequent code builds and releases. It is important to focus on the processes that support a continuous transformation before committing to tooling.
OP15*	Frequent client demos to gather feedback and correct deviations, frequent planning; backlog combing and retrospectives after each sprint. Demos enable business and technology stakeholders to work closely together to drive positive cultural change.
OP16*	Adopt established agile practices, such as Scrum, that already define processes for rapid, iterative, product development and quick decision making. Tailor the practices, just enough, to fit the culture of the organization (Dikert, Paasivaara and Lassenius, 2016).
OP17	Create agile adoption key indicators. Metrics to track the organizational attainment of agile practices, such as the number of people trained and projects running agile. Metrics track the success of agile adoption across stakeholder groups over time (Thune *et al.*, 2013).
OP18*	Encourage Communities of Practice or Special Interest Groups within the firm to promote agile successes, share learning and offer support. Dikert (Dikert, Paasivaara and Lassenius, 2016) notes that the formation and influence of agile communities is reported to have a significant impact on agile adoption.
OP19	Adapt HR policies for rewards and compensation at the team level and not solely at the individual level. This is a marked shift from HR policies which are applied uniformly across bank LOBs. Candidate selection should be adjusted to hire candidates with cross functional skills and superior interpersonal skills (e.g. embrace change, not process dependent, open to criticism, innovative and flexible) (Thune *et al.*, 2013). These changes should be gradually introduced as other changes become entrenched practices.
OP20	Change the physical office layout for co-location of teams. This encourages collaboration, shortens communication lines and improves feedback. Provide team rooms or spaces that facilitate team communication (Valade, 2008) but

	don't overlook the need for accommodating personal zones to allow people to step away when needed.
OP21	Establish procedures for agile product co-development with vendors. Strategic sourcing processes for incremental agile product delivery with vendors. Contract negotiation, conditions of product acceptance, remedies for non-conformance and milestone based payments. Current Strategic Sourcing processes may require changes to establish partnerships quickly. Generally, the literature is not supportive of agile product development with vendors. However, strategic partnerships are an important component of getting new products to market faster. Master Service Agreements and Service Level Agreements should be established with partners.
OP22	Create a project management methodology selection model to route projects to either agile or plan-based methods. Projects whose characteristics are misaligned with the project methodology have less chances of success. Firms should seek their own balance of plan-based and agile methods (Dikert, Paasivaara and Lassenius, 2016).
OP23	Decide which bank area is responsible for selecting a project's management methodology; agile or plan-based. The research indicates who decides on methodology is inconsistent across firms (Gibson, Woodruff and Barnum, 2016).
OP24	Use of sprints lasting from one week to no more than one month. The majority of firms use two week sprints. This aligns with the agile manufacturing principle of producing small product batches (Meredith and Francis, 2000).
OP25*	Management trusts agile teams to execute their projects without constant oversight (Thune *et al.*, 2013; Stettina and Hörz, 2015). Management still needs checks and balances within the shared stakeholder/team environment to replace the constant oversight. However, management must provide guidance and support without being in an overbearing oversight role.
OP26	Prioritize agile competencies that drive productivity. Begin with a baseline of best practices that prepares agile teams for future improvements. This requires defining and evolving a competency model of practices that provide

	value to agile teams. Prioritize competencies to continuously improve effectiveness at both the organizational and project level (GAO, 2012).
OP27	Estimate and measure the effort required for early adopting agile teams. The effort required varies by firm depending on the firm's established culture, propensity to change and firm size. Use external experienced coaches as needed for early estimates.
OP28*	Use incremental, gradual and continuous agile transformation (Gandomani and Nafchi, 2015). Wholesome adaptation is difficult. Create a roadmap for incremental agile adoption and sustainment including planning, stakeholder analysis, analysis of the firm's environments, communications strategy and agile sustainment. Successful firms take years in the planning and execution to be successful in their agile journeys (Ahlbäck *et al.*, 2017; Freeland, Danoesastro and Rehberg, 2018). The key to avoid adoption failure is better planning and execution.
OP29	Master Service Agreements and Service Level Agreements are established with strategic partners. Partnerships are an important component of getting new products to market faster. Current Strategic Sourcing processes may require adaptation to establish partnerships quickly.

Note: * denotes this is a top 20 best practice. Practices are not ordered by significance.

3.4.8 Agile Project Team Best Practices

The literature indicated several best practices for agile teams in Table 2. These are not in any specific order and are referenced with a TP identifier to denote this is a team practice.

Table 2 – Agile Project Team Best Practices

ID	Best Practice
TP1	Automated regression testing.
TP2*	Close client interaction with client on-site and available to the team.
TP3	Team collective code ownership.

TP4*	Incremental product releases made possible through continuous integration and daily continuous builds.
TP5	Test driven development; test cases are built in advance of code development.
TP6	Adoption of user stories, backlog and estimating per iteration.
TP7*	Allow time for code refactoring and re-design. Avoid excessive technical debt when building applications that are expected to have a long life cycle. However, technical debt may be acceptable where the project must meet a time to market or regulatory requirement.
TP8	Agile coaches are available to the project team from project onset.
TP9	Ability to inject new requirements into the product backlog throughout the project.
TP10	Defect remediation should be prioritized over new functionality at every sprint. It is critical to adopt practices that prevent product mediocrity and technical debt.
TP11	Small, self-managed teams.
TP12	There is an established process for on-boarding new team members into an agile team. Possible methods are boot camps, mentoring, job shadowing, formal training and group orientation.
TP13	Light documentation and just enough documentation.
TP14*	Dedicated teams; teams are not disbanded after a project completes as is the norm for plan based projects in matrix organizations. Agile teams remain together from project to project (Thune *et al.*, 2013). Dedicated resources breed domain knowledge, build lasting relationships with customers and provide additional productivity through increased domain knowledge (Valade, 2008). Rotate developers on teams moderately, to avoid domain weariness, attrition and burnout.

TP15*	Product Owner commitment to devote a high percentage of their time to be available to the project. This role is the liaison between the agile team and the business sponsor and hence a high level of time commitment is needed. The Product Owner is fully integrated into the project team and development process (Thune *et al.*, 2013).
TP16	Full cross-functional agile teams. The agile team should have all the skills required to complete the project work internally. This requirement is almost universal across the literature reviewed (Shore and Warden, 2007; Stuart, 2008; Wiss, 2008; Qumer and Henderson-Sellers, 2008; CEB, 2009; Browaeys and Fisser, 2012; GAO, 2012; Moniruzzaman and Hossain, 2013; PwC, 2014; Inayat *et al.*, 2015; Papadopoulos, 2015; Hoda and Murugesan, 2016).
TP17	Projects should be small, self-contained with few external linkages. Decreases dependency on external components delivered by other teams or vendors. This reduces the risk of incomplete sprints due to late deliverables. In banking this is challenging due to the high dependency on multiple functional, often dispersed and non-agile teams to implement a change.
TP18	Senior developers with agile experience can take on the role of Scrum Masters. In mature agile teams, Scrum Masters can rotate between a core group of experienced agile developers (Thune *et al.*, 2013). They ensure agile practices are followed, communications across team members and stakeholders are effective and foster a continuous improvement mindset (Thune *et al.*, 2013).
TP19	Measure progress through burn-down charts, team velocity and continuous planning. Provide a dashboard to show progress and ensure it is easily viewed by the team. The dashboard includes up to date stories, tasks and real-time information on the work remaining. Kanban boards, burn-down charts, sprint velocity are examples of dashboard elements.
TP20*	Project stakeholders participate in daily stand-up team meetings not exceeding 15 minutes with small team teams (Valade, 2008). Valade also

	suggested a no-meeting day once a week. Project impediments are noted and team members are tasked to remove them.
TP21	When a new team is established, they must be co-located with a mature agile team until they have mastered the core agile competencies and can work independently.
TP22	Retrospective sessions are held with the team once per iteration to reflect on what practices worked well, which did not and improve team practices for subsequent iterations.
TP23*	Project delivery success measures: quantitative and qualitative measures are collected and the end of each project to assess success (Thune *et al.*, 2013). Determine the project value on customer satisfaction and ROI (GAO, 2012). With agile projects emphasis is on delivering customer satisfaction beyond just cost, schedule and scope.
TP24	Agile team effectiveness; perform team "health checks" to assess alignment with agile practices. Volvo Inc. performs agile maturity assessments of virtual teams through a form based scorecard (Thune *et al.*, 2013). Some firms use team assessments based on the Nokia test (Martin, 2003; Wiss, 2008; Maples, 2009; Sutherland, 2010)

3.4.9 Mapping Best Practices to the AWRM Factors

This section classifies and maps the best practices into the AWRM quadrants and dimensions. The aim is to identify what quadrants are strongest in terms of best practice alignment and which quadrants are weak and less important for agile software development through a mapping exercise. Whereas both manufacturing and software development benefit from agile approaches the importance of some dimensions for agile practices in software development differ.

In summary, the four AWRM quadrants are:

1. Agile Strategy encompasses the strategic aspects of agility. These are the strategies required to change the corporate culture for an agile adoption.

2. Agile Processes enable and sustain an agile adoption. This is the tactical aspect of an agile adoption; the processes, tools, norms and practices required to run agile projects.
3. Agile Linkages denotes the agile practices necessary when engaging external vendors on projects. This quadrant encompasses aspects related to vendor engagement, contract issues and best practices for involving external vendors in an agile project.
4. Agile People describes the practices required for building agile teams. This includes the training, the changes to HR criteria for hiring new agile staff, new agile roles, processes and structures enabling rapid decision making and communication.

By mapping the agile adoption best practices into the quadrants in Table 3, reveals which quadrants have the most relevant practices. As a convention, a best practice is only mapped into one quadrant to avoid duplication. The author acknowledges that some best practices could cross multiple AWRM quadrants but the most suitable quadrant fit for each practice was selected. As well, there may be overlaps in organizational best practices that are also key practices at the team level. For example, automated regression testing is a best practice at the team level, but it is first an organizational decision to provide the tools and processes to enable it.

The Agile Strategy dimension factor 1.a (*Wide Deep Scanning*) is empty. This factor describes a firm's procedures for understanding its exogenous environment and understanding change drivers that may impact it. The closest best practice is OP12 but this practice is better aligned with 3.a (Agility Benchmarking). *Wide Deep Scanning* is something that banks already perform at the strategic level to understand competitors, new technologies and impacting regulatory requirements. It is not specifically an agile best practice but one already performed in banking. AWRM suggests this as a best practice for those firms who are not already performing this as part of their strategic planning.

Two AWRM dimensions were renamed for better clarity. Specifically, *Flexible Assets and Systems* was renamed to *Agile Supporting Assets and Systems*, *Multi-Skilled / Flexible People* was renamed to *Cross-Functional Teams.* It is this author's view that the remaining dimension titles apply equally well to manufacturing and software based product development.

Table 3 – Mapping Agile Adoption Best Practices into AWRM Dimensions

1. Agile Strategy		**2. Agile Processes**	
1.a Wide Deep Scanning	1.b Strategic Commitment **OP1, OP2, OP3, OP4, OP25, OP11**	2.a Agile Supporting Assets and Systems **OP14, OP9, OP22, TP1, TP4, TP5, TP7, TP13, OP8, OP27**	2.b Fast Product Development **OP24**
1.c Full Deployment **OP7, OP28**	1.d Agile Scoreboard **TP23, TP24, OP17**	2.c Rapid Problem Solving **OP16**	2.d Rich Information Systems **OP15, TP19**
4. Agile People		**3. Agile Linkages**	
4.a Adaptable Structures **OP5, OP20, OP6, TP17, OP26, OP19**	4.b Cross-Functional Teams **TP3, TP12, OP10, TP11, TP14, TP16, TP15, TP21, TP18**	3.a Agility Benchmarking **OP12**	3.b Deep Customer Insight **TP2 , TP6**
4.c Rapid, Able Decision Making **TP9, TP10, TP20, TP16, OP23**	4.d Continuous Learning **OP18, OP13, TP22, TP8**	3.c Aligned Suppliers **OP21**	3.c Performing Partnerships **OP29**

Source: Author (2018)

3.5 Literature Synthesis

The literature review mapped the best practices for agile practices adoption into the AWRM framework. This review concluded with 29 organizational best practices and 25 team best practices; a total of 54 practices. This review also identified 32 challenges firms experienced in adopting agile practices for software development.

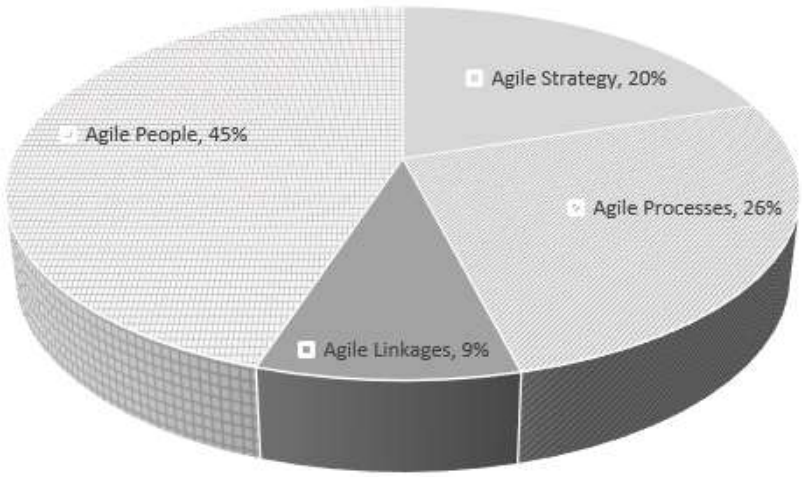
By contrast, a literature survey of agile software product development methodologies (Scrum, XP, DSDM, Crystal Clear) identified 59 agile best practices (Mc Hugh *et al.*, 2013) but only 13 were identified as being applicable to the development of software products in the regulated medical devices industry. The GAO report on agile practices (GAO, 2012) identified 32 practices for software development projects. Only 10 practices were used and found effective by the five government agencies who adopted agile. As well, GAO identified 14 challenges with adapting agile to a government environment. A study on agile deployment in three software intensive firms in Finland (Pikkarainen *et al.*, 2012) identified 169 barriers to adopting agile. This indicates that not all agile practices are a fit for all firms and adoption challenges are expected.

Mapping the 54 best practices into the AWRM framework (Table 4) reveals which quadrants are the most influential for an agile adoption.

Table 4 – Best Practices Distribution per AWRM Category

AWRM Quadrant	**OP**	**TP**	**Total**
Agile Strategy	9	2	11
Agile Processes	8	6	14
Agile Linkages	3	2	5
Agile People	9	15	24
	29	25	**54**

Figure 3-3 – Best Practice Dominance by Category as a Percentage



Source: Author (2019)

Table 4 and Figure 3-3 indicates those practices aligned with people, processes and strategy are the most influential. Linkage factors were not as significant (9%) due to lack of literature on vendors participating on agile project teams. The literature reviewed on linkages indicated that vendors and partnerships, although beneficial for a firm, their participation was generally problematic on agile projects. The literature provided guidance on practices for managing vendor engagements. The reviewed literature on agile adoptions focused on internal firm factors more frequently than it considered the external firm environment. Factors such as industry regulation and vendor participation may require tailoring of agile practices.

A study on obstacles in moving to agile software development highlights that four main categories of change are; organization and management, people, process and tools. These are the areas where the greatest challenges could be experienced (Gandomani, Zulzalil, Ghani, Ziaei Nafchi, *et al.*, 2013). A study (Misra, Kumar and Kumar, 2006) on agile success factors included a framework for agile adoption that focused on three categories; people, technical and organizational factors. Misra's categories are similar to those identified in Figure 2-6 as people, process and strategy. Another study (Dikert, Paasivaara and Lassenius, 2016) indicated the importance of cultural and organizational change, management support and having the right people. In summary, the categories identified by previous researchers are similar to those identified through the literature review.

3.5.1 AWRM Benefits

The benefit of the AWRM model is that it provided a ready framework specific to agile practices which can be used to classify the best practices for an agile adoption. The intent of the AWRM framework was a tool for auditing manufacturing firms on their agile practices. In this research, the framework was re-purposed to provide a model to understand the influential factors for agile adoption. The literature review of agile best practices has shown that those practices align with the AWRM dimensions.

Linkages were weakly addressed in the literature, yet it is considered as important by AWRM and features four practice dimensions. Given the level of vendor engagement and partnerships in banking for getting products to market quicker, the lack of attention given to linkages is surprising. The literature on agile best practices is mostly inwardly focused on the firm's adoption of practices and not on the involvement of external parties. The literature addressing the participation of vendors within agile projects deems this aspect to be more of a hindrance than a benefit.

In agile adoptions, firms frequently look outside to other technology firms who are already using agile practices to learn from and adapt them to their own environment. ING Bank, as an example, adapted practices from Google, Spotify and Zappos in their agile transformation (McKinsey & Company, 2017). Other banks have met with Silicon Valley firms to learn from their agile transformations (Tengshe and Noble, 2007; Blumberg and Stuer, 2016; Fortune, 2016). This practice is similar to AWRM's "Wide Deep Scanning", which encourages firms to look at their exogenous environment for opportunities to leverage learnings of other firms.

3.5.2 AWRM Gaps

The AWRM framework, although suited to an agile audit, lacks prescriptive guidance for understanding priorities and actions steps necessary for applying and sustaining the agile practices. The dimensions cannot all be applied concurrently. The AWRM model lacks guidance as to when and in what order the practices should be applied. There is no agile adoption roadmap highlighting which practices to apply at the start of an adoption and which practices are required for sustaining agility.

AMRG does not address how to scale agile. Yet, scaling agile is a challenge for most practitioners in software development. In manufacturing, the assumption is that for small to medium enterprises (SMEs) agile can be instituted holistically at the firm level. For large banks, building software based services, the research indicates a measured and gradual adoption is best. Preparing a firm for an agile adoption is also not addressed by ARMG (Riggins, 2016).

3.5.3 Literature Gaps

The literature review at this time did not find peer reviewed, journal or conference proceedings that addressed agile product development practices adoption in Canadian banking. Articles from the public press and from local consulting firms superficially touched upon transformational best practices and impediments encountered. In summary, insightful literature into agile adoptions in Canadian banking is lacking.

The literature reviewed comprised the best practices for agile adoption in several software development industries. Where possible, the literature reviewed agile adoptions by global banks, mostly in the United States and Europe. The best practices and challenges experienced by these organizations could be similar to those encountered by Canadian banks. As noted by the Reference list, many literature sources were reviewed. The ones pertinent to the financial industry were primarily from Efma, the CEB; whose members comprise many Fortune 100 firms. Consulting firms such as PwC, BCG, McKinsey & Company, Ernst & Young and KPMG also provided insight into financial industry trends.

The literature review concluded that although there is a wealth of literature on agile adoption best practices, the literature specific to agile in banking is scarce. Also lacking is the availability of literature on agile adoptions in large enterprises. A main finding of a study on large-scale agile transformations (Dikert, Paasivaara and Lassenius, 2016) noted that despite the relevance of this topic, research is seriously lagging and there is a need for rigorous case studies. ING Bank undertook a large enterprise agile transformation in 2015 (Meijs, 2014; McKinsey & Company, 2017), yet the available literature is positively biased to highlight the benefits without insight into the challenges. ING's transformation impacted 3500 head office staff, resulting in hundreds of redundancies, little is published on the challenges encountered with such a large scale transformations.

The majority of the literature focused on the application of agile at the team level. Only a few publications touched upon the involvement of vendors and partnerships in the product creation process. Lacking is literature on sustaining agile practices, yet some articles acknowledged the difficulty of sustaining agile practices for the long term (Shore and Warden, 2007; Maples, 2009).

3.5.4 Change Management Strategies

Every agile adoption entails a culture change to new ways of working and new roles. Change management is frequently mentioned in the literature but no details are provided on the use of established change management frameworks. Popular frameworks for initiating a cultural change are; Lewin's resistance to change model (NHS North West Leadership Academy, 2011; Hussain *et al.*, 2016), the Satir Change Model (Satir, 1991) and the Change Curve attributed to Dr. Kubler-Ross (University of Exeter, 2017). Kotter's eight stages for change management is also an established change management model but was not mentioned in any literature reviewed (Kotter, 2007; Foster, 2013). Change management frameworks provide a useful roadmap for change but were underrepresented in the literature.

3.5.5 Documentation and Knowledge Management Strategies

A practice that is also underrepresented in the reviewed literature is knowledge management strategies. As the shift to agile software development processes by definition are documentation lean; knowledge capture becomes an issue. Agile practices propose minimal documentation, relying instead on application knowledge embedded in the code, user stories and tasks. Firms of all sizes experience staff turnover. A large bank with 70,000 employees and an average annual staff turnover of 7.3% (2012-2013) (Conference Board of Canada, 2014) will have 5110 employees turnover each year. Knowledge management required to maintain critical financial applications over a ten year life cycle, will experience issues if application developers are no longer with the firm.

Transforming tacit knowledge to explicit knowledge is a challenge in agile software development. Knowledge management strategies are needed for capturing tacit knowledge (Chandra M., Kumar and Kumar, 2010), however the research does not go into details on how to accomplish this. One publication (Davis, 2013) addresses the issue of tacit and explicit knowledge capture but does not advise how to bridge the gap other than proposing that tacit knowledge can be shared with the team through stories. The HEC study also

touches upon the importance of documentation especially when an application is developed by a third party supplier (Dubé, Roy and Bernier, 2008) .

This author's own experience is that the sharing of stories does not provide sufficient detail for application development. As well, the quality of the imparted information is only as good as the quality of the story teller. The factual integrity of the story morphs as it is imparted from one developer to another due to bias and the developer's contextual involvement with the application. For example, a developer may have been exposed to only one module of an application and therefore have limited knowledge of the entire application.

3.5.6 Agile, Plan-Based and Hybrid Methods

Another gap in the research is the sole focus on agile adoptions. Few publications address the issue that agile methods are a fit for some projects but may not be a fit for others. One advantage of the waterfall model is that it allows an easy transition from co-located to distributed teams. It provides a clear structure for organizing and controlling the activities during the entire software development process (Papadopoulos, 2015). Each phase of the software development process from initiation to customer delivery has clear inputs and outputs that can be allocated to disparate teams. Papadopoulos posits that with waterfall, detailed requirement documents exist at the onset and enable the assignment of tasks to dispersed teams. The concept of bi-modal methodologies is not well covered in the literature.

Each methodology has its fit and very few firms use a purist agile development methodology. A survey of 107 firms using agile (Gibson, Woodruff and Barnum, 2016) revealed that only 7% of members used agile practices exclusively. Surprisingly, 93% of firms were using hybrid methodologies combining features of agile and plan-based practices. Tailoring agile practices to suit the firm is not uncommon (Diebold *et al.*, 2015).

There is a need for a project selection matrix as not all projects have the same characteristics or should use the same methodology (Cockburn, 2000). One paper proposes a method for agile development methodology selection using a *Reference Ranking Organizational for Enrichment Evaluation* (PROMETHEE) model (Mareschal, Brans and Vincke, 1984; Sharma and Bawa, 2016). The Analytic Hierarchy Process (AHP) (Saaty, 1987) is another Multi-Criteria Decision Making (MCDM) method. Although these methods are well documented and have been used for multi-criteria decision making, they could be overly

complex for the average PM. CEB's PMO Executive Council created an easy to use *Suitability Scorecard for Agile Development* tool to determine the methodology best fit. Further, the CEB survey (Gibson, Woodruff and Barnum, 2016) highlighted that those responsible for methodology selection is inconsistent across firms; a critical issue not addressed by other literature. Overall, the literature is weak on bi-modal methods and project fit selection.

3.5.7 Regulated Environments

AWRM does not provide guidance on agile best practices for regulated industries. The literature on agile practices for regulated industries was primarily from the US medical devices industry (Rasmussen *et al.*, 2009; Mc Hugh *et al.*, 2013; Ryan, 2014; Burba, 2015; Fewell, 2015). This highly regulated industry provides formal guidelines to its members on the use of agile practices. At this time, no standards body provides guidance on agile practices in banking, yet it is a highly regulated industry.

3.6 Summary

The AWRM model was beneficial in classifying best practices into domains and dimensions: the what. It does not prescribe the order these best practices should be applied: the how. The literature review provided a wealth of best practices used by software development firms in their agile adoptions. It also highlighted many impediments that firms will experience. However, literature specific to agile adoptions in Canadian banking is lacking.

The AWRM model has been useful up to this point for providing a framework on what practices contribute to an organization's agility. Although the framework was a basis for assessing agility in manufacturing firms, it provided this literature review with a structure for anchoring the findings for agile best practices to industries whose products are software based.

This first stage of the research provided a comprehensive list of best practices and challenges across several industries. The literature synthesis also highlighted literature gaps on such topics as knowledge management, effects of regulation on agile practices and change management practices. Challenges, best practices and strategies used by firms in their agile transformation journey were identified. The documented strategies provided insight into how best to approach, evolve and maintain agile practices.

The aim of this research is to understand which best practices are applicable to Canadian banking. As noted in the literature on regulated environments, not all agile adoption best practices are suited for all industries; a measure of tailoring is to be expected in any industry. Further, a firm's business environment can constrain transformational strategy and practices. The result of the following sections is to move from the general to the specific best practices applicable to Canadian banking in order to address the issues and challenges associated with using agile methodologies for product development in the Canadian banking context.

4. Methodology

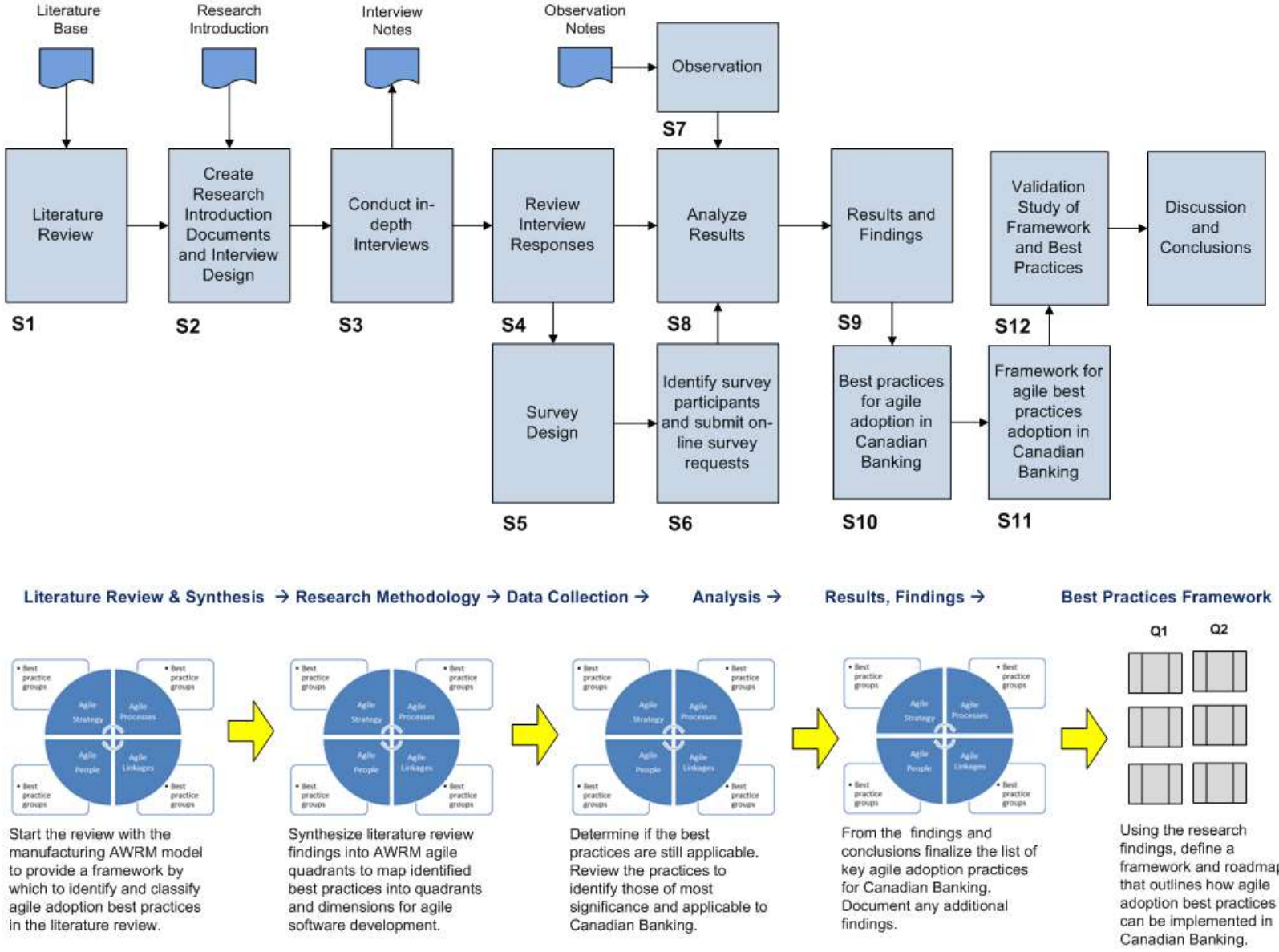
4.1 Introduction

This section explores the research methodology used for data collection, analysis and conclusion. The methodology aims to answer the research question, the aims and objectives and gaps in the literature review. The literature review identified the best practices and challenges in agile adoption by industries involved in software based product development, including a review of best practices used by some firms. The research methodology leverages the literature review findings as a basis for exploratory research on Canadian banking. Whereas the literature reviewed general agile adoption practices across several firms, this research phase is focused on understanding what specific practices are applicable to the Canadian banking environment. Although the data gathered for the research involved participants from four banks, the research can be considered a single case study of agile practices within an industry.

The research process was designed along eleven phases, as illustrated in Figure 4-1;

1. Conduct an extensive literature review - S1.
2. Develop the research methodology.
3. Develop introductory research documentation and the interview design - S2.
4. Conduct semi-structured interviews - S3, S4.
5. Develop survey design – S5.
6. Submit the on-line survey to participants - S6.
7. Analyze and classify the research data from interviews, observations and survey – S6, S7, S8.
8. Synthesize case studies, observations and literature into findings – S9.
9. Finalize a framework of agile adoption best practices and a roadmap for implementation – S10, S11.
10. Conduct a validation study of the framework and best practices – S12
11. Discussion and Conclusions

Figure 4-1 – Phenomenological Exploratory Research Process



Source: Author (2018)

4.2 Methodology Selection and Fit

A pragmatic research philosophy allows the use of the best methods appropriate to the research question whether these be qualitative, quantitative or combined approaches. Pragmatism remains the dominant paradigm in mixed methods research (Brierley, 2017). Although every method has its limitations, the mixed methods approach compensates for weaknesses in both qualitative and quantitative research. Qualitative research has the potential for biased interpretations and it is problematic generalizing the findings for larger groups. Quantitative research is weak in exploring the reason for behaviors; the "why", but is free of the bias and generalization issues faced by qualitative research. Combining both approaches using mixed methods leverages the strengths of one research method while compensating for weaknesses of the other.

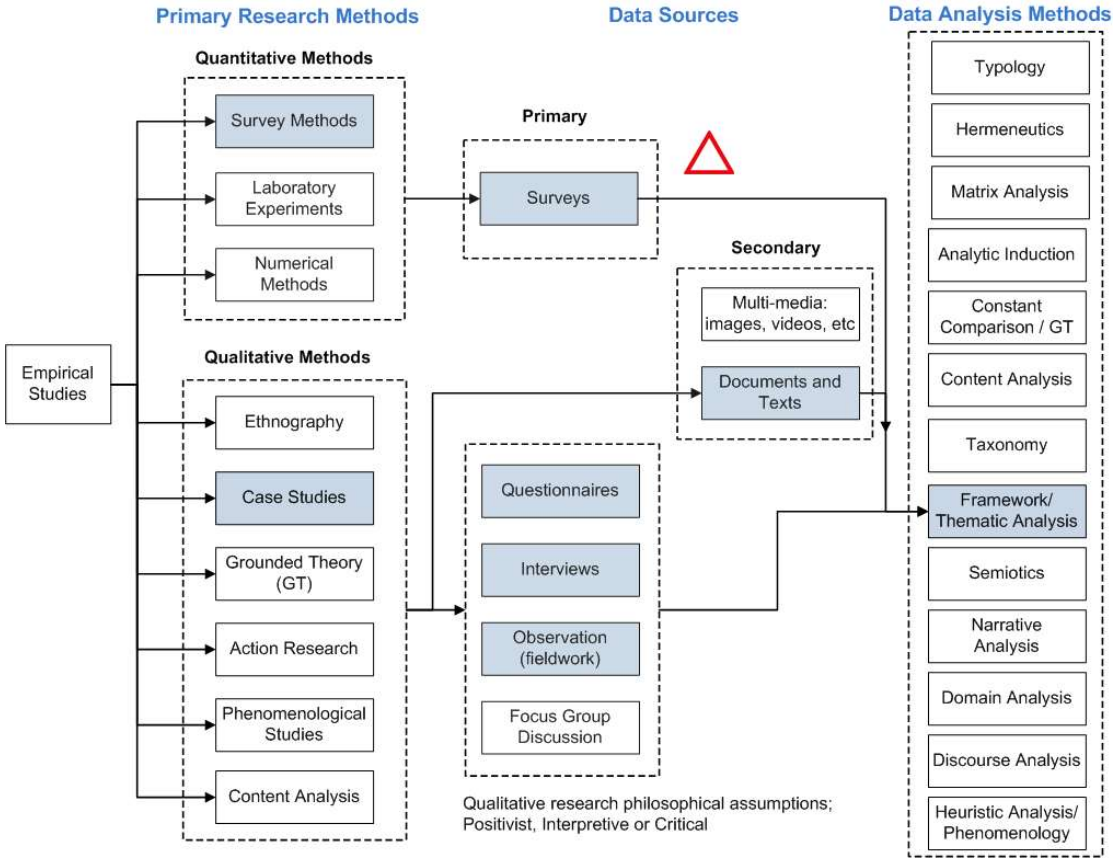
This research design is a qualitative case study of an industry. Qualitative research is used in social science research and seeks to understand a given research problem from the perspectives of the local population (Shoshanna, 2002). Qualitative research involves the use of interviews, documents and participant observation data to understand and explain social phenomena. Qualitative research provides a better understanding of the social and cultural contexts of software development (Mnkandla, 2008). Agile practices adoption involves changes to culture, people and processes and requires understanding social and technical issues that may arise.

Mixed methods, using both qualitative and quantitative strategies, for data gathering and analysis have been previously used by researchers performing similar phenomenological exploratory research. One study (Underdown and Talluri, 2002) used a multi-case study, observation and a survey instrument in their agile transformation research. A case study, in-depth interviews and a survey was used (Ayed, Vanderose and Habra, 2014) by another agile adoption study. Research into Ericsson's agile communities of practice (Paasivaara and Lassenius, 2014) used a longitudinal case study, observation and semi-structured interviews. Another researcher (Mnkandla, 2008) used interviews, a survey, participant observation and e-mail responses in a qualitative study on agile methodology practices; an approach equally suited to this research. A longitudinal case study (Korhonen, 2013) of an adopting agile firm used a qualitative approach encompassing analysis of documentation records and a survey. Other researchers investigating agile adopting firms used similar qualitative research approaches (Misra, Kumar and Kumar, 2009; Gandomani and Nafchi, 2015; Serrador and Pinto, 2015; Stettina and Hörz, 2015).

As with similar studies, this research is qualitative with supplementing survey data for triangulation; a mixed methods approach. The qualitative instruments in this study were in-depth interviews and participant observations. Triangulation is one of the advantages of utilizing mixed methods as it improves the validity of the research by allowing a researcher to view a phenomenon from multiple facets. If the results of both research methods produce similar findings, the research can be more confident of its validity.

Figure 4-2 illustrates various empirical research methods; the shaded areas represent the methods used in this study.

Figure 4-2 – Empirical Study Methods



Sources: Author, (Ratcliff, 2002; Mack *et al.*, 2005; Inayat *et al.*, 2015)

One study (Palinkas *et al.*, 2015) posits that the popularity of mixed methods is precipitated by the realization that the challenges of evidence-based research are sufficiently complex that a single methodological approach is inadequate. Mixed method designs are preferable as they provide a better understanding of research issues than either qualitative or quantitative approaches alone (Palinkas *et al.*, 2015) and were ideally suited for the exploratory nature of this research.

Other researchers used Grounded Theory (GT) approaches for investigating agile practices (Cockburn, 2003; Mnkandla, 2008; Gandomani, Zulzalil, Ghani and Sultan, 2013b; Gandomani and Nafchi, 2015). A study (Gandomani *et al.*, 2015) on the impact of inadequate agile training, stated that GT has its roots in social sciences and is a suitable method for qualitative research to understand people's interactions and behaviors. Gandomani proposed that GT is well suited when there is no clear hypothesis or research problem up front. However, this study had a defined research question, hence, GT was ruled out as an approach in favor of a framework based analytical method.

4.3 Research Instruments

The research relied on, as a foundation, the best practices identified through the literature review. Those best practices specific to Canadian banking were researched through semi-structured in-depth interviews, a survey and participant observation. The subject-completed instrument was a web based survey. The researcher-completed field instruments were: recordings or Interview Notes, written after each interview and Observation Notes written up after each meeting.

4.3.1 Semi-Structured In-Depth Interviews – S2, S3, S4

The semi-structured in-depth interviews elicited feedback from senior staff involved with agile project leadership at four Canadian banks. Seven participants with experience in Canadian banks agreed to participate. The interview participants were bank executives involved in adopting agile practices within their divisions, managers responsible for implementing agile practices and agile coaches who mentored agile teams in financial services. These participants were selected based on their in-depth involvement with agile transformations and their broader view of agile product development.

A research introductory document outlining topics to be discussed was sent to participants by e-mail one week prior to the interview. Informed consent, either oral or written was obtained from participants prior to the interview. The discussion topics focused on organizational strategy, processes, people and linkages as regards agile best practices and challenges experienced by individuals in agile adopting banks. The research participant document addressed the following topics:

1. The purpose of the research.
2. The contribution and significance of the research.
3. The name of the university.

4. The expectations of time commitment from the participant.
5. The interview topics to be discussed.
6. That participation was voluntary and the participant could withdraw from the research at any time.
7. How confidentiality and anonymity of data was represented.
8. Assurances the data would be erased once the research completed.

In-depth interviews allowed for greater spontaneity and adaptation of the interaction between the researcher and the participant (Mack *et al.*, 2005). As well, the relationship between the researcher and participant was less formal than through quantitative instruments. Open ended questions and probing allowed participants to respond in their own words (Mathers, Fox and Hunn, 1998). The researcher gleaned richer information through exploratory questions than through structured questionnaires; it provided an opportunity to ask why and how. The interviews were conducted in person and recorded, with the participant's consent. If the participant declined to be recorded, field notes were taken in lieu. Participants were assured that neither they nor their firms were identified. Field notes and recordings are erased upon research completion.

4.3.2 Interview Question Development

The aim of the interviews were to understand the impediments faced by senior agile project staff and which best practices were applied in their agile transformations. Numerous best practices were identified through the literature review and these practices were the basis for the interview questions.

The time allotted for the interviews was one hour. One participant committed two hours. Numerous best practices were identified and it would be impossible to cover all best practices within an hour (Mathers, Fox and Hunn, 1998). Therefore, the interview was limited to 20 questions. The method used to reduce the key practices from 57 to 20 is discussed in section 4.3.5.6 and Appendix B. The number of questions that could be fully addressed through interviews and surveys is limited by the time allotted.

The interview questions were derived from the 20 key agile practices. This author examined each agile practice when composing open-ended interview questions. Whereas the survey questions are close-ended, the interview questions were open-ended to elicit richer discussion. Open dialogue yields richer data from each participant. Each interview

question can be traced to one of the 20 best practices. Appendix B (Table 32) shows the traceability mapping between the key practices and the interview questions.

To make the best use of time for each interview, participants received the interview questions by e-mail two weeks prior. This allowed the participant to prepare for the discussion and plan their responses accordingly.

4.3.3 Interview Pilot Study

A pilot study was conducted before the main study (Section 4). The pilot assessed the interview instrument for any weaknesses regarding question comprehension, quality of responses and validation of the interview time constraint. The interviews were scheduled at a minimum of two weeks apart to allow for remediation of any issues before the next interview. Based on the data gathered from initial interviews, more emphasis was subsequently placed on some questions. As interviews should yield as much rich data as possible within the time available, the trade-off between richness of data and the interview time constraint were assessed during the pilot.

The interview process used for a pilot study is illustrated in Figure 4-3 and is similar to Deming's cycle for business process improvement: Plan, Do, Check, Act (Deming, 2016). The lessons learned from each pilot interview were applied to other interviews in a process that continuously improved the data quality and time utilization. Lessons learned from the pilot study resulted in changes to the interview design and were completed prior to the main study. Interview and survey questions remained unchanged throughout the main study for consistency.

Figure 4-3 – Interview Planning and Execution

Source: Author (2018)

4.3.4 Interview Sample Size and Sampling Methodology

The sample size for the main study's semi structured interviews was seven participants with a time allocation of one hour each. A study (Wiss, 2008) on the popularity of agile methods in the financial industry also interviewed seven participants. To increase the study's participant sample was challenging due to a small population. Although there are six large Canadian banks, there are few individuals who have actively led agile adoptions as per the author's LinkedIn outreach results. As with Wiss's experience in studying agile in banking, insiders were reluctant to participate in the study.

A book on research methods (Patton, 1990) noted that there are no rules for sample size in qualitative inquiry but the time frame within which the research must be concluded often limits the number of case studies that can be investigated. Patton stated that sample size in qualitative inquiry depends on the purpose of the inquiry and what can be done with available time and resources. Case studies provide useful explanations of past data but are not wholly predictive of future situations. They provide explanations of phenomena derived from interpretive empirical research which could be valuable for other organizations (Walsham, 1995).

This literature review identified 57 best practices. In keeping the interviews time boxed to one hour and address the most important aspects of an agile adoption the research focused on the 20 best practices deemed most critical for successful agile adoptions.

4.3.4.1 Sampling Criteria

Purposeful sampling was used for participant selection. It is a technique widely used in qualitative research for identifying and selecting information-rich cases for making the most effective use of limited resources (Palinkas *et al.*, 2015). This type of sampling involves the selection of participants who are especially knowledgeable with the phenomenon of interest. A purposeful sampling inclusive criterion (criterion-i) strategy was used to narrow variation and focus on similarities across participants (Palinkas *et al.*, 2015). A criterion strategy identifies and selects participants that meet a pre-determined criteria of importance for this research; namely participants with exposure to agile transformations in Canadian banks.

The participants elicited for the interviews were those senior individuals with exposure to agile strategy and practices in banking. For example, an agile coach will have a broader cross-organizational view of the opportunities and challenges of a transformation than would a software developer.

The participants were representative of the challenges experienced by banks as each one faced similar challenges; early stage adoption challenges, small project teams, entrenched traditional cultures in banks with over 100 years of history. The banks were similar in organizational structure, products, services, regulatory environment, faced the same competitive challenges and shared the same external advisory firms for strategy consulting. The researcher assumes that due to homogeneous industry factors, the challenges, opportunities and agile adoption strategies could be similar across banks. Therefore, interviews from seven participants with experience in four banks could be representative of the agile adoption experiences at other large Canadian banks.

Upon completing an interview, the researcher asked the participant if they could refer anyone else who could be interested in participating. This process is known as chain referral sampling (Mack *et al.*, 2005); a type of purposeful sampling and is used to elicit further qualified research participants from the initial participant list. This sampling strategy is also referred to as "snowball" sampling (Palinkas *et al.*, 2015). A larger population sample increases the research reliability and validity. This research methodology can be used with a larger sample size if available.

4.3.5 Survey Design - S5, S6

4.3.5.1 Survey Sample Size and Sampling Methodology

The second source of primary data was a survey. The survey participant recruitment strategy also utilized a purposeful sampling criterion strategy (Mack *et al.*, 2005); the selection criteria being PMs, Scrum Masters, agile coaches and Product Owners who participated in Canadian banking agile projects. Research participants were elicited from bank PMOs, local PMI Chapters, Agile Alliance, Scrum Alliance, local agile groups on Meetup.com and agile practitioners listed on LinkedIn. The aim was to receive completed surveys from at least 23 participants who were experienced in applying agile practices in Canadian banks. Partially completed surveys were rejected.

Similar studies used survey based data collection. One research study (Ismail, 2013) used a 32 question survey with a sample size of 31 participants. Both open and closed questions were used. Participants were given two weeks to complete the survey. Ismail's dissertation did not specify the questionnaire completion time. Another doctoral study (Bauer, 1992) used interviews, questionnaires, documents and observations for data collection. The two page questionnaire used 10 open and closed questions. It took 15 minutes, on average, to complete with a sample size of 388 participants. Interviews, questionnaires and

participant observation were also used in another study (Mnkandla, 2008). The questionnaire consisted of 21 open and closed questions and was expected to take no more than 20 minutes to complete. A study on perceptions of agile software development (De Cesare *et al.*, 2010) consisted solely of a 32 question survey sent to 970 organizations of which 62 responded; a 6% response rate.

It was estimated that the number of participants who actually have Canadian banking agile project management experience are no more than 150 possible candidates. A search conducted on LinkedIn identified approximately 90 potential participants who claimed to have Canadian banking agile experience. Participation from PMI, Agile Alliance and Scrum Alliance members may further increase the sample population to 150. Assuming an optimistic participation rate of 15% and accounting for a small number of incomplete surveys, would yield responses from at most 23 candidates.

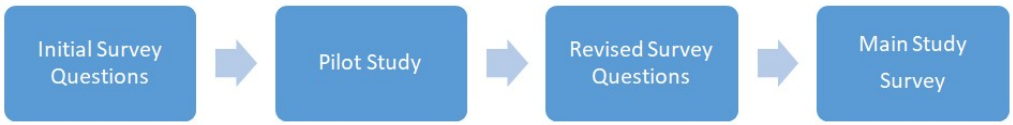
The pool of participants experienced with agile in Canadian banking is small. If this were a study of agile practices in software development, without being industry (Canadian banking) and segment specific (top large banks), the study would have a larger population to draw from. Some Canadian banks were in their nascent agile adoption stage and the population size was therefore small. The author acknowledges the sample size was small for deep statistical analysis but adequate for triangulating the interview data with survey data.

The focus of the survey questions evolved from the AWRM categories of Agile Strategy, Process and People. The survey contained similar questions to the interviews so that data triangulation could be used to strengthen validity. Each interview topic was aligned with one or more survey questions (Appendix B, Table 32). The interview handout is included in Appendix G.

4.3.5.2 Survey Pilot Study

The survey instrument was tested through a pilot study. Pilot studies improve the reliability of the survey instrument by determining whether the questions are understood by the respondent and as intended by the researcher (Shoshanna, 2002). A pilot may highlight ambiguities or referred terms that are unfamiliar to the participant but taken for granted by the researcher. Misra used a similar approach by pre-testing the study questionnaire for ambiguities, readability and ordering of the questions (Misra, Kumar and Kumar, 2009). The survey development process for this study is illustrated in Figure 4-4.

Figure 4-4 – Survey Development



Source: Author (2018)

4.3.5.3 Survey Structure and Analysis

The structure of the survey consisted primarily of closed questions using a five point Likert scale (Allen and Seaman, 2007). Only rudimentary, descriptive statistical analysis was performed on the survey data collected as illustrated in Appendix C. The survey results were tabulated and plotted on a radar chart so that clustered data points, signifying agreement with the question, were evident (Appendix C, Figures 10-1, 10-2).

Those agile practices with positive response scores (A*gree* and *Strongly Agree)* of 60% or greater are considered key practices. Scores lesser than 60% was evaluated individually for significance. For example a score of 55%, could still be considered acceptable depending on the degree of variance. For those exceptions where the Agreement Score (Appendix C) is below 60%, but the researcher has accepted the response as positive, the rationale for acceptance was documented. As the intent of the survey was to provide triangulation data to validate the interview findings, it was expected that low survey scores on a best practice would correlate with low importance expressed in the interview.

Surveys place primary emphasis on ensuring the knowledge gained is representative of the population from which the sample was drawn; it draws out generalizations from the population sampled (Palinkas *et al.*, 2015). As an example; if senior managers identified agile training prior to project participation is a best practice, it would be expected that at least 80% of survey respondents agree that training is important. By contrast, an agreement score of 35% indicates that although this is considered important, only a small percentage of the sample valued the training. This result questions whether firms are actually committed to training their staff or if other factors accounted for the gap.

Chronbach's alpha was used for testing internal consistency of questionnaires based on Likert scales. The test generates values between 1 and 0, although low and negative scores can result for a valid test if reverse Likert scale coding is not accounted for or if the questions address unrelated factors. Generally accepted scores above 0.7 indicate acceptable reliability. A study (Misra, Kumar and Kumar, 2009) on adopting agile

practices used Cronbach's alpha (Moshen Tavakol and Dennick, 2011) to measure survey response reliability. It was also used by other researchers (Bauer, 1992; Syed-Abdullah, Holcombe and Gheorge, 2006; Serrador and Pinto, 2015) for reliability measurement. One study (Mohsen Tavakol and Dennick, 2011) commented that it should be mandatory for researchers to estimate alpha to add validity and accuracy to the interpretation of data.

4.3.5.4 Survey Length

On average a web based survey takes approximately 15 minutes to complete. This correlates to 26 to 30 survey questions (Figure 4-5). The more questions in a survey, the less time the participant focuses on providing quality responses. As participants experience "survey fatigue" they may speed up their responses. This results in a lower quality and reliability of data. Survey abandonment rates increase when surveys take more than 8 minutes (SurveyMonkey, 2011). A full service market research firm recommends that online surveys should take no more than 20 minutes (Hopper, 2012). The 15 minute constraint was a balance between risking that participants would rush through the survey and yet covering a sufficient number of key research questions. The use of a Likert scale allowed a participant to quickly score the responses, thereby allowing for more questions to be covered. The participant could optionally add comments at the end of the survey.

Figure 4-5 – Comparison of Survey Questions and Completion Times

Question Count	Average Seconds Spent Per Question*	Total Survey Completion Times
1	75	1 min 15 sec
2	40	2 min
3-10	30	2 - 5 min
11-15	25	5 -7 min
16-25	21	7 - 9 min
26-30	19	9 - 10 min

** Rounded and grouped for illustrative purposes*

Source: (SurveyMonkey, 2011)

4.3.5.5 Data Collection Constraints

Interviews and surveys are accepted instruments for data collection in research studies. Each one has its strengths and weaknesses. Whereas interviews yield richer data through

probing and asking why, the surveys yield data that allows a researcher to quantitatively analyze a phenomenon under study; e.g. how many.

Constraints common to both instruments is the limited time allotted for data collection and the study's sample size. These constraints imposed limits on a complete analysis of the best practices identified through the literature review. Hence, the data collection efforts focuses on the most critical success factors.

The author acknowledges that given the time allotted for interviews and surveys, it was challenging to collect fulsome data on all best practices. Therefore, the subject interviews addressed 20 questions based on the 20 best practices. The survey consisted of 32 agile practice questions that could be answered using Likert scale type responses. Using a Likert scale facilitates scoring the results quantitatively and reduces the amount of time that a respondent spends on any one question. The survey questions were based on the same 20 key practices used in the interviews. Demographic, optional contact information and two open questions brought the number of total survey questions to 45. It was important that all questions be answered within 15 minutes before survey abandonment took a toll on completion rates.

4.3.5.6 20 Best Practices Selection

To identify 20 key practices for this study, the 57 best practices were first moved into an Excel spreadsheet. This author scored each practice by importance on a scale of 1 to 10; 10 being the most important. The same spreadsheet was provided (without the author's scores) to three agile practitioners to perform the same scoring exercise (refer to Appendix B). The independent scoring by the three practitioners was to reduce the researcher bias as regards key practice selection and assess how well this author's selections correlated with that of other experienced practitioners.

The three participants were; a well-known agile author and consultant to Canadian banks, a VP of Agile Enablement at one of the six large Canadian banks and an agile coach who was responsible for the agile transformation at a large software firm. These participants were selected because of their agile transformation experience in large firms.

All four score results were collected, averages computed, and the best practices list was sorted by highest score. Feedback from the three practitioners indicated there were duplicate practices and some practices could be merged with others. Subsequently, the best practices list was reduced to 54. A further prioritization sort yielded 20 best practices for interview and survey questionnaire development. A sample of the sorted list of the

top practices is in Appendix B. The 20 key practices were mapped into the AWRM dimensions in Figure 4-6 to illustrate the key practice coverage among the four dimensions. The scores identified People, Strategy and Processes as the dominant quadrants.

Figure 4-6 – Top 20 Practices Mapped to AWRM

1. Agile Strategy	2. Agile Processes
OP1, OP2, OP4, OP7, OP11, OP25, OP28, TP23	OP14, OP15, OP16, TP4, TP7
4. Agile People	**3. Agile Linkages**
OP10, OP13, OP18, TP14, TP15, TP20	TP2

Source: Author (2018)

4.3.6 Observation - S7

The observations consisted of notes taken from TD Bank internal in-person project daily standup meetings, retrospective meetings, coaching meetings, one on one discussions with agile coaches and from attending meetings of two public agile special interest groups in the Toronto city area. This aspect of the research provided additional context into successful practices and impediments that agile adopting banks experience.

The observations were non-participative; the researcher did not influence the meetings. Observation notes were written immediately after each meeting. As stated, the aim of the non-participative observation was to hear the challenges experienced by agile practitioners. The observation data supports the interviews and survey.

4.3.7 Mixed Methods

The research used a mixed methods approach; qualitative methods in tandem with survey data. Qualitative research complemented by quantitative methods helps to interpret and understand complex situations. Complex study environments involving human behaviors

and attitudes benefit most when a variety of data collection methods are employed (NSF, 1997).

Case study research (Yin, 2009) mentions that multiple sources of evidence in case studies allows an investigation to address a broader range of issues but the most important advantage is the development of converging lines of inquiry; a process of corroboration and triangulation. Yin states that a case study conclusion is more convincing and accurate if based on multiple sources of information. Yin refers to the use of data from multiple sources as *data triangulation*. Multiple sources of data also addresses the problem of *construct validity* because each data source essentially measures the same phenomenon.

Using survey data to supplement qualitative data is an accepted method for improving data analysis through triangulation. Triangulation was cited as one of the biggest benefits of mixed methods (NSF, 1997). By using different sources of data and analysis methods, a researcher can maximize the strength and minimize the weakness of each method employed. Mixed methods research supports data triangulation which strengthens validly and increases the utility of the research (The Open University, 2014). If data obtained through various methods point to the same conclusions, the research can be more confident of its quality (Taylor-Powell and Renner, 2003).

The data gathering sequence for the pilot and main study was for in-depth interviews to be conducted first followed by an internet based survey. For the pilot study, this allowed survey question adjustments if any issues were found with the interview questions. This linear approach allowed for any corrections to be made to methodology before proceeding further and is an approach recommended for mixed methods research (NSF, 1997).

4.4 Data Analysis - S8

Qualitative data analysis consists of reducing, classifying and making sense of vast amounts of information from various sources to validate research questions. Descriptive information from the primary data sources are interpreted to provide an explanation of a phenomenon. Two approaches can be selected for qualitative data analysis. One commonly used method is an exploratory approach whereby the data is reviewed and coded. This method interprets the data to evolve new study themes. Developing themes is a feature of qualitative analysis. The researcher analyzes the data for patterns that explain the phenomena under investigation. This method is also known as thematic analysis (The Open University, 2014).

The second approach is to examine the data through the lens of a pre-defined framework that reflects the interests of the research. This method is referred to as Framework Analysis and lies within the family of thematic analysis, or qualitative content analysis methods (Gale *et al.*, 2013). Thematic analysis groups data into themes that were directly evolved from the research question and were established before data collection began (Pell Institute, 2017). In this study, the research question was formalized on completion of the literature synthesis and prior to any data gathering.

4.4.1 Framework Analysis

The Framework Method was developed in the late 1980s (Gale *et al.*, 2013). The distinguishing feature of this method is the use of a matrix for classifying summarized data into coding cells. This structure allows a researcher to systematically reduce the data to analyze it by case, whereby a case may be an individual or organization under study (Gale *et al.*, 2013).

Framework Analysis has been used for case and multi-case thematic analysis of data (NatCen, 2012). Given the amount of data gathered through observation, surveys and questionnaires during this research, this approach provided a highly systematic method of organizing and categorizing the research data. It is a proven approach for data analysis and produces highly structured outputs of summarized data. The method is sufficiently flexible to include not only interview transcripts but also observation notes into the matrix (Gale *et al.*, 2013).

4.4.2 Framework Analysis Suitability

The Framework Method is suited to this study as AWRM already provides a readily available reference framework for classifying data according to four best practice groups. The AWRM framework was used to identify agile best practices groups for the literature review and the same classification was used for data collection and analysis.

In qualitative research, data is categorized using either preset or emergent categories. Preset categories consist of themes that are pre-established in advance of data elicitation. The themes are identified even before data is categorized. Data is then searched to match the themes. By contrast, emergent categories evolve as the researcher explores the data as in grounded theory methods. Categories evolve when analyzing the data (Taylor-Powell and Renner, 2003) and there are no pre-conceived categories.

In deductive studies coding is facilitated when the study has specific pre-defined areas of interest already mapped out, as with this study, and eases the subsequent indexing of research data. The collected data from interviews, survey and observations are charted into an Excel table by corresponding AWRM dimension.

In this study, preset dimensions from the AWRM framework formed the basis of the Fundamental Analysis approach. The themes were defined by the best practice groups of Strategy, Processes, People and Linkages. The survey data, supporting triangulation, was based on 20 key practices.

Appendix E illustrates how using an Excel spreadsheet matrix for coding and classification, can be applied to this study using the Framework Method approach. The analysis spreadsheet consists of four tabs for classifying data related to a dimension. In the sample in Appendix E the data column is within the "Agile People" tab. This sample represents the worksheet containing the analysis from interviews, observations and surveys for the key six people practices.

The framework method is illustrated using the Agile People best practices OP10 sample in Appendix H. The top row contains a description of the best practice. The rows following contain the feedback from interview participants, surveys and any relevant observations documented.

There were cases where there is no observation data for a best practice. These cases are denoted by "NA" in the Observation cell. Where an applicable observation was documented, the date and meeting name of the observation was included. To ensure confidentiality, the bank's name and/or individual name is left out.

Interpretation is the final step of the data analysis. The Interpretation section is the researcher's interpretation of the collected evidence as to whether the best practice identified through the literature review and data collection phases applies to the Canadian banking context.

4.4.3 Framework Analysis Implementation

The Framework Analysis for this study was executed through a six step approach similar to Gale's seven step process (Gale *et al.*, 2013).

1. Transcription - transcription of interviews, observations and survey responses.
2. Data familiarization - review interview, survey and observation data.

3. Coding - review the data and use coding based on AWRM framework and best practices.
4. Apply the analytical framework using AWRM classifications.
5. Chart the data into the framework matrix.
6. Interpret the data.

CDC also describes a similar four step process in their guideline for analyzing qualitative data (CDC, 2009), consisting of: Review, Organization, Coding and Interpretation of data.

Recorded interviews were transcribed verbatim into text notes. Recorded interviews were reviewed twice for accuracy of transcription. To ensure accuracy of the interview transcriptions, a copy was provided to the interview participant to ensure what was discussed was accurately documented. The participant was asked to review the accuracy of the transcription. Any omissions were applied to the transcription thereafter.

Observations were transcribed into Observation Notes immediately after each meeting to ensure discussion topics are captured at the time. Observation notes were not validated for accuracy by a third party as these were taken in anonymity, were held in large meeting groups and reaching out to meeting participants was impractical. The researcher made best efforts to capture the themes of the observations accurately and without bias.

Survey results included in the research were applied directly from the web based surveys. These were quantifiable survey results and not influenced by researcher bias. Analysis of the collected data determined if there was a positive correlation between the best practices identified through primary data gathering and those identified through the literature review. The result was a framework of best practices that could be important for Canadian banks considering adopting agile practices.

4.4.4 Methods Triangulation

Triangulation improves validation of research data by verification from two or more sources. Using various data collection methods can improve the understanding of a phenomenon. In this study data was collected through interviews, a survey and observations. This approach is known as methods triangulation as it validates the consistency of findings through the use of different data collection methods (RWJF, 2008).

As an example, the literature review indicated that agile training should be provided to each agile project team member as a best practice. If the interview findings from seven participants and agreement from the survey participants indicates training is a best practice and should be provided to all team members, then there is corroboration that comprehensive training is a best practice. A positive correlation resulting from two instruments strongly suggests training for agile teams is a best practice in agile adoptions.

4.5 Results, Findings and Agile Best Practices Framework - S9, S10, S11

The results of the analysis was a list best practices from the literature review that the research identified as being applicable to Canadian banking. These best practices were drawn along a suggested implementation timeline that specifies the order in which the best practices should be applied. The identified best practices and implementation phases provides a foundational approach which Canadian banks can use as a transformational roadmap.

4.6 Validation Study - S12

A validation study of the agile adoption framework and best practices derived from S10 and S11 is conducted with banking executives who have agile transformation experience. The purpose of the validation study is to understand, from an practitioner perspective, if the proposed agile transformational framework provides relevant guidance for a Canadian bank planning an agile transformation.

4.7 Conducting a Pilot Study

A pilot study was conducted prior to the main study to assess the research design and instruments. A pilot study is a small scale trial run conducted before a larger study and provides an assessment of methodology fit and an early warning of instrument weaknesses in the proposed study. A pilot study assesses a number of factors prior to conducting a main study (Polit-O'Hara and Beck Tatano, 2006). The pilot study evaluated the effectiveness of interview and survey instruments, data collection and analysis. The pilot for this research assessed the effectiveness of methodology phases S2 through S9. A pilot study assesses the following factors:

1. Adequacy of the research plan.
2. The participants understand the purpose of the study.
3. Research instrument instructions provided to the participants are comprehensible.
4. Wording of the survey.
5. Time taken to conduct the interviews and survey.

6. Interview and survey questions are comprehensible.
7. Adequacy of resources for the research (time, people, instruments).
8. Data collection and analytical methods are a fit for the research.
9. Data entry, coding and appropriateness of statistical methods.

A sample size of 10% to 20% of the main study population should be reasonable for conducting a pilot (Baker L., 1999). The interview pilot was conducted with three participants from the main study population. For the survey, a sample of six participants with Canadian banking agile experience as agile coaches, Scrum Masters or Project Managers was selected through purposeful sampling.

Pilot study data can be included into a main study. If changes are required to the research instruments, the collected data may be flawed or inaccurate and thus not suited for inclusion in the main study. However, whereupon the pilot study determines that the instruments and methods are accurate then the collected data is valuable for the main study (Van Teijlingen and Hundley, 2001). Contamination of data from pilot studies to main studies is less of a concern in qualitative research where researchers frequently use some or all of their pilot data as part of the main study. In such cases, it may not be possible to exclude the pilot study participants as in doing so would result in too small a sample for the main study (Van Teijlingen and Hundley, 2001).

4.7.1 Pilot Report

A report should be produced upon completion of a pilot study (Hassan, Schattner and Mazza, 2006). The report addresses the following areas:

1. Feasibility of study protocol
2. Recruitment
3. Testing the Research Instruments
4. Data Collection and Analysis
5. Results
6. Pilot Study Summary

One study proposes (Van Teijlingen and Hundley, 2001) that researchers have an ethical obligation to report issues arising from all parts of a study, including the pilot phase. Specifically, to report in more detail the improvements made to the study design and the research process. Conducting a pilot study does not guarantee success of the main study

but does increase its likelihood (Van Teijlingen and Hundley, 2001). Instrument adjustments identified through the pilot study were implemented into the main study.

4.8 Summary

This section outlined the research methodology which was based on qualitative methods with a survey component used for data triangulation as described. The benefits of triangulation for improving the quality of case based research are well documented (NSF, 1997; Taylor-Powell and Renner, 2003; RWJF, 2008; Yin, 2009; The Open University, 2014).

The data gathering methods for both qualitative and survey methods were described in this section along with their constraints. The data analysis is thematic based and used a Framework Analysis method for research data coding and charting. Analysis and charting of large amounts of textual data is possible by using a matrix based approach to provide a condensed data view (Gale *et al.*, 2013). The AWRM framework greatly facilitates data coding as it provides a readily available framework for best practices classification. The next section discusses the results of the pilot study performed in preparation for the main study.

5. Pilot Study

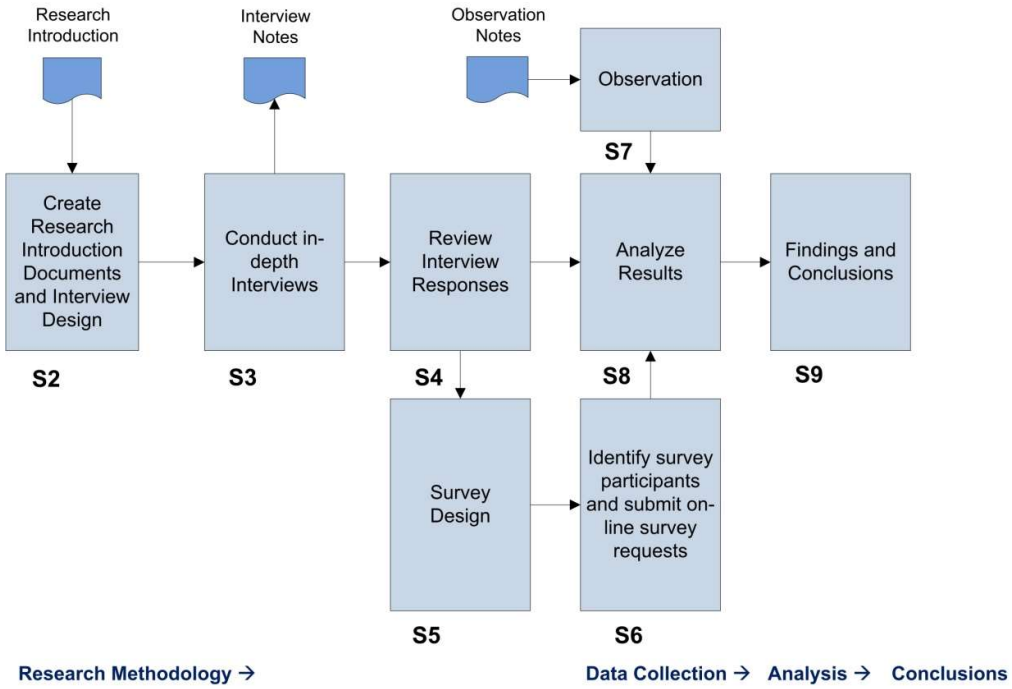
This section discusses the results of the pilot study conducted as a pre-requisite to developing the main study. The aim of this study was to test the methods and instruments to be used by the main study. The author's challenges with the pilot study are discussed herein. Researchers have an ethical and scientific obligation to attempt reporting the results of pilot studies (Van Teijlingen and Hundley, 2001; Thabane *et al.*, 2010).

5.1 Feasibility of Study Protocol

The study protocol was based on the proposed research methodology and encompasses stages S2 through S9 as previously discussed (Figure 5-1). The scope of the pilot study was to refine the research introductory documents, finalize the interview questions, ensure the participant's comprehension of the survey, observe survey completion time and assess the applicability of the framework methodology for data analysis.

One on one interviews and an online survey collected data on the identified 20 best practices for agile adoption in banking. An analytical framework was subsequently applied to collect the qualitative and survey data for analysis.

Figure 5-1 – Pilot Study Protocol



Source: Author (2018)

The protocol followed indicated that the majority of agile adoption best practices used by software development firms were also used by the regulated banking environment. Some best practices required tailoring to adapt to a bank's organizational constraints whereas others were not a fit.

5.2 Recruitment

Participants for the one on one interviews were 3 individuals from the pool of 7 who had already agreed to participate on the interview portion of the research. Survey participation for the pilot was elicited from the local "Agile TO Meetup Group" whose members are agile coaches, project managers and members of agile teams from various Canadian organizations. Permission to speak about the research was first sought from the group chairman. The research project was introduced at a group meeting on January 2018 with a request for participants.

All interviews were conducted in person and were recorded. Recruiting interview participants was accomplished through a combination of social networking on LinkedIn and leveraging prior relationships with agile professionals in Canadian banking.

5.3 Testing the Research Instruments

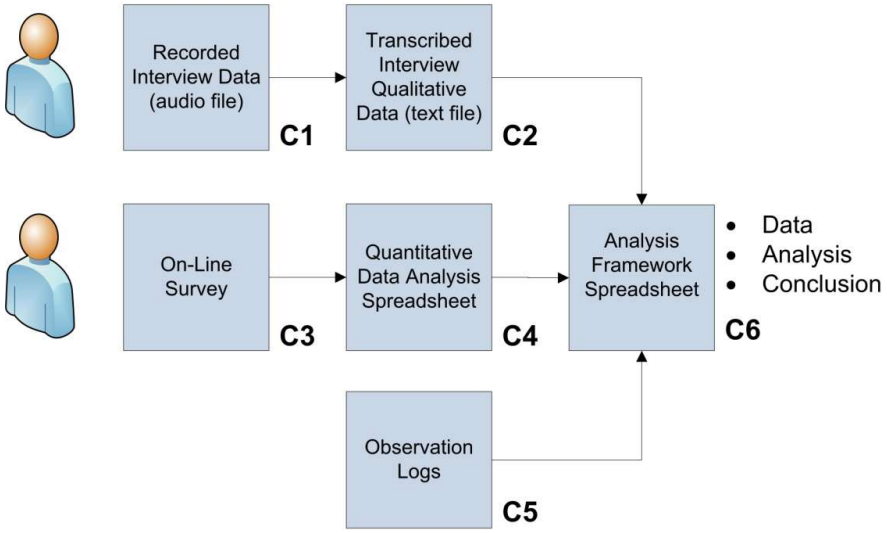
The measurement instruments were one on one interviews and a web based survey. The data collected by the pilot phase would be pooled with the main study data.

A research introduction document was created as a way of describing the aim of the research, the confidentiality, privacy discussion and contact information. Three variations of the document were created. Two for interview and survey participants (Appendix F) and one general version for those requiring background on the research before committing to participate in the interview or survey.

As indicated in the methodology section, the qualitative data was gathered prior to the survey data as a best practice (Thabane *et al.*, 2010). Common issues mentioned by interview participants were added into the revised survey questions. Interview participants were excluded from filling out the survey. Likewise, survey participants were not interviewed.

Figure 5-2 illustrates the process for data capture through interviews (C1, C2), survey (C3, C4), observation logs from meetings attended (C5). Finally, all findings are combined into the spreadsheet based analytical framework where analysis was performed and a conclusion on the best practice was derived (C6).

Figure 5-2 – Pilot Study Process



Source: Author (2018)

5.3.1 Interviews - C1, C2

Three interviews were conducted. The first interview was used to understand if the questions were understood and to measure the adequacy of the 60 minute period allocated for interviews. There are 22 questions that are covered in the interview; 20 can be directly traced to the best practices and two are open questions unrelated to any best practice. Before each interview a research introduction document and a list of interview questions (Appendix G) was e-mailed to the participant. This allowed the participant to be prepared for the discussion.

The experience form the first interview was that 60 minutes was inadequate to cover the questions. A realistic time frame was 90 minutes with most interviews concluding within that time. Any interviews longer than 90 minutes were mentally draining for both the researcher and participant. One interview lasted 110 minutes. The interview and research introductory documents were subsequently modified to specify that a time commitment of 90 minutes was required for participation. The researcher's conversational and meeting facilitation skills influence the interview duration.

Recording the interviews became a necessity. It was distracting to carry on a conversation and taking notes while keeping the interview within the time allotted. Note taking impeded the flow of the interview discussion and was stopped. Permission to record the interview was subsequently obtained from each participant. Using a cellular phone for recording the conversation was an unobtrusive and familiar device. The conclusion from

the first interview was that the questions were well understood and there was no need for change. Subsequent interviews were scheduled with two other participants.

Although the interviews were semi-structured insofar as the questions were sent in advance, the exploratory nature of the conversation often surfaced topics not previously considered. One common theme was the lack of buy-in from business partners during agile adoptions. Business partners seemed disinterested and skeptical of agile principles.

The interview recordings were then transcribed onto an interview form so that the responses clearly aligned with the questions. It took approximately 3 hours to transcribe each 1.5 hour interview. The transcribed notes were then copied into the analytical framework. Interviews participants were identified as PA, PB and PC. For each interview, it took one hour to add the interview notes into the analytical framework cells. In summary, each interview consumed 5.5 hours.

5.3.2 Survey - C3, C4

The survey was first conducted with a paper based form with one participant in person. This survey took approximately 30 minutes to complete. The participant noted that it actually took 20 minutes to complete the multiple choice questions and an additional 10 minutes to respond to the optional questions. Several issues with the survey were pointed out by this participant; notably that some questions were redundant and there was no way to opt out of a question. The questions themselves were well understood and no changes were needed. The aim of meeting a 20 minute survey response time was also met. Overall the paper based survey was useful for surfacing issues before moving the survey on-line. However, this participant's feedback no longer mapped fully into the new internet survey format and was not used as data.

The interview feedback indicated that business partner buy-in into agile practices was weak. Two survey questions were therefore added to assess the business partner participation and buy-in into agile practices. The survey questions were added to gather more feedback into this facet of agile adoption.

The survey questions were meant to provide further information on the best practices covered in the interview. The survey consisted of 8 demographic questions, 31 Likert scale type questions, 3 open questions and 3 process type questions for a total of 45 questions. The survey evolved through several iterations before it was available on-line to participants in January 2018.

The internet survey was created using the Survey Monkey service. The online survey allowed for a national population reach and could be completed at any time as long as the survey was open for responses. The survey link was sent to the Agile TO's group blog with a request for participants. After two weeks a final reminder was sent to the group to complete the survey.

There were 14 responses to the survey request. Four were unusable as the participants simply reviewed the survey questions without completing it. Four respondents did not qualify as they indicated no Canadian banking experience. The first survey question asked if they had experience in Canadian banking with agile practices, if they responded "NO", then the survey terminated.

The remaining 6 participants completed the survey and some even provided responses to the open questions. The survey originally displayed one question at a time to the participant. The initial survey response times were 20 minutes as measured by Survey Monkey. One participant suggested the survey format be changed to provide all the questions in one screen as this would be quicker to complete and would allow the participant to see all questions at once. This change improved the average survey completion time from 20 minutes to 8 by reducing the number user clicks and pages displayed. Subsequently the research introductory document was updated to indicate that 10 minutes would be needed to complete the survey.

5.3.3 Observation Logs - C5

Observations from three meetings attended were used for the framework analysis to supplement the interview and survey data. Notes from these meetings were noted into a log sheet for each meeting attended. Participant and firm names were excluded for confidentiality wherever possible. Using the Observation data provided additional context and was helpful for best practice analysis. The Observation data was also used in the main study.

5.3.4 Analytical Framework - C6

The spreadsheet based framework was expanded during the pilot study. It was difficult to analyze the survey responses without having the survey question in the spreadsheet. Some best practices had three survey questions as well as free form comments. This author assumed that few respondents would provide free form responses, yet, some respondents provided lengthy text responses which was valuable for supplementing the qualitative

data. This author also found it useful to add in the spreadsheet the per-cent agreement score and sample variance to provide additional context to the survey responses.

The framework's original Analysis cell was divided into two cells; Analysis and Conclusion. The original Analysis cell discussed the results of the interview, survey data and conclusion. A Conclusion cell was added following the Analysis so the researcher could easily delineate the results and analysis, thereby improving the readability of the framework.

As a result of the pilot, the analytical framework was updated to be more readable, enabling the author to assess the fulsome data for analysis. The framework spreadsheet provides full traceability from each best practice, to the interview data, survey question, survey scores, analysis and conclusion. Appendix H illustrates the final format for the improved framework and shows the actual pilot data and analysis derived for the AWRM Agile People Dimension.

5.4 Data Collection and Analysis

Data entry consisted of taking the interview and survey results and mapping them into the analytical framework spreadsheet cells. The interview feedback for each best practice was added into the cell associated with the participant. The three interview participants were identified as PA, PB and PC. The survey participants were identified as R1 through R6. The survey scores were added to the analytical framework for each best practice along with the participant's free-form feedback.

The survey results for each question were added to a scoring spreadsheet (Appendix C) which calculated average score, sample and population variances. The +/- sample variance was calculated and plotted on a radar chart to show the response variance on each question. Scores with low sample variance (< 0.6) indicate a close cohesion of agreement or disagreement by participants, providing a higher level of response validity. Scores with higher variance (>= 0.6) indicate a wider dispersion of results between agreement and disagreement for any one question.

5.4.1 Reliability Analysis

One study (Moshen Tavakol and Dennick, 2011) proposed that a research instrument, such as a questionnaire, should be reliable insofar as it should produce the same results consistently. The researchers indicated that Cronbach's alpha is the most widely used objective measure of reliability. Alpha provides a measure of internal consistency of a

Likert scale and is expressed as a value between 0 and 1. If items in the questionnaire are related to each other and the sample size is adequate, the value of alpha increases, signifying high test reliability.

For this pilot the calculated alpha was 0.93, indicating a high level of internal consistency (Appendix C). This indicates that the questions have a high level of inter-relatedness. An alpha score of 0.93 indicates a 0.14 random error component in the scores (0.93 X 0.93 = 0.865; 1 - 0.865 = 0.135), which is low.

5.5 Results

The aim of the pilot was to test the methodology and research instruments. Due to the small population sample, the pilot analysis and conclusion was not meant to be a representation of the wider population. The analysis section of the framework spreadsheet contains the researcher's summary of the findings from interviews and the survey. From the study data, the researcher produced an analysis and brief conclusion, stating the applicability of the best practice to banking.

5.6 Pilot Study Summary

The pilot study identified gaps in the research instruments and highlighted the benefits of using a pilot study prior to a main study. Unforeseen issues surfaced from the interviews and resulted in new survey questions. Feedback from one participant improved the survey presentation and reduced average completion time by 12 minutes. The pilot also identified the need for several introductory document versions to communicate the aims of the research to different audiences.

In conclusion, the pilot successfully evaluated the feasibility of the study protocol to identify the applicability of the 20 best practices. The pilot study successfully demonstrated the feasibility of the research methodology and the application of a framework analysis for identifying agile adoption best practices in Canadian banking.

6. Main Study Data Collection and Analysis

This section describes the main study data collection, analysis and methodology adapted from the pilot study. The survey and interview based data collection steps taken are explained and how data from each method was combined to provide a basis for results and conclusions.

6.1 Data Collection

The main study's data collection concluded with 7 interviews and 46 survey responses. Of the 46 survey responses, some respondents indicated they had no Canadian banking experience, others left incomplete surveys and only 27 survey responses qualified for the study.

Survey and interview participants indicated that they had agile working experience in the following seven Canadian Banks:

1. Bank of Nova Scotia (BNS)
2. Toronto Dominion Bank (TD)
3. Royal Bank of Canada (RBC)
4. Commercial Imperial Bank of Canada (CIBC)
5. Bank of Montreal (BMO)
6. Caisse de Depot Desjardins
7. National Bank of Canada (NBC)

Six of these banks are classified as D-SIBs; the largest of Canadian banks.

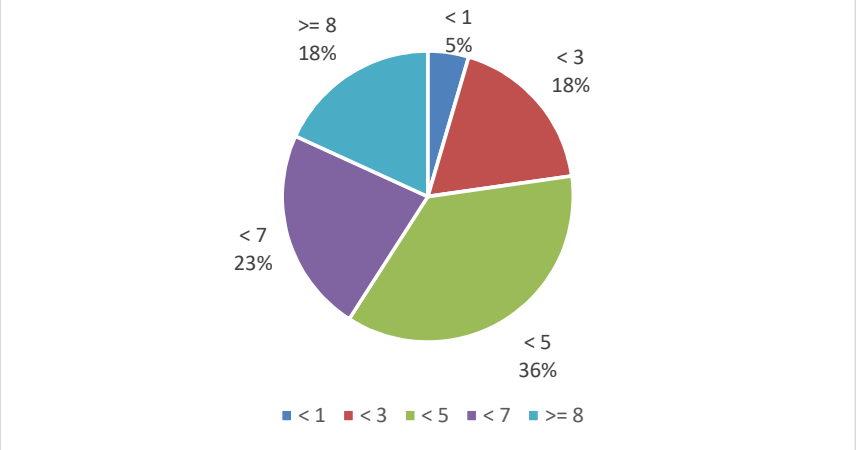
6.1.1 Survey

The on-line survey was created in December 2017 and responses were elicited from participants between January and May 2018. The survey was created with the Survey Monkey service where it was accessible to any participant with internet access. Survey participation was requested from all Canadian PMI Chapters, Scrum Alliance, Agile Alliance, AgileTO Meetup Group, from five agile practitioners at TD Bank and from over 40 personal appeals to agile practitioners on LinkedIn.

The researcher had assumed a best outcome of 23 responses, based on an approximate population size of 150 candidates. The number of survey responses were close to the original estimate with 27 completed surveys out of 46 submissions.

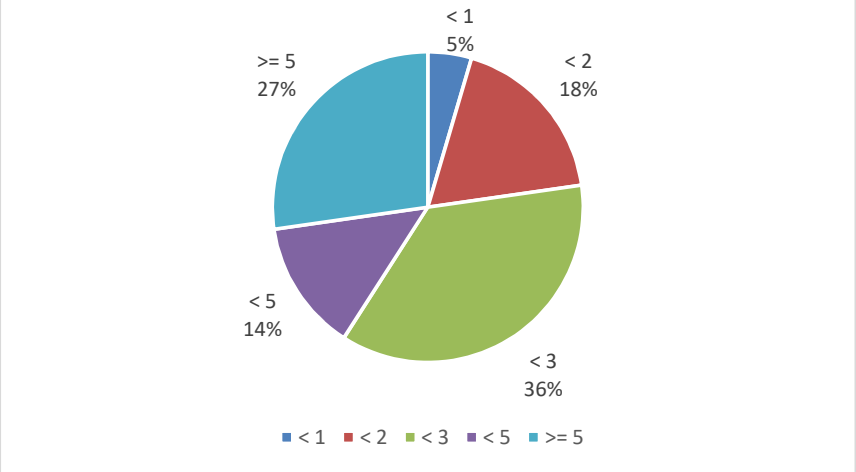
Survey participants indicated they had experience working in Canadian banks. Twenty two participants provided demographic information. Participants indicated that 59% had fewer than 5 years of work experience in Canadian banks (Figure 6-1). Likewise 59% of respondents indicated they had less than 5 years of agile experience (Figure 6-2). As regards certifications, the most popular certifications held were; PMI's PMP (31%) and the agile Certified Scrum Master (CSM) certification (34%) (Figure 6-3).

Figure 6-1 - Q4: Participant Years of Work in Canadian Banking



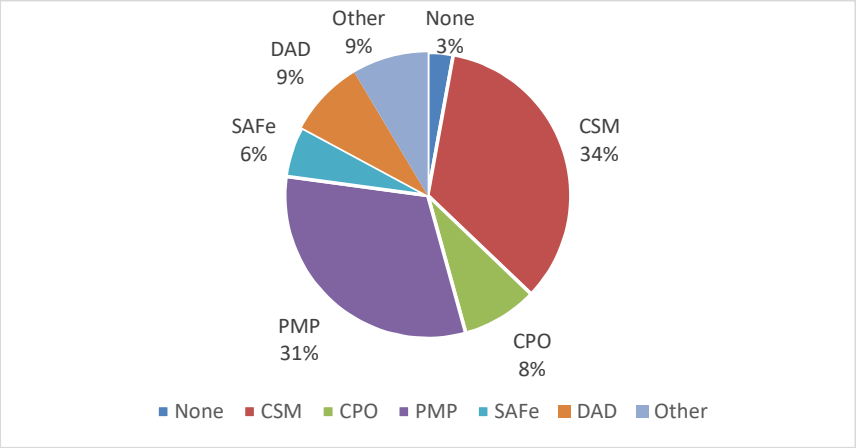
Source: Author (2018)

Figure 6-2 - Q2: Participant Years of Agile Experience



Source: Author (2018)

Figure 6-3 - Q3: Participant Project Certifications Held



Source: Author (2018)

The survey questions relating to the best practices (Q9 through Q39) were based on a 5 point Likert scale. Survey questions Q41 through Q43 were optional free form text.

Similar to the pilot study, the main study's Cronbach's Alpha was calculated at 0.9, indicating a high level of internal consistency for the expanded survey. However, the author cautions that Alpha results may have large standard errors when used with small samples (Yurdugül, 2008) as in this study.

6.1.2 Interviews

The one on one interviews proved to be challenging in getting participants to speak about their agile experience. Wiss's comments regarding challenges in getting participants for his own study of agile practices in Swiss banks were prophetic.

"It has proven to be a challenge to find interview partners from the finance industry who were willing to speak about their experiences with agile methods". (Wiss, 2008, p. 63)

The same challenges were experienced by this researcher in recruiting interview participants. One Canadian bank CIO replied *"Not sure I really want to participate in this as I don't want information becoming public".* As well, two of the original seven interview candidates who agreed to participate on the research declined when it came to the interview. By eliciting participants at an agile conference and through LinkedIn appeals, three more participants came forward for a total of seven interview participants.

Of the seven participants who took part in the study, four held VP titles, one was an agile coach, two were Senior Project Managers with agile experience working for a large

Canadian publically held consulting firm. All participants had experience with agile in Canadian banking. Three of the four VPs interviewed were responsible for initiating agile practices within their banks. As with the pilot, each interview lasted approximately 90 minutes.

Although the interviews were semi-structured, all followed the same baseline questions (Appendix G). The degree of discussion on any one question varied from interview to interview. Participants had different experiences and challenges with their own agile adoption. Whereas one participant had few comments on a question, another participant would have extensive commentary on the same question. This provided a varied dataset to review for common patterns.

The interviews were recorded and then transcribed verbatim into a transcription sheet with the responses tagged to each question. The recordings were often played back two to three times to capture the conversation correctly into text. The transcription was then provided to the survey participant to ensure accuracy of the conversation. In two cases, minor corrections were received from participants.

The contents of the transcription were then moved into the analysis framework. The analysis framework contained all interview responses for each question along with supporting free-form survey responses. As with the pilot, the fulsome interview process consumed approximately 6 hours per participant.

6.2 Interpretation and Bias

In this main study the researcher attempted to accurately interpret the data and remove personal bias from the results. All completed survey results have been included with the exception of those incomplete surveys. Survey data was presented as is. Scores were derived by examining individual question responses, calculating an average score and sample variance. This supplemented the qualitative data, allowing the researcher to conduct an analysis using both data sources.

Qualitative data analysis involves the researcher engaging with participants through conversation and texts of their ideas to discover themes and issues related to the research subject. Two potential problems arise due to the complexity of the phenomena under study; the possibility of misinterpreting the ideas of participants and that misinterpretation becomes misrepresentation, thus deriving conclusions on false grounds (Epigeum, 2012).

To minimize interview misinterpretation, the recorded interviews were transcribed verbatim into a document. The document was e-mailed to the interview participant to review and inform the researcher should there be any discrepancy between what was discussed in the interview and what was documented in the text. The participant's text notes was then moved into to the analysis framework spreadsheet.

For each best practice column, the survey scores, participant interview and survey content was included so that when analyzing the data, all responses were available to the researcher in one objectively presented document.

When interpreting a participant's ideas and issues there is opportunity for misinterpretation due to bias. Studies suggest that the most significant sources of error in research are misinterpretation and over-interpretation of data (Epigeum, 2012). The steps taken in this research attempts to eliminate bias trough a participant feedback mechanism, using an analytical framework to lay out the findings in a logical manner that facilitates objective analysis and the researcher's own awareness that bias can skew the research conclusions.

7. Results, and Findings

This section discusses the results from the data analysis using the framework method which incorporated the interview, survey and observation data.

7.1 Results

The analysis section of the framework spreadsheet combines the researcher's summary of the findings from the interviews and survey. From the analysis, the researcher produced a brief conclusion, stating the applicability of the best practice to banking. This section lists the best practice, analysis and conclusion extracted from the pilot study's framework for each best practice. The framework analysis spreadsheet containing the interviews responses is lengthy and only three fields were used for brevity. The framework used for deriving the analysis and conclusions for one of the AWRM dimensions is shown in Appendix H.

7.2 Analysis

This section analyzes the data for each best practice using both the interview and survey responses and provides a conclusion. The grayed areas in the table indicates the best practice text, the non-shaded areas contain the analysis and the conclusion. Similar to the literature review, the best practices are grouped into the four AWRM dimensions.

7.2.1 Notation

The notation used below used:

- Survey respondents are identified as R*n* whereby *n* is the respondent ID. For example R17 denotes respondent 17.
- The seven interview participants are identified as PA, PB, PC, PD, PE, PF and PG.

7.2.2 AWRM Strategy

Table 5 – OP1

Text: Obtain executive commitment and support for making the change from established practices to agile. Agile adoption is an impactful culture change for agile adoption and executive support is necessary to navigate through political challenges that will ensue.
Analysis: As with other industries, executive level support is important to drive an agile transformation. Evidence from the survey and interviews suggest that executive commitment to the agile adoption in banking is present. 63% of survey respondents indicated that executive commitment to agile adoption was evident with 4 times more agreement scores than disagreement. On the question if executives communicated a compelling argument for agile practices adoption, 54% agreed, with 3 times more agreement than disagreement scores. This may indicate that the executive level communication could have been more effective. PC commented that *"there was an effort to create a sense of urgency, but was not the most cogent or complete over time. The delivery of the message was inconsistent"*. PF had similar feedback; *"A clear reason was communicated but not really a compelling reason. Because of the size of banks and the differences form one group to another, the level of commitment was inconsistent across groups"*. R16 noted that an impediment to agile adoptions was the lack of executive support. R5 noted a lack of a defined and clear project roadmap that made it difficult to articulate and track progress to the executive level sponsors. PE commented that *"we have executive buy-in but most executives don't have an understanding of agile"*. On the question if survey participants believed agile practices were needed in banking, overwhelmingly 96% of respondents agreed. When the agile adoption was at the grass roots level, executive support was then required to take it enterprise wide (PB, PG). Grass roots efforts will not scale unless backed by executive support. Noteworthy is that agile adoptions in banking are primarily driven by CIOs, not business executives. R15 noted that what works well for agile adoptions is *"executive support, clear mission statement and definition of benefits at all levels"*. PG commented that *"an issue is the mid-level business and technology ownership, there is an issue of no driving leader to make a change at that level. The top level executives at*

the CIO level and higher are very much aware and driving agile but this does not always become a driver at the middle management levels". Similarly R11 noted that a challenge with agile projects was *"senior managers who are told they must do agile without really understanding what it is all about and who subsequently make it very difficult to take an approach that is different from what they already know."* John Kotter's article on change management failures states that you need at least 75% of your managers to buy into the change for it to be effective (Kotter, 2007).
Conclusion: Executive level and line management broad support is required to evolve grass roots agile initiatives into organizational practices. This is a best practice as indicated by the literature review and is applicable to banking as noted by the interview and survey feedback.

Table 6 – OP2

Text: Create a sense of urgency. The executive provides a compelling and convincing reason for the change to agile practices. It can act as a catalyst for change that people can rally behind and buy into the necessity for the change. For example, persistent project failures, late project delivery or competitive threats from nimbler FinTechs are compelling catalysts for change. Executives must make it clear that change is non-negotiable.
Analysis: Although a sense of urgency is often useful for instilling organizational change, PB and PD noted that there was no sense of urgency as the bank did not see any reason to change. PB commented that *"a sense of urgency came later but not initially"*. It was not until the executives noticed the positive results from agile pilots; then it became urgent to adopt these practices widely. PC's bank started the adoption with an executive sense of urgency. PG commented that *"there was much grass roots interest and an agile methodology was needed to address this interest. A few years later the CIOs realized that the agile methods could benefit the bank"*. The urgency arose due to numerous grass roots agile projects having initiated their own agile practices. There was a need to have a consistent agile framework across the bank to ensure consistency of practices.

To say that agile practices started as urgent executive driven endeavors is a misnomer. In most banks the executives are happy to continue as is. PD comments that *"once this large application was completed, the business sponsors were happy to leave it at that and not use the practices on other platforms".* R18 commented that *"there's no real impetus for change in the Canadian banking sector. No executive in any Canadian bank has been able to tell me why they need to change from how they do business today"*. R11 noted that "*150 plus years of attitude and practice must be unlearned and redesigned*". The survey feedback indicates positively that there was a sense of urgency created by executives. As well, 100% of survey respondents indicated that their business partners saw a need for adopting agile practices.
Conclusion: The literature review indicates that creating a sense of urgency at the executive level is an effective catalyst for effecting an agile adoption. However, the evidence of this strategy being used within Canadian banking is weak. Some executives did create a sense of urgency to instill change whereas others felt it was urgent to apply these practices only after seeing evidence of success by small projects. As a best practice, a sense of urgency should be a catalyst for organizational change in banking. John Kotter's eight step change model is a change framework applicable to agile transformations (Kotter, 2007; Foster, 2013). This change model emphasizes that the first step is to create a sense of urgency for the change.

Table 7 – OP4

Text: Communications Strategy; over communicate the agile adoption journey focusing on the benefits, objectives and outcomes. Create a communication plan for adoption and sustainment of agile practices, e.g. town halls, newsletter, quarterly seminars, social media, wikis, etc. Intensive communication was emphasized in a number of studies (Dikert et al. 2016). Establish regular town halls for communicating successes. Invite external speakers to explain their use of agile practices.
Analysis: PA, PB noted that communications strategies were implemented at their banks but not consistently. PG notes the strategy was not 100% successful. Communication on the adoption was effective at the executive level but weak at the senior manager and lower staff levels. PE mentioned that *"Agile adoption was mentioned as a business*

transformation effort. Unless people were actually in the project doing agile, it was largely ignored".

The feedback indicated that communications and roadmaps are important but not always well implemented. Survey respondents (44%) agreed that roadmaps were clearly communicated. Only 31% agreed that their bank had a well planned and executed agile adoption.

PB's experience with communications was that *"town halls and newsletters were used. Most people had heard of agile but not everyone understood it. Town halls were largely attended with more than 300 attendees. People were curious but not necessarily ready for agile".*

PC commented that as the agile adoption progressed, the executive messaging was not coherent; *"there was a communication strategy but it was not extensive. Message was not coherent over time due to changing ownership over time. In the early days this was not a perfectly thought out effort. No roadmap and was fairly superficial in the beginning".* Similarly, PE stated that *"communications was sent out in a newsletter. However, very few people paid attention to the newsletter or announcement. Agile adoption was mentioned as a business transformation effort. Unless people were actually in the project doing agile, it was largely ignored".*

The participant feedback indicated that communications is important but not always as effective in getting stakeholders to understand the transformation journey. PG indicated their communication approach was: *"an agile newsletter goes out every 6 weeks, there is mention of agile at senior management meetings, videos have been made on agile, etc. Executives and senior management at the top are aware of agile efforts but the problem has been cascading this to the lower levels to ensure awareness."*

In response to the "what would you have done differently in your agile adoption" question, PC provided the following comments on communication; *"too many people were talking about the agile messaging but not a coherent or cohesive communications plan. A more focused approach to communicating the agile transformation would have likely yielded better results and reached out to a wider audience. The leadership stance and how to coherently inform others is a key determinant of success. Coherent communication would have worked better in the early stages of agile adoption."*

Only 50% of survey respondents felt they were well informed of the agile transformation progress. Overall scores for agreement ratios are almost balanced indicating weak

agreement. The feedback suggests this best practice is used by banks but there remains opportunities for improvement.
Conclusion: A communications strategy and transformation roadmap is a best practice for firms undertaking an agile adoption. The evidence in banking is that although this is important, it is not well applied. As well, the degree of communication success varies from one bank to another (PB's feedback versus PE's and PG's feedback). The agile adoption communication must therefore be sustained with the same consistency throughout the adoption journey, not only at the start of the adoption. Frequent, pervasive communication and roadmaps for an agile adoption, in any industry, is a best practice as evidenced in the literature review and applicable to banking.

Table 8 – OP7

Use pilot projects to experiment what practices work best and which ones need to be tailored to the organization. Pilot projects help increase the confidence in agile practices and improve management confidence. Using pilot projects was reported as a significant success factor (Dikert et al. 2016; Burba 2015). The projects should start with small teams (5 to 9 staff) and be self-contained, with few external linkages, before applying agile practices to larger projects with larger teams. Develop the culture and best practices on small projects before considering scaling to practices such as Scrum of Scrums (Burba 2015).
Analysis: Feedback from interviews and participants indicated that agile adoption in banking is an incremental approach with pilot or "showcase" projects taking the lead on agile adoptions. Survey respondents agree (79%) that agile adoption through pilots were the most common method of ramping agile. The sample variance is high (4.22) in this case because one respondent worked for a smaller bank who adopted a big-bang approach, however, there were four times more agree than disagree votes, indicating pilots are widely used in banking. PB notes that in their bank *"three pilot projects in year one at the bank. These projects were 7 to 12 people, mostly self-contained"*. PC commented on some of the challenges his bank had in achieving success with agile pilots; *"heavy duty outside resources brought in on contract with the intent that something big and bold could be accomplished in small time and show that this could be sustainable for the bank to adopt. The effect was that*

this was tremendously positive; business problems could be solved quickly. However, this was accomplished through rule breaking, fast tracking and bypassing normal process. Caused resentment as internal staff felt they had to work within bank constraints whereas contractors did not".

PG stated that in his bank *"projects were piloted to test out techniques and process before rolling these into a wider methodology. Part of this was a calibration to test agile maturity and this was done as part of the pilots. The results were not necessarily what people wanted to see but they were accurate. Using this approach, a lot of value was provided in terms of learning that made its way back into improving the methodology"*.

PG's approach to pilots was; *"the bank started with small projects as the new methodology could cause risk. In the annual planning we asked what projects could be agile based without adding risk to market or delivery. We wanted to improve delivery but not increase risk to the bank".*

Only 46% agreed that that gradual agile adoption through pilots was a successful strategy. The agree/disagree factor is 3 times more for agree. A high number of neutral responses reduced the overall agreement score, thereby indicating that although pilots were widely used by banks in their agile adoption, perhaps not all pilots were successful. Comments from R21, R17 and R22 indicate that dependencies on external teams is an issue. The best practice for pilots emphasizes that pilot projects should be self-contained with minimal external dependencies.

BCG notes that "to fly, you need pilots" (Burchardi *et al.*, 2016). The article proposes that agile pilots are necessary in order to determine whether agile is a fit for the organization and whether it is accepting of agile principles. BCG proposes that pilots are critical for a company to make the necessary adaptations to agile.

Conclusion: Incremental adoption of agile practices was recommended in the literature review to get experience in agile principles and use lessons learned from pilots to scale up to larger initiatives. The evidence from the interview feedback indicates banks are using pilots to gain experience and use lessons learned to improve their agile practices. The literature review indicates this is a best practice and is already evidently used in Canadian banking.

Table 9 – OP11

Text: Establish an "Agile Centre of Excellence" (CoE) to provide enablement and support of the agile transformation. Implementation of an agile CoE and transparency of resources are key to agile project management (Stettina & Hörz 2015). Almost 90% of agile teams surveyed (Gibson et al. 2016) believe that PM governance and resource management processes mandated by a traditional PMO impedes project progress. The GAO study (GAO 2012) suggests using "Agile Centre of Excellence" instead of a PMO.
Analysis: The participant feedback indicated there was a central body governing the agile adoption effort in their bank. The difference among banks is whether the agile CoE is part of the PMO or independent of it. The feedback from PC is that there are benefits to combine the PMO and agile CoE. PB indicated that there is a significant cultural difference between the agile CoE and the traditional PMO. The survey feedback indicated that a central group supports agile in banking. 70% of respondents agreed that a central body is necessary for enabling an agile adoption, while 88% of respondents indicated that a central coordinating body at their bank coordinated the agile adoption. This correlates with the feedback from the literature review indicating a central coordinating body is a best practice. Several participants caution on the dissonance that develops between the traditional PMO and the agile CoE or PMO (PC, PD, PE) if they are not working together. PC commented that *"one of the challenges was that there were multiple groups. All the elements were good but not a high degree of coherence. One group was about enablement (DevOps) another group was associated with the PMO (Value Assurance) but these should have been the same. Yes centralized, but the two groups should have been one. Duopoly of CIOs could have been a factor. Multitude of consulting companies could have been a factor as everyone on the street saw this as an opportunity to provide their wisdom as to what was important".* PE indicated that multiple PMOs caused conflict; *"there was no agile specific PMO. There was a business transformation PMO in addition to the regular PMO. There was overlap and confusion as a result. The better approach would have been to have one PMO as this would have resulted in efficiencies and removed duplication. For example, doing a status report for a VP, but there was also status for the business transformation, then there was status for the regular PMO. Too much duplication to do this weekly. The business transformation PMO was more focused on agile principles and were good*

supporters of these processes. The regular PMO were not supporters of agile and as such there was conflict between the two groups. So, whereas one group is setting up an agile workspace and proceeding to use agile practices, the PMO group is asking for requirements specifications and artifacts that they are used to". PG's experience with PMOs was more positive; *"yes, the EPMO fully supported the agile transformation. This was centralized with the traditional PMO. The EPMO was key to starting the agile adoption and sustaining it thereafter".* PD had similar positive feedback on the importance of the PMO for adopting agile practices. R13 commented that a mindset change needs to occur within traditional PMOs to be accepting of new practices. R16 cautions on the quality of coaches being brought into PMOs if they don't have the requisite level of knowledge or applicable background; *"Agile CoEs filled with the new wave of coaches, without real hands-on experience, XP, project management or program management".* The feedback indicated that a central body is required to champion the agile adoption and should be within the existing PMO. It also cautions against setting up a separate agile CoE from the PMO as it leads to inefficiencies and lack of synergies.
Conclusion: A central coordinating body for the agile adoption is a best practice in agile practicing industries as indicated by the literature review. It is also a best practice in banking as indicated by the feedback. Two executives interviewed (PG, PD) expressed that the PMO was valuable in adopting and sustaining agile. However, there is a potential lack of synergy and efficiency when an agile CoE is established separately from the central PMO.

Table 10 – OP25

Text: Management trusts agile teams to execute their projects without constant oversight (Thune et al. 2013; Stettina & Hörz 2015). Management still needs checks and balances within the shared stakeholder/team environment to replace the constant oversight. However, management must provide guidance and support without being in an overbearing oversight role.
Analysis: The respondents indicated there is management oversight of agile projects at senior levels, however that oversight does not directly interfere with the agile project teams. Weekly management and steering committee reviews of agile projects still occur

as they do for traditional projects. The management checks and balances have not changed between agile and traditional plan-based projects. The feedback indicates a level of trust exists between management and agile teams.

PB noted that *"the same level of oversight as plan-based methods but agile was more transparent; if there was a problem it was visible faster. Management was present at daily stand-ups. Directors and VPs were present regularly on the first pilots but not thereafter. Weekly steering committees were still required. Until there is trust of the agile teams, management reporting will still be needed but will decrease over time as trust builds. Trust is a condition for the success of agile projects. Management should be there to remove barriers and trust the team to do the work"*. Similarly, PF stated that *"management was very involved, they were curious, they looked in, dealt with problems as they arose and generally trusted the team"*.

PD noted that there was good executive support and trust; *"very good level of executive support and they trusted the teams. Status reporting was done weekly. The executive meets with the agile team more than once a week. When the product rollout is planned then the executive is more involved"*.

PE observed that *"traditional reporting is still needed on a day to day basis to get a level of comfort that everything is on track. Two sets of rules to play by; the old culture still wants reporting while trying to move ahead with a new culture"*.

Reduced management oversight is a best practice as denoted by the literature review but for banking this is an evolutionary end-state. The survey feedback indicated that only 37% of respondents agree that management trusts the teams to complete their work without extensive oversight. The ratio between agree and disagree is 1 indicating an even number of respondents agreeing and disagreeing on this issue.

PG noted that the PM role is still important on agile projects due to the financial reporting the bank requires. The management culture in banking requires the traditional reporting and monitoring processes which are counter to agile principles of trust and lean reporting. Project reporting requirements, be it for waterfall or agile projects, therefore remains consistent regardless of methodology. The size of banks and their entrenched ways of working still require a high degree of project oversight.

A BCG article on avoiding common pitfalls in agile adoption (BCG, 2018b) states that product owners must allow for greater freedom and a cultural change that focuses on

trusting lower-level employees. McKinsey promotes the concept self-managing teams that define the best way to reach goals and prioritize activities (Aghina *et al.*, 2018).
Conclusion: In banking, management needs checks and balances for oversight of projects, regardless of the methodology used. There is evidence from the interviews that management trusts the agile teams but a high level of reporting is required. The level of banking project oversight and reporting is more demanding than in other software development industries. That is the nature of a regulated industry. However, banks must balance compliance and regulatory needs with agile principles of trust and reduced documentation. In banking this should be a best practice but needs further development.

Table 11 – OP28

Text: Use incremental, gradual and continuous agile transformation (Gandomani & Nafchi 2015). Wholesome adaptation is difficult. Create a roadmap for incremental agile adoption and sustainment including planning, stakeholder analysis and analysis of the firm's environments, communications strategy including agile sustainment.
Analysis: Evidence from the interviews indicated that banks start with an incremental approach to agile adoption. Banks have a longer-term strategy of adopting agile practices more widely but not necessarily holistically. Larger banks are challenged with scaling up agile adoptions bank-wide. PE and PF comment that bank-wide agile adoption may not be a desired end state. PG notes that divisions within his bank can adopt agile practices and the PMO provides coaching and education support, however, there is no directive for bank-wide adoption. PF mentions that agile practices are not necessarily a fit for every area of a bank. Smaller banks with less legacy systems, ING Bank as an example, may be more open to LOB adoptions. PB commented that a gradual implementation was followed; *"the strategy was to roll it out across the entire bank. Three pilots, massive investment in training and still not a lot of awareness in the bank"*. When asked what he would have done differently for the agile adoption, PB noted that *"instead of gaining momentum with IT, would have stayed smaller and target very specific teams to do agile. Implement a culture change first with teams and show promise of being more successful with agile"*.

PC's approach to agile transformation was also incremental; *"incremental approach was used. Could do this everywhere at once and everyone could be exposed to it. However, it could be problematic. The dominant philosophy was that some groups can adopt agile on small scale projects and then scale up their capabilities. Companies such as ING have the benefit of adopting new practices as these are fairly new organizations and don't have the legacy of process and systems that most Tier 1 banks do".* Similarly, PE noted that *"bank wide adoptions were never fully successful, but there was various levels of adoption maturity in bank groups. Too many legacy applications and process prevent company-wide adoption".* R12 also suggested what works well is to use an incremental approach to agile adoption. The survey score indicates agreement (68%) that an incremental and gradual approach is the best way to scale an agile adoption. The agreement ratio indicates 4.5 times more agreement on this subject. The researcher's own experience with two large bank agile adoptions was that incremental and gradual approaches were effective.
Conclusion: Incremental, gradual and continuous agile adoption is a best practice. Based on the positive interview responses and survey feedback, the incremental approach of agile adoption is a best practice for banking as it is in other industries.

Table 12 – TP23

Text: Project delivery success measures; quantitative and qualitative measures are collected and the end of each project to access success (Thune et al. 2013). Determine the project value on customer satisfaction and ROI (GAO 2012). With agile projects emphasis is on delivering customer satisfaction beyond just cost, schedule and scope.
Analysis: As with traditional plan based projects, agile projects in banking use the same qualitative and quantitative project measures. What is measured may be different at different banks; for example PB noted that the primary agile project measure was how much faster agile projects delivered results; *"they were comparing the time between agile delivery and traditional delivery but metrics were otherwise a weak area"*. Similarly, PD commented that *"the measures have been on delivery; how frequent are we delivering releases. Measures of absolute velocity, is it increasing, is it stable? Are we delivering what we said we would deliver; tracking commitments"*. PC comments that the traditional measures of on-time and on-budget were also used for agile projects.

PC, a VP at a D-SIB Canadian bank, provided the following hypothesis why quantitative measures prevail; *"On time and on budget measures were used. This is the nature of a public held company not only banks. Shareholders expect returns, executives expect quantifiable measures of spend, etc. As such this percolates into project based quantitative measures – it's the large organizational functions that drives the type of measure used. For example, a business case says it is going to achieve a certain business impact and this has to be measured in some quantitative way to be measured. Until you change the financial lens by which projects are measured, it is difficult to depart from strictly quantitative measures such as on time and on budget".*

PG noted that measures *"is still a mix. The focus is on the business case. We measure value which is often still on-time and on-budget. Story maps should be driving value. The relationship between scope and value needs to be considered. Not many people can really articulate the value aspect which is different from scope"*.

The survey responses indicates low agreement (44%) that both qualitative and quantitative measures are used on projects. When asked if client satisfaction is based on qualitative measures the agreement drops to 28%, indicating that project success measures in banking are still largely quantitative (e.g. schedule, cost, scope). Project measures are important but banking has not yet evolved to using qualitative measures.

Survey question Q37 asked participants if they agreed that waterfall practices were not carried over into agile projects, 37% strongly disagreed and 22.2% disagreed, indicating that traditional practices were still carried over into agile projects.

Conclusion: Qualitative and quantitative measures for agile projects are a best practice as indicated by the literature review. These measures are equally important in banking as evidenced by the feedback. However, adoption of uniquely qualitative measures is not yet the norm for Canadian banks which still emphasize quantitative measures. A best practice for banking is perhaps a hybrid combination of both measures, acknowledging that quantitative measures will not be displaced.

7.2.3 AWRM Processes

Table 13 – OP14

Text: Tooling for Agile; establish tools and processes for automated regression testing. Implement tool suites for DevOps that support frequent code builds and releases. It is important to focus on the processes that support a continuous transformation before committing to tooling.
Analysis: The evidence points out that agile supporting tools such as Rally and Jira are used for managing user stories. The QA function is automated in some banks although not yet widely established. In some cases it is not possible to achieve full QA testing automation due to some applications not having the suitable tooling for automation. PB acknowledges that automated testing is expensive and they have found ways to reduce regression testing costs through lower cost labor, he noted that *"no, DevOps was not used, this is a big cultural change. QA automation was not widespread and many teams struggle with automation of testing"* . PC notes that for large banks DevOps is difficult to achieve. PC commented that they used *"a mixture of automated and manual testing. Some teams were fully automated as in a DevOps type of approach. Some early adopters naturally evolved into having a tool chain for supporting rapid development. One challenge was a dedicated testing group. Some conflicts of interest on how you bring about automated testing and how that impacted with their traditional roles and authority. Fundamental problems with lack of testing discipline that exist already within the organization only exacerbate agile adoptions. Agile should not be an excuse to skip engineering practices"*. PD commented that *"today we are still behind on QA and DevOps. QA is still not fully automated. More and more test cases accumulated with every sprint due to lack of automation. Someone even suggested a sprint for testing!"*. PE suggests that *"different levels of automated testing are in use. DevOps has been very immature. Not a very clear delineation as to where it starts and where it ends"*. PG admitted that *"we're still building the experience with DevOps. There is a roadmap for getting there but we're still not mature. We're working on a process to create test data for automated testing thereafter. We recognize the necessity for DevOps but are still at the beginning of a long journey. One of the re-occurring issues is who pays for testing automation"*.

There is a cost balance to be achieved between establishing QA automation or using lower cost resources. PB acknowledged that eventually the number of test cases after each sprint grows as new functional points are added and this results in an ever increasing QA test effort. PC noted that tooling is valuable but many banks are still struggling with implementing DevOps. As an observation from a QA meeting held in 2016, the QA Lead commented that not all the division's applications were a fit for automated testing. The survey respondents indicated that 41% agree seeing evidence of automated QA in use at their bank, indicating weak use of DevOps and test automation. The ratio of agree to disagree is 1.1 and 37% of the sample disagrees that banks are using tools for agile automation.
Conclusion: The literature review indicates tooling for supporting automation of agile processes is a best practice. In Canadian banking, DevOps and automated QA testing are in their infancy and sporadically used. However, most respondents indicate that their banks are working on automating more of their processes. In conclusion, this best practice does apply to banking, albeit an aspirational end-state which has not yet reached maturity at some banks.

Table 14 – OP15

Text: Frequent client demos to gather feedback and correct deviations, frequent planning; backlog combing and conducting retrospectives after each sprint. Demos enable business and technology stakeholders to work closely together to drive positive cultural change.
Analysis: The interviews and survey indicated that client meetings through demos, close client interaction and daily stand-ups are followed by the majority of banks. Of the survey respondents, 67% agree that these agile ceremonies are conducted. The agreement ratio is 6 times more for "agree", indicating strong agreement on this issue. PC observed that *"for the most part, daily rituals were followed. These were practiced in principle but perhaps not practiced to the true intent of the meeting. For example, daily stand-ups can quickly degenerate into longer status reports that don't really cover what the stand-up was meant for. There were many traditional PMPs who did not notice the difference because they really didn't understand agile"*.

PD also noted that *"yes, these processes were followed. Business was involved in sprint planning. As much as possible was done following pure Scrum. However the tailoring is very much artifact driven. Audit and governance still require their artifacts for compliance".* Similarly, PE noted that *"absolutely followed all the indicated processes. Tailoring was at every organization. There were hybrid approaches of Scrum used all over the place. Due to different oversight and governance models, some organizations must follow compliance requirements and that impacts the agile approach"*. PG mentioned that *"yes, these ceremonies are happening but probably not doing them well. For example, stand-ups become status meetings. One project was performing retrospectives after sprint planning which should not be the practice. We're in the process of increasing our agile capabilities so the experience at the team level is nascent"*. R18 commented that *"the face to face communication between business and development teams has cleared a lot of misconceptions on both sides about the other"*. Similarly R20 noted that *"the idea of getting the client involved and having a co-located team had helped banks move toward a successful agile adoption"*. A re-occurring theme is that a strong facilitator is required to prevent daily stand-ups from losing focus and becoming problem solving sessions (PA, PB and PG). Coaching and strong facilitation skills are needed on agile teams. PC commented that agile does not solve the problem of finding good leaders and resources, you have to start off with quality people in the first place.
Conclusion: The literature review identified client demos, close client interaction, retrospectives and daily stand-ups as best practices. These are equally applicable to agile in banking. New agile teams will require coaching and good facilitation skills to prevent ceremonies losing focus.

Table 15 – OP16

Text: Adopt established agile practices, such as Scrum, that already define processes for rapid, iterative, product development and quick decision making. Tailor the methodology, just enough, to fit the culture of the organization (Dikert et al. 2016).
Analysis: The majority of respondents indicated that banks do tailor the agile practices to fit their environment. Scrum is the popular methodology in banking as mentioned by

participants. One agile coach (R17) points out that agile adoption becomes problematic when there is too much deviation from core agile principles.

PA notes that *"most of the agile practices followed by banks is Scrum. Not sure if people are aware of other agile methods other than the Scrum framework. SAFe is not used. Sometimes need to educate people as to what agile is and Scrum. No idea that Scrum is really part of an agile methodology"*.

PB and PD commented that Scrum was also used in their banks. Similarly, PC commented that *"Scrum adoption was left to the individual area. Banks don't generally take anything out of the box. Tailoring always comes into the picture. Scrum was prevalent because it is easy to train and easy to learn"*.

PE observed that *"Scrum is used more generally than Lean. Lots of modifications to the Scrum approach. Yes, practices were tailored to fit the bank's requirements for governance and audit. There does not seem to be a repeatable agile model. Agile is tailored differently from bank to bank and from division to division; very inconsistent. Even within the same bank there is a different tailored approach to each one area"*.

Similarly PG noted that *"the whole agile process was tailored to fit the bank. Components were taken from DAD, SAFe, Less, Scrum and Nexus. We took the pieces that best fit our environment and built new. Anyone joining the organization from the outside can still see and experience that this is fundamentally an agile methodology"*.

On the survey responses, 78% agree that their bank tailored agile practices to fit their needs. Overwhelmingly the ratio of agree to disagree is a factor of 21 indicating strong agreement that banks do tailor agile practices.

In summary, all banks tailor their agile practices to adapt agile to their culture and project processes. Overly deviating from agile fundamental practices could be problematic for the success of an agile adoption. The feedback correlates with the best practice findings from the literature review which supports that agile should be tailored to fit the culture, but just enough.

Conclusion: Tailoring of agile practices to fit the firm's culture is a best practice. Excessive deviation from core agile principles is an anti-pattern. Most banks have already started with Scrum to provide baseline agile practices and tailored these practices to fit their organizations. This approach is aligned with the best practices identified in the literature review and is also a best practice for Canadian banks.

Table 16 – TP4

Text: Incremental product releases made possible through continuous integration and daily continuous builds; DevOps practices.
Analysis: The feedback suggested that DevOps practices are not quite established in banking. PC mentions that this is difficult to establish in large banks. PB mentions that although staff were familiarized with the Minimal Viable Product (MVP) concept and the need for frequent code releases, the bank still had lengthy code release cycles of 3 to 6 months. PA noted that inter-organizational dependencies with non-agile projects also caused issues with frequent code delivery. Lack of environments to support DevOps was also noted. Only 56% of respondents agreed that frequent code builds and delivery was used by their banks. In summary, this is a nascent practice and may take time to achieve the maturity of deploying more frequent code releases. PC commented that for large banks, DevOps is difficult to achieve. PD noted that *"today we are still behind on QA and DevOps".* PE commented that *"DevOps has been very immature. Not a very clear delineation as to where it starts and where it ends"*. PG mentioned that *"we're still building the experience with DevOps. We recognize the necessity for DevOps but are still at the beginning of a long journey".* As a best practice this may be more suited for smaller firms with less dependencies and more product focus. This is difficult to implement in large banks where agile teams have dependencies on other non-agile teams.
Conclusion: This is a best practice for some software product development firms as indicated by the literature review. DevOps benefits faster MVP releases but is difficult to implement in the banking environment due to dependencies on control functions and other non-agile groups. Most banks in the study were adopting DevOps, indicating this is a valued best practice which is still nascent.

Table 17 - TP7

Text: Allow time for code refactoring and re-design. Avoid excessive technical debt when building applications that are expected to have a long life cycle. However, technical debt may be acceptable where the project must meet a time to market or regulatory requirement.
Analysis: All interview participants noted that business commitments to get a product available to clients by a certain date took priority over clearing defects. PC commented that for banks to treat all defects as a priority is a foreign concept. As such, it is normal in banking that technical debt is carried over from sprint to sprint. Participants noted there was a commitment to reduce defects but time to market issues were the first priority. PC noted that the technical debt carried over was not burdensome. PC stated that product delivery has a higher priority over defect cleansing. PD noted that it depends; there were some projects where time to market was the priority and others where the code had to be perfect. PA stated that *"in most cases they had to meet the release date regardless of the defects. There were campaigns that had to meet the timelines communicated to the clients. Trade-offs are made between what is highly disruptive to the client and what we can get away with".* PB's comments on defects were that *"most people do not understand or practice zero defects. All defects are high priority, should not have a scale of one more important than the other. As such, the whole culture changes. Developers knowing this take more ownership of code quality in delivering zero defects to QA. Most people still prioritize their defects".* PC's experience with defect remediation was that *"with showcase initiatives, the priority was to get the product out the door and show positive results, the defects were treated later in the project; technical debt was incurred purposefully. Short-term velocity is impacted by fixing defects in the next sprint as new work is not getting done while defects are fixed. The timelines that are promised by the business however get in the way of following the practice of clearing out defects as a priority. Product delivery has a higher priority over defect cleansing. Technical debt is something banks have lived with for a long time".*

PE discussed the project challenges of not addressing defects on time; *"they always carried over technical debt into the next sprint. Later in the project there were many defects still outstanding and the later sprints were high in defect remediation. The issue here is that there were schedule commitments made and functionality expected by certain dates and therefore defects were pushed to later sprints in order to meet schedule commitments made to executives. One project stream had a high number of outstanding defects and resulted in resources re-allocated from other streams to remediate defects. This impacted the overall project timeline".*

PG explained the defect remediation strategy at his bank as *"defects are not always addressed within the next sprint. The philosophy followed is that if a story does not complete or does not work within a sprint, it is moved to the next sprint and not closed. The technical lead and architect have accountability to ensure the technical debt does not become overwhelming. Outstanding technical debt drives the prioritization process. This becomes part of the prioritization process in sprint planning. This is part of the look-ahead advance planning, a concept adopted from the DAD methodology. This gets the team to look out three sprints in advance but allows the team to evaluate the impact of technical debt".*

Only 30% of survey respondents agreed that their bank prioritized defect remediation over new feature builds. The research indicated that defect remediation happens as a second priority with the first being time to market needs. The technical debt carried forward is moderate and manageable. This is an example where base agile principles are tailored to align with the bank's culture.

Conclusion: The purist agile principle to remove all defects prior to adding new functionality cannot always be applied in banking. The application of this best practice in banking diverges from the best practices identified in the literature review insofar as time to market priorities may override defect remediation. Although timely defect remediation is a best practice, banks may not always follow the practice.

7.2.4 AWRM Linkages

Table 18 – TP2

Text: Close client interaction with client on-site and available to the team.
Analysis: The responses were positive on client involvement and being available to agile teams in banking. However, the concept of the Product Owner (PO) being on site and co-located with the team does not always happen except for highly visible projects. Some of the challenges noted are that product owners are often located in other buildings away from the agile team. POs also have other day to day activities and are not always fully dedicated to the agile team. One compromise was to have the PO available for a certain time each day or available on-demand by telephone. PB explains that *"co-location is not always possible nor realistic for Product Owners but there was the condition that they have to be available at least once a day and that can be in-person or by telephone. Some were with the agile teams and that improves communications. Some had challenges being available"*. The PO is dedicated to the product and is part of a product team. This does not happen in banking and at best agile teams can count on a partial daily allocation of the PO's time. PG commented that there are many collaboration tools available at the bank (Skype, Lync IM, WebEx, etc.) that removes the necessity for an on-site PO. These technologies were not available when the agile manifesto was created and hence the requirement for product owner on-site presence is perhaps outdated. PC observed that *"getting business to prioritize where they spend their time was a challenge. Some business leaders have actually allocated space on their floors for co-location of technology and business teams. This would be for the most valuable customer facing applications. Geographically most agile teams are closer to the business location. Some business leaders saw agile as a way to improve the product and their relationship with IT. However, this did not happen across the board and not as soon as it should have happened. A lot of agile teams and initiatives suffered by not having a fully present or nearby product owner. The issue was getting business to prioritize their time to be available to agile teams"*. PE's experience with PO availability was that *"yes they were available, local, within reach and often brought into the Scrum sessions. But they didn't have any empowerment to make decisions. They would take the decisions back to their executives"*.

PF's experience was similar and he expressed that *"availability was not an issue, but the Product Owner model was not a fit for a particular project. One product owner did not work, not enough knowledge in one person. So a committee of 5 people was formed to provide product owner guidance. The team was co-located with the wider agile project team"*.

PG commented that his challenges were *"identifying who is the right Product Owner. We need a bank-wide definition. Right now it is who best can articulate the need of the customer. There is a Product Owner per agile team and for a large project there is a Chief Product Owner who can coordinate the needs across all owners. We need to better determine where the Product Owner role fits in relation to other business roles within the bank"*.

The feedback indicates that 67% of survey respondents agree that POs were accessible to the agile teams. POs do not have to be co-located with the agile teams, but committed to being available as needed. Comments from R2 and R4 indicate that co-location is still preferred whenever possible as it helps banks move towards a successful agile adoption. R18 also commented that face-to-face communication between business and development teams had cleared misconceptions on both sides about the other. In summary, banking agile teams find ways to accommodate the need for close client interaction which may not always be feasible.

Conclusion: Close client interaction between a PO and the agile team is a best practice in other industries as it is in banking. The PO must commit to being available to the agile team on a daily basis for an agreed number of hours. Preference is co-located POs whenever possible, but understanding that this is not always possible due to the size and geographic dispersion of Canadian bank staff.

7.2.5 AWRM People

Table 19 – OP10

Text: Use experienced staff. Identify champions that are accepting of agile practices and can act as early stage agile evangelists and mentors. If available, develop evangelists from staff that are already trained on agile practices. Use experienced agile coaches to assist with agile practices adoption and to provide methodology leadership on projects from the onset. External coaches are best to spot where corrections in the agile approach are needed. Their advice is better received as they are considered impartial. Ensure that experienced developers are engaged on initial agile projects. If the level of experience is not available internally, consider bringing that skill from outside (CEB 2012).
Analysis: Although having the most experienced staff to participate on agile projects is a best practice, the evidence suggested those staff involved on agile projects are not always the bank's high performing individuals. The staff applied to agile projects are the same bank staff used in any other project as noted by PA, PB, PE, PF and PG. In most cases, agile coaches are brought in from the outside to supplement the skills that internal staff lack. PA notes that in his experience, external consultants are expected to train staff on agile principles. Staff and middle management knowledge of agile principles was weak. PD and PE noted that external consultants are brought in for highly critical projects that the bank must deliver successfully. More than one participant mentioned Deloitte providing coaching and transformational services. An observation from a meeting in 2016 with a senior agile coach was that one bank brought in a consulting firm (McKinsey & Company) to lead a critical agile project. The firm brought in their staff to start the project, then gradually identified high performing bank employees to add to the project. PC noted that *"the first projects were highly impactful and well chosen. The experienced staff were largely imported into the project teams, some bank staff was added, but primarily staff from the outside. Agile external coaches were added to the team, some truly great, some not so great. The coaches provided training, mentoring and process guidance"*. PD commented that his project *"was big bang on a burning platform. Yes, the best staff available was used. External agile coaches were used and their primary role was coaching the teams"*.

PE's experience with coaches was similar and he noted that his project was *"a big bang approach and much expertise was brought in from the outside such as Deloitte and Cognizant as well as off-shore development. Coaches were brought in from Deloitte and they provided lessons learned from their previous organizations. Helped with front-end planning and financials as well"*.

PG and PB commented that staff who are used to working on traditional projects are not ideal for agile projects. The biggest issue is dealing with "heroes"; those staff who come in at the last minute and save the day. Heroes have difficulty adapting to working in an environment where team success is valued over individual success.

PB commented that in his project experience there were a *"mix of staff, some experienced and some new. Some teams did not even have staff that were the right fit for an agile team; issue of staff that were used to being the heroes and now having to work in a team where the hero approach is an anti-pattern for success. Lack of the right staff mix is detrimental to the project. If someone is not the right person for the team then you have to change that person right up-front"*.

PG comments that heroes have to find a different way to shine on agile teams. Similar to PB's feedback, PG noted that *"one challenge is people involved with agile projects are not the right fit for the project. Some people are highly skilled and are used to being the hero on projects. These are saviors who come in at the last minute to save the project and get the attention. In agile you have to work as a team and personality clashes do occur. These heroes can still shine but have to shine differently. Coaches were brought in to help with the agile training and coaching of teams"*.

R2 notes a lack of buy-in from bank staff, not taking leadership and waiting to be told what to do. This goes against the principle of self-managed teams and could be indicative of staff not understanding their roles on agile projects.

The evidence suggested that coaches are an important part of an agile adoption (82% agreement). There are 11 more times agreements than disagreements on this question, strongly suggesting that coaches are a must for agile adoptions especially in cases where agile organizational knowledge is weak.

One agile coach (PF) commented that banks need to be cautious about the level of agile knowledge of the large consulting firms as they promote a process based approach which could be counter to agile principles. Process based approaches fit with the way banks

operate but go against agile principles. Large firms are setup for economies of scale. Economies of scale and agile thinking are not congruent.

R17 commented that the market has been invaded by agile coaches with no hands-on development or IT background expertise. They are one of the top reasons why the agile implementation failed in some banks. PF was skeptical about the contribution and value for money realized by engaging a large consulting firm, versus using experienced coaches to drive agile transformations.

The feedback indicated that some banks want to adopt agile practices but are weak on knowledge of such practices. The literature review noted; if the staff cannot be sourced from within the bank then bring in the skills from outside. This was also suggested by some participants interviewed. When positive results were needed, external consultants and experienced agile coaches were brought in to run agile projects.

Conclusion: Using experienced staff in the first agile pilots is critical to demonstrate success. However, banks don't always have the high performing staff with agile skills necessary to guarantee the success of initial agile projects. External consultants and coaches can fill the gap and seed the practices to enable successful agile adoptions.

A common theme has been to scale agile adoptions by using top tier consulting firms who carry over expertise gained from pervious agile transformations. The banks have the financial resources to engage large consulting firms for assistance. Smaller firms lack the financial resources and use coaches instead in their transformations. As well, the processes, structure and resources of a top tier consultancy may be better aligned with the bank's culture and ways of working. In most cases, banks have established longstanding relationships with consultancies who understand their needs well.

This is a best practice in other industries and applies equally to banking due to the need to develop qualified agile practitioners by seeding the knowledge from external experienced practitioners.

Table 20 – OP13

Text: Training on agile principles. Provide comprehensive training tailored to different organizational stakeholders. Differentiated curriculum for executives, managers and developers. Several studies stated that training improved the chances of success for agile adoptions (Dikert et al. 2016). Ensure multiple opportunities exist for taking training, not

a one-time event but a continuous delivery model (e.g. class based, on-demand web based, etc.).
Analysis: PB and PC noted that in their bank, agile training is differentiated to the audience and available throughout the year. PG commented that training was provided to staff before a project starts and that training is tailored to the needs of the individual LOB. An assessment of the skills in the LOB is conducted before training is provided. The level of training provided varied. Executives were provided training to understand agile concepts. Training to senior management and line staff was provided but was not always adequate. The training provided used in-house and external providers. The long term aim of most banks is to provide training in-house where training of the bank's unique tailored agile approach can be taught. PG commented that it was great to hire staff with agile experience but they would still need to be trained on the bank's own agile methodology. PA noted that for external consultants brought into an agile project there is no training provided. This could potentially be a gap whereby training is only provided to full time staff. Given that banks tailor their agile practices, a knowledge gap may develop between internal staff and untrained external consultants. PB explained the training provided was *"three types of training or awareness presentations: a 45 minute awareness session for senior level staff, a half-day training for senior managers and a three day training course for agile team members. Training was always available year-round and delivered in-class"*. PC commented that training was *"provided by external consultants. Executive level education was available. Socialization of the practices with senior leadership teams. Deeply discounted training from the outside was available. Any team had a training budget and encouraged to spend it on agile training. For management, training was not so much on the rituals and practices but more so on the agile mindset. The importance was to get management and executives trained on this mindset as this could drive better decisions and outcomes downstream. Over 400 people at Director level and above were socialized on agile. Training was differentiated to the audience. Scrum Master and Product Owner training was provided. Business metrics were missing from outside training"*. R7 commented that there was limited agile training at all levels. R13 also commented that there is a lack of agile knowledge at the senior management level and above. PD commented that more training for product owners and sponsors is required. When PD

was asked what he would have done differently for an agile adoption, he responded *"a higher number of FTE to fill the coaching roles, more training for Product Owners and sponsors"*.

The survey results indicate that 56% of respondents believe the training they received was adequate. The agreement factor was only 2.3 and the sample variance was 1.79 thereby indicating widespread difference of agreement on whether the training was adequate.

Most banks have focused on Scrum Master training of their staff. However, a gap on Product Owner training for the business exists today (PD, PG). This causes a rift between business and IT whereby the business does not fully understand their role, the practices or benefits of agile.

In general the evidence is that differentiated training is available and is generally effective. However, most agile adoptions start with external firms providing training prior to the bank creating its own curriculum. This is a normal part of the adoption process whereby the bank learns what training is provided, assesses its needs and creates its own training. Each bank has addressed its training requirements in different ways but all banks had the aim of providing tailored agile training in-house.

Conclusion: Currently the training is weak and there are gaps insofar as inclusion of the business. The feedback has been that despite much effort on training, there is still room for improvement. As indicated in the literature review, training is important in any industry. The lack of knowledge on agile practices at the senior management level and business is an impediment to a wider agile adoption as these critical stakeholders will resist what they don't understand. Training should be provided to all staff levels including consultants and should not be a one-time exercise.

Comprehensive and differentiated training for business and IT stakeholders prior to participation on agile projects is a best practice and necessary for banking agile adoption.

Table 21 – OP18

Text: Encourage Communities of Practice (CoPs) or Special Interest Groups within the firm to promote agile successes, share learning and offer support. A study (Dikert et al. 2016) noted that the formation and influence of agile communities is reported to have a significant impact on agile adoption.
Analysis: The evidence suggested that communities of practice were encouraged and established by the PMO at some banks. PB, PC and PG commented that communities did provide value for adopting agile practices. PA, being an external consultant, did not benefit from participation in the CoPs. External consultants brought in to run agile projects do not benefit from the same access to training and social communities as internal staff do. PB explained that *"the CoE started the communities of practice. They helped with the adoption of agile, it helped people with guidance when they did not know what to do"*. PC comments that *"Regular coffee-houses were setup particularly for business to help people with the agile transition and answer questions on such things as how to size MVPs. These were hosted every four weeks, well attended and recorded. Started off with groups as large as 60 people. Was an opportunity for internal marketing/promotion of groups. Was also a way to get people in contact with coaches. Meet the coaches sessions were very effective because of the attendance of different teams and people would realize that they were having the same issues across different teams. This allowed people to contact each other and share likewise experiences."* PD notes that CoPs help with agile adoptions but lose their value as participants become more knowledgeable of agile practices. PD commented that *"CoPs for Product owners were stared but were relatively small. CoPs were not started organically but were suggested by a consulting firm. CoPs did a good job to get people interested in agile but these are of lesser value when there are seasoned agile teams in place already. For newer people coming into the bank this did help"*. PE notes that in his bank CoPs were started but stopped shortly thereafter due to lack of support. Part of the issue was that momentum could not be sustained due to staff turnover. This indicates that a level of continuous support from a central body (CoE or PMO) is needed to sustain CoPs. PG commented that their CoE is run by the PMO and is successful in helping newcomers to agile.

The survey feedback shows a 54% agreement on the effectiveness of communities of practice in banking, while 35% disagree on their effectiveness. A variance of 1.6 indicates a wide dispersion in opinions, signifying weak support of CoE effectiveness.
Conclusion: Newcomers to agile benefit from CoPs. One challenge is sustaining interest over time. They may be established initially as a way to encourage knowledge sharing but may play a lesser role in time as the organization matures. Their value is highest during the initial adoption phases but less so as the organization matures. CoPs as a best practice is already established in Canadian banks.

Table 22 – TP14

Text: Dedicated teams; teams are not disbanded after a project completes as is the norm for plan based projects in matrix organizations. Agile teams remain together from project to project (Thune et al. 2013). Dedicated resources breed domain knowledge, builds lasting relationships with customers and provides additional productivity through increased domain knowledge (Valade 2008). Rotate developers on teams moderately, to avoid domain weariness, attrition and burnout.
Analysis: The majority of evidence from the interviews and survey suggested that keeping agile teams together is not the norm in banking. One bank reported that they were moving to a product based model whereby teams would remain together to address a portfolio of products. However, the study feedback suggests this is the exception rather than the norm. Only 26% of respondents agreed that the project teams remain together in their bank. The challenges with the typical matrix organizational structure does not lend itself to dedicated teams. People managers don't want to give up their best staff to a dedicated team. As a result project teams are disbanded once the project completes. This practice makes it difficult to establish the productivity (agile velocity) of agile teams as with every project a new mix of people comprise the team. Additionally, teams don't benefit from sustaining the close inter-personal group dynamics developed throughout the project (norming, storming, performing, etc.). Interview participants PA, PB, PC and PE noted that agile teams do not remain together in their bank. PC noted that *"When we disband agile teams we're setting the clock back on the learning curve. This is a major project problem. Projects are completed, the team*

is disbanded and moved to other projects, this is the nature of the organizations. The issue is also real estate, some teams are out of the center and would have to commute. This causes all kinds of issues due to being relocated to agile project teams in different cities away from their normal operating base. Geographic dispersion of key resources is an issue with centralized agile project teams".

PB's experience was that *"teams are disbanded every time but stability of teams is very important. The matrix organization approach is an anti-pattern for dedicated teams. This is a big challenge for politically structured banks. Small areas can do this but for larger divisions this is not viable".*

R11 noted that *"I have seen stable teams in great work environments that are able to deliver quickly and often".*

R2 commented that people working together for longer periods of time leads to better communication and trust. One challenge is that most departments are not organized for product groups. Whereas in some software development firms (e.g. Adobe) a team is focused on one product. In banking, staff usually work on multiple applications without being allocated to a dedicated portfolio of products. Teams are created to address the needs of new products and then disbanded post project. To establish this best practice in banking requires organizational change for creating dedicated product teams and incremental product delivery models. Some efficiencies of scale that a matrix organization provides would be lost.

By contrast, PD's IT area supports a client facing application and has structured the group along the lines of a product model. He noted that *"as part of continuous integration the project teams as much as possible remains constant. This is the approach of a platform based team. This has been unique to this group and there is a belief that this will spread to other groups in the bank".*

PG's bank is evolving to a product based model, but the issue of keeping teams together becomes difficult when contractors are part of the team. When the project completes, the contractor leaves the firm. The team loses predictable velocity and knowledge. Yet, most banks use contract resources to supplement staff capacity. PE provided similar feedback *"project teams are disbanded after the project. Once the project delivers, everyone goes back to their teams. This is especially the case when external vendors are involved with agile teams. After the project completes the vendor's resources go back to the vendors. There are no self-contained teams. No consistency or continuity".*

A BCG article on "Secrets to Scaling Up Agile" (Burchardi *et al.*, 2016) purports that agile teams are focused and fully accountable. Teams do not work on several projects simultaneously, nor do they leave a project once their work is done. They remain for the duration thereby developing a sense of product accountability.
Conclusion: This is not yet a best practice in the current banking environment due to an entrenched organizational matrix structure. Until banks evolve from functional to product based organizations, dedicated agile teams will not be the norm. This is a difficult organizational change for most banks. The literature review indicates this is a best practice in other software development industries. Feedback from respondents indicates a product based model is desirable but it is not yet prevalent in Canadian banks. However, some banking divisions are beginning to adopt an application product model.

Table 23 – TP15

Text: Product Owner (PO) commitment to devote a high percentage of their time to be available to the project. This role is the liaison between the agile team and the business sponsor and hence a high level of time commitment is needed. The Product Owner is fully integrated into the project team and development process (Thune et al. 2013).
Analysis: Overall the comments suggest that the Product Owner is available to the agile project teams although not on a full time basis. In all cases the product owner was fractionally available to the team and this was deemed adequate. PG noted that PO availability is an issue but not sure yet how much of an issue this was. POs need to balance the demands of their everyday tasks with the participative demands of an agile project. Only 41% of survey respondents agreed the PO could successfully balance their day to day activities with project participation. In tailoring this best practice to fit the banking environment, the PO must be fractionally available to the agile team but cannot be fully dedicated. The compromise is achieving a balance between doing their day to day work and being available to the project. A fundamental agile principle is that a PO be available to the project team. Another challenge cited was that the PO was sometimes a proxy for the business and did not have the authority to make decisions on the project. This resulted in decision delays

and should be avoided by giving POs authority on decisions. PE commented that a PO should have a level of autonomy and empowerment for making decisions.

PC noted that *"business is available on projects. Yes there is conflict. However this is an evolutionary approach, does not happen overnight and certainly not unique to banking"*.

PD observed that there was *"a fairly decent job between separation of duties. Good balance in being available. In some cases the Business Analysts are empowered for decision making without having the product owner there"*.

PE's experience was; *"Product Owners were dedicated and available. In close proximity and available. However, they were not always empowered for critical, impactful, decision making"*.

PG commented that POs don't have to be physically present to help agile teams. Contact by telephone or video conferencing can proxy for physical presence. The Agile Manifesto was created at a time when video conferencing was not widely available and therefore the need for POs to be always available can be met through recent technology innovations such as video conferencing and collaborative workspaces (Wikis).

Conclusion: This is a best practice that applies to banking. The literature review indicates that as a best practice the PO be on the agile team and fully available on the agile project. However, in banking the PO is generally not available full time to projects. Banks must dedicate adequate fractional PO time to agile projects. The PO must also have decision making authority.

Table 24 – TP20

Text: Project stakeholders participate in daily stand-up team meetings. Daily stand-ups not exceeding 15 minutes with small team teams (Valade 2008). Valade also suggested a no-meeting day once a week. Project impediments are noted and team members are tasked to remove them.
Analysis: Evidence from the interviews and survey indicated that agile meetings (ceremonies) were held, particularly daily stand-ups and they worked well. PC noted that a good facilitator is needed to keep the stand-ups on track and not evolve into problem solving meetings. PB's approach to keep meetings within 15 minutes is to hold them at 11:45 AM; before lunch! PB indicated that at his bank *"stand-ups, retrospectives, etc. (were performed). Poor attendance by business members on meetings. Daily stand-ups need discipline to stay on track for 15 minutes. Some members joined these by telephone"*. PC commented that *"meetings were held. Business participation was challenging, depending on the project. Stand-up meetings were all over the map, some were very disciplined and others evolved into long meetings. Need good facilitators"*. PE also reported similar issues; *"daily stand-ups were for the most part on track but it depended on the strength of the Scrum Master's facilitation skills"*. By contrast, PD reported that *"Scrum ceremonies, daily stand-ups, retrospectives and fully engaged Product Owners. The daily stand-ups stayed focused and did not stray into solutions. Solutioning was taken off to the side (parking lot)"*. PG expressed that *"Product Owners should be in a lot of these meetings. Product owners are part of the retrospectives and are encouraged to attend the daily stand-ups. For demos the Product Owner needs to be there"*. Survey respondents (56%) agree that daily stand-ups are held at their banks. There were three times more agreement scores on this question than disagreements. R22 notes that ceremonies worked well in their experience. PB noted that business attendance at the daily stand-up could be a challenge, due to weak attendance.
Conclusion: Daily stand-ups are a best practice for improving communication and necessary for banks using agile principles. Product Owner attendance at meetings could be a challenge.

8. Discussion and Framework Development

The previous section analyzed the framework data and derived conclusions from the collected data. This section summarizes the previous analysis and conclusions to examine what is working well in Canadian banking agile transformations and what its opportunities for improvement are.

8.1 What's Working Well

There are many aspects of agile adoptions that Canadian banks are doing well. Agile firms in various industries share a baseline of best practices. The AWRM framework, used to audit a manufacturing firm's degree of agility, defines practices which are equally applicable to software based product development. As well, the literature review identified best practices from other industries that were adopted by banking and tailored to fit their environment. This section summarizes the best practices that Canadian banks have adopted in moving to agile.

8.1.1 Coaches and Consultancies

Use of external coaches and consultants to fill agile transformational skill gaps has been beneficial. Banks have established relationships with top consultancy firms for many advisory needs including assistance with agile transformations. The research participants identified Deloitte, BCG and McKinsey & Company as consultancies that banks used to initiate agile projects or divisional level agile transformations. These firms have digital transformational experience from previous consulting work with other firms.

External coaches are also widely used by banks primarily to shepherd initial agile teams and provide guidance for internal training programs. When internal agile skills are lacking, external coaches have been effective in filling the gap and training full time staff on agile principles. PG cautioned that hiring external coaches is not optimal, as these coaches bring their own agile practices which may not align with the bank’s own tailored agile practices. However, early adopting banks may not have options due to lack of experienced internal coaches. Hiring experienced Scrum Masters to fill the role of a coach was not recommended.

Agile transformations have high organizational impacts to processes, staff roles, premises, training and new ways of working. A CIO requires guidance from experienced practitioners to assist with such an impactful transformation. They will also benefit from understanding basic agile principles and how these principles are used by other firms

before engaging any experts. The literature review indicated that executives from Standard Bank and Citigroup visited Silicon Valley firms to understand and adapt their practices (see 3.4 A Sample of Companies and their Agile Adoption Journeys). A division of ING Bank in the Netherlands modeled their agile adoption model from collaborating with Spotify (McKinsey & Company, 2017). Understanding how other firms have transformed their culture and processes before embarking on an agile transformational is a common practice.

8.1.2 Executive Support

Executive support for this change is a must (Danoesastro, Rehberg and Freeland, 2018). There are many organizational obstacles to overcome in these transformational initiatives. An agile transformation is an impactful culture change and executive support is necessary to navigate through political challenges that will ensue. This level of change cannot happen without consistent and constant support from executives.

One Canadian bank CIO initiated the transformation by establishing a sense of urgency indicating the status quo was no longer accepted due to decreasing revenues and competitive challenges from FinTechs. A large organizational re-structure followed heralding a new agile culture. He insisted all agile teams be co-located at head office wherever possible and initiated a division wide agile training program for senior managers. Executive communication and town halls emphasized agile project successes and agile organizational adaptation measures; number of staff trained, number of agile projects, etc.

Agile transformations are successful when there is consistent support and committed executives to champion the change throughout the agile transformation and thereafter. Senior executive support, business engagement and thorough change management are essential for agile transformations (Rehberg and Danoesastro, 2018).

8.1.3 Incremental and Gradual Adoption

Incrementally adopt agile practices, through pilots, for learning before establishing agile practices that fit the bank. As BCG article notes that "to fly you need pilots" (Burchardi *et al.*, 2016), meaning that in large banks, pilots are necessary to determine what agile practices will work and which need to be tailored. An important aspect of a gradual agile adoption is that it minimizes the impact of change. It allows the bank to slowly conform to the idea that change is imminent.

No large Canadian bank has adopted a bank-wide approach to agile, rather the adoption is at the divisional level and only where agile practices makes sense. However, all bank participants interviewed note that agile adoptions have started with small projects using exploratory agile principles before establishing those principles as practices. BCG comments that the most effective approach for agile adoptions is through end-to-end pilots with involvement from both business and IT (Rehberg and Danoesastro, 2018).

8.1.4 Co-location

The literature review indicates that agile project team co-location is a best practice (see 3.3.3.1 Flexible Assets and Systems). Banks have established work areas to facilitate collaboration and reduce communication distance. CIBC, BNS, TD and RBC have "digital factories"; dedicated agile collaboration areas outside of the head office environment (Singh, 2016). TD Bank emphasizes co-location of agile teams in their head office although they also have agile teams in Waterloo's CommuniTech startup hub. CIBC has a startup like collaborative presence in Toronto's MaRS innovation hub. Co-location facilitates agile teams comprised of business and technology stakeholders to work collaboratively. R2 and R4 indicate that co-location is still preferred whenever possible as it helps banks move towards a successful agile adoption.

8.1.5 Tailoring

Tailoring the agile practices to fit the bank's organizational structure and needs was indicated as a best practice by the literature and study participants. All banks tailor the agile practices to bridge their culture from plan-based to agile practices. However, deviating too much form agile fundamental practices could be problematic for the success of an agile adoption. The feedback indicates that banks tailor agile principles to fit their needs.

8.1.6 Fixed Sprints

Time boxing sprints is a commonly accepted practice. Although some early agile adoptions had longer sprints of up to 4 weeks, most banking agile projects are using time-boxed 2 week sprints. This is in-line with the agile Scrum recommendation for sprint duration and correlates with the literature reviewed (Burkner *et al.*, 2017)(see 3.2.2 Agile Methodologies).

8.1.7 Ceremonies

Agile ceremonies are being followed effectively with few issues. The daily standup is by far the most commonly followed ceremony across participants interviewed. Participants

indicated that backlog grooming, retrospects and daily stand-ups were being used by their banks. Strong facilitators are needed to ensure ceremonies stay on track. Agile ceremonies are well established practices in Canadian banks and aligns with the practices indicated in the literature review (see 3.2.2 Agile Methodologies).

8.2 Opportunities for Improvement

Participants commented they noted issues with agile adoptions. What banks need to improve upon is discussed below.

8.2.1 Culture

The banking culture is at odds with the startup culture they are trying to embrace. PD commented that *"it is very difficult to change a culture that has been doing waterfall for twenty years and been successful in this comfort zone; why change when we have been successful for so long?".*

Whereas banks have a "never fail" philosophy, startups promote a "fail fast" approach. A fail fast philosophy encourages experimentation and early termination of projects when they no longer meet the client's needs. As well, experimental approaches are encouraged in a fail fast culture. Experiments may fail but the philosophy is to allow failure to occur early on, rather than to let a failing experiment drag on, and to learn from the failure.

Changing the banking culture to use new ways of working has been a challenge. Large Canadian banks have been in existence for over a hundred years and are extremely profitable, so the need to change ways of working is not a burning issue. The research indicates that getting buy-in from business stakeholders and middle management for adopting agile methods is a challenge.

Some bank CIOs have thrust agile methods into their organizations with a philosophy of adapt or leave, resulting in what has been referred to in the literature as “agile victims”: those who cannot adapt to the changing culture and are re-structured out of the bank. ING Bank applied this philosophy in its agile transformation (McKinsey & Company, 2017) resulting in staff re-applying for the new job roles. R3 commented that what worked well when adopting agile practices was *"force and removal of people blocking (change). Agile cannot thrive in a location where people actively fight against process, understanding and accepting change".*

Executives realize that to change the culture requires a new strategy for changing the organization from plan-based to agile methods. As structure follows strategy, these

initiatives result in new organizational roles, processes, policies, work arrangements and reward systems. Getting buy-in from stakeholders for such changes is improved when combined with incremental transformation and planned change management approaches.

8.2.2 Change Management

There is a lack of change management practices to encourage buy-in from senior managers and their staff. A roadmap for change is needed and is often lacking. Transformations are run almost as experiments, fortuitously looking to land on a fit suitable to the bank but resulting in several failed attempts to get it right the first time. Three banks had previously explored agile practices, determined they were not the right fit and found themselves starting anew. One bank was using agile for many years within several divisions but could not scale the practices from projects to programs. Experimentation may be an acceptable approach to find the right balance, possibly even encouraged by executives, but it wastes momentum with false starts and can result in reverting to the comfort zone of previous methods.

Survey question Q42 asked participants what the agile barriers to adoption in banking were. A textual frequency analysis indicated that “change” was the biggest impediment. Popular change management models are John Kotter's eight stage framework (Kotter, 2007) and Kurt Lewin's (Hussain *et al.*, 2016) change process. Kotter’s eight step change management model aligns well with agile transformational strategies and is explained in Appendix J. Well planned and executed change management strategies are needed to gradually change culture.

8.2.3 Executive Commitment

Lack of consistent, on-going executive commitment was mentioned by participants. Momentum can be lost especially when there are executive changes during the transformation. Participants noted that they were not aware of transformation roadmaps outlining the approach for agile adoption. Interview participants noted that strategies and roadmaps were available but were not comprehensive. Executive commitment through frequent communication at town halls, showcasing successes and promoting agile practices was weak. Lack of commitment causes staff to fall back to their comfort zones and legacy practices.

8.2.4 Communication

Communicating the agile transformation is often lacking. Frequent communication on the agile journey where successes are highlighted and organizational progress towards agility

is reported is not well communicated to staff. Town halls, newsletters and CoEs, are methods of communicating and supporting an agile transformation. Identifying champions at the early stages of an adoption that could promote agile practices within the firm is also beneficial.

One bank's communication approach used quarterly town halls where early agile successes were highlighted, scrum masters were invited to speak about their projects and external speakers from the agile community were invited. As well, a monthly newsletter kept everyone informed of agile transformation progress, available training and coaching sessions and agile projects on the go. The communication effort was supported by an intranet site that contained documentation, agile CoE news and upcoming events. Not all banks have sustained this level of transformational journey management.

Well intentioned communication strategies can fall victim to the early adopter syndrome; whereby the first initiatives get all the focus and resources and subsequent initiatives fall short of support. Frequent and timely communication on the agile journey must be a component of any transformation strategy.

8.2.5 Training

Agile training should be provided to all levels and before an agile transformation is enacted. Training was another weak spot identified particularly for Product Owners, business partners and consultants. The study indicated various levels of quality training was available for internal staff and met their needs. However, contractors brought into agile teams didn't receive training and were not knowledgeable of the bank's tailored agile practices.

8.2.6 Product Based Organization

Some banks have started to adopt a "factory" model for product development. This entails adopting a product based versus a functional based organization. A product based organization maintains teams together to work in a structured product release mode, evolving an application over time in a step-wise manner. Examples in banking are teams maintaining mobile applications, on-line trading and banking applications where there is high touch client impact.

Whereas in functional organizations teams are disbanded and returned to their departments after a project completes, product teams remain together for the lifetime of

the product. A factory model is not yet a mature practice at most banks, but is an approach supported by agile software development practices.

8.2.7 Business Engagement

Closer business engagement and alignment on agile projects is needed. In a co-location model the expectation is that the Product Owner is always available to the team. However, in banking this is not always possible as a Product Owner may be in another city or country. Through modern communications such as video conferencing, the distance obstacles are removed allowing business stakeholders to virtually participate on agile teams.

However, despite technical advances to bring business closer to technology teams on agile projects, there is a continued reluctance from business stakeholders to adopt agile methods. One technology executive commented that when adopting agile, his business counterpart was concerned with the approach and emphasized that they would not support him if it failed. Most agile transformations are led by CIOs, however, business engagement is needed on agile transformations. Up-front communication of agile benefits is necessary to get everyone's buy-in.

8.2.8 Management Trust

Interview respondents indicated that management demonstrated trust of agile teams by not interfering in the daily stand-ups or the day to day functioning of the teams. However, legacy reporting requirements are still needed by banking for multiple stakeholders and therefore agile teams were not convinced that management fully trusted them.

The survey feedback indicates that only 37% of respondents agree that management trusted the teams to complete their work without extensive oversight. PC comments that on time and on budget measures are used and this is the nature of public held companies not only banks. Shareholders expect returns, executives expect quantifiable measures of spend, etc. and therefore require frequent timely reports of progress made.

Socialization on the need for banks to have broad reporting requirements should be communicated to staff. As the demand for reporting will not subside, staff attitudes to reporting and oversight should be changed through socialization of the need.

8.2.9 Human Resources Policies

Changes to HR practices for hiring and rewarding staff are needed. Although banks have made the foray into agile software development, the reward systems are still based on

individuals and not teams. Several banks have "Star" awards that reward the work of “heroes” through quarterly awards and year-end bonuses. RBC has a best practice of annually rewarding project teams than solely rewarding individuals.

PG commented that “heroes” have to find a different ways to shine. HR also needs to focus more on candidates with soft skills such as collaboration, teamwork and communication. Agile teams require staff to work closely together and this emphasizes the soft skills more so than technical prowess. Role definitions for agile teams such as Scrum Masters and Product Owners must be created to support a new organizational mindset and structure. The role of the PM in the agile world needs consideration as it is inconsistent across banks. Some banks have replaced the PM role with Scrum Masters, others have retained the PM role alongside the Scrum Master.

8.2.10 Automation

Lack of QA automation and use of continuous integration through DevOps is evident. Most banks have started on the automation path although these are nascent efforts at this time. QA continues to be mostly a manual activity. Some banks have made progress into automating QA regression testing, but this continues to be challenging. DevOps is also new ground for banks especially when adopting a product based model for continuous delivery (Mathaisel, 2013). Some banks claim to be leaders on DevOps use but the interviews indicate that this is a new evolutionary process for most.

The benefits of automated regression testing are relevant as each agile sprint results in an increasing number of test cases. Automation reduces regression testing time but developing automation scripts is costly. DevOps was mentioned as beneficial but not a must have for banks. Agile projects have been successfully delivered without DevOps.

8.2.11 Central PMO and CoE

Participants indicate that banks established agile CoEs to support agile transformations. Feedback indicated that the CoE was critical in starting and sustaining an agile transformation. Where challenges ensued was when the agile CoE and PMO were separate. Even when both were aligned under the Enterprise PMO (EPMO) there was still conflict.

Plan based and agile methods must be supported by the same organization with a clear assessment method to determine what methodology is a best fit for the type of project. No one methodology is a fit for all projects. As Gartner points out, there is room for Mode

1 and Mode 2 methodologies within the same organization. Both plan-based and agile methods must be aligned within the same EPMO, or PMO, organization to prevent cultural dissonance and devolution into methodology silos.

8.2.12 Summary

In summary, banks are using the practices and agile adoption strategies common to other software development firms who have transitioned to agile practices. There are practices which require tailoring due to the organizational structure and the legacy culture of a large bank.

Organizational change, culture, executive communication, training and business engagement are common weaknesses in transformations yet these factors are intertwined and weakness in any one impacts the others. This interdependency is also noted by the AWRM research. All factors must be implemented synergistically for a successful agile transformation.

One Senior VP at a Canadian bank summarized his barriers to agile adoption as follows:

1. Change of mindset.
2. Lack of Product Owner model.
3. Leaning on existing crutches.
4. Luxury of a large profitable bank.
5. Self-imposed bureaucracy with too many processes and signoff.
6. Lack of boldness around expectations.
7. Distinctive competitive advantages other than project delivery.
8. Apathy; acceptance of the status quo.
9. Lack of appropriate premises or workspaces.
10. Getting agreement across multiple parties on new ways of doing things.
11. Momentum; this is the way things are done here! Momentum makes it difficult to implement change.

Agile at his bank is on on-going journey. The barriers noted reflect similar challenges expressed by other practitioners in Canadian banks.

At a March 2018 Systems Thinking Meetup in Toronto, Dr. Bellows (The W. Edwards Deming Institute, 2019) commented on differences between “me” and “we” organizations. Where “we” organizations are more agile, have low tolerance for bureaucracy and limited hierarchy are characteristic of a holacratic organization. By

contrast “me” organizations have hierarchical management structures, bureaucracy, formal roles and are characteristic of large traditional organizations. Dr. Bellows suggested the reason “me” organizations still exist today is due to lack of competition. What holds back "me" organizations is the Taylorist scientific business organization that was created for economies of scale and standardization, rather than agility and innovation (Bauer, 1992).

It is telling that incumbent banks had not changed for years until their payment business was disrupted by FinTech startups. In Wealth Management, banks have been forced to adopt robo-advisors to compete with offerings from startups such as WealthSimple. Canadian banks have been historically protected from competition by regulatory barriers and high capital requirements for entry. Nimble FinTech startups with niche financial product offerings and low regulatory barriers are forcing incumbent banks to wake up and challenge these disruptors.

8.3 Agile Adoption Framework

8.3.1 Introduction

Based on the research conducted through literature reviews, study data analyzed from agile practitioners working in Canadian banks, a framework for a bank adopting agile product development practices is proposed herein.

A global survey on organizational agility; that being the ability to reconfigure strategy, structure, processes, people and technology for agility, is elusive for most firms (Ahlbäck *et al.*, 2017) (see 3.3.5.1 Adaptable Structures, Empowering Organizational Structures). The survey noted that the reason firms have not started an agile adoption is because they lack an implementation plan.

The proposed agile adoption framework consists of five high level cycles; Planning, Initiation, Piloting, Scaling, Sustaining and Optimizing (see 3.3 Agile Adoption Frameworks). Ambler and Lines (2017) proposes a four step approach to implementing change; Prepare, Introduce, Review (learn) and Done (continuously improve). An article on agile transformations discusses a four step approach as: Assessing agile foundations, Experimentation, Scaling-Up and Continuous Evolution (Aghina, Ahlback and Jaenicke, 2018)(see 3.3.2.3 Full Deployment). Another article proposes a three stage approach for transformation: Define the value, Launch, Accelerate and Scale Up (Catlin *et al.*, 2017).

One firm's approach to adoption is also based on a four phase approach; Initiation, Planning, Execution and Closure with further sub-phases for each (Deloitte, 2017).

Most agile adoptions follow a stage model. A sense and adapt model at the last stage ensures that agile practices continuously evolve to meet changing requirements. The staged adaptation process follows Deming's four phases; Plan, Do, Study and Act (Deming, 2016).

Kotter's eight step change model is used in this framework as a guideline for change management. Change management is a multi-stage approach for ensuring that programmatic changes are implemented systematically and that lasting change is achieved (Foster, 2013). Kotter's model provides a roadmap for guiding organizational change initiatives (see 3.5.4 Change Management Strategies). Kotter comments that management does not realize transformation is a process and not a one-time event. Each stage builds upon each other and it takes years to achieve change. Management, in search of visible quick wins, often accelerates the change process by skipping stages (Kotter, 2007). As a result, most change initiatives generate only lukewarm results or fail miserably (Kotter, 2007).

Kotter's change model is particularly applicable for this framework as it defines a change process that is suited to an evolutionary change philosophy. Kotter's change stages are defined here as K1 through K8 (Figure 8-1). Appendix J provides more detail on each stage.

Agile maturity models are used by some banks. Those familiar with Carnegie Mellon's Software Engineering Institute five step Capability Maturity Model for assessing an organization's project management maturity (Paulk *et al.*, 1993) can relate to KPMG's five step model for agile maturity (KPMG, 2015) used here (see 3.3.4.1 Agility Benchmarking). It is a suggested model for assessing an organization's agile maturity as the transformation progresses from pilots to sustainable project practices. TD Bank uses a similar five step model for assessing their agile project teams as a way to identify opportunities for additional coaching. KPMG's maturity model is defined here as levels L01 through L05 (Figure 8-1). The levels are explained in more detail in Appendix K.

For the remainder of this chapter references to an agile PMO denote either an agile CoE or an agile PMO; the terms are interchangeable. The survey indicated that 34% of survey participants held Scrum Master Certifications, the highest percentage of all certifications

listed (see 6.1.1 Survey). As with the literature review, Scrum continues to be the dominant agile foundational methodology in Canadian banking.

The following sections explain each agile adoption stage in more detail. Figure 8-1 introduces the agile adoption framework at a high level and how the best practices map into each stage.

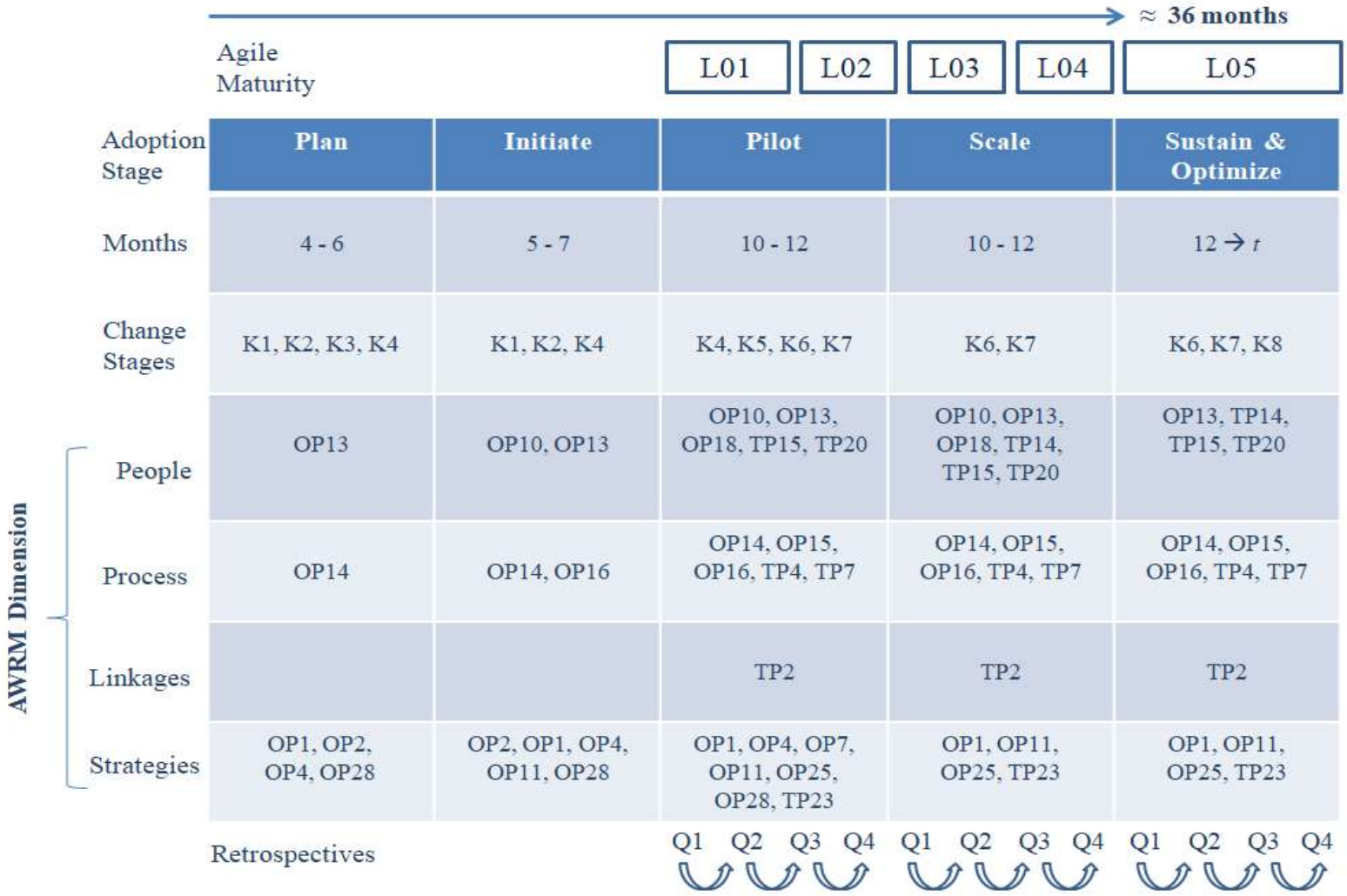
8.3.2 Change Management Approach

The agile transformation for any bank must be tailored to accommodate the bank's culture and processes (see 3.3.4.3 Aligned Suppliers, Regulated Industries). The agile practices defined in the early planning stage will evolve through the transformation and may not be the same practices by the Sustain and Optimize stage. The requirements that ensure a successful agile adoption may be unclear at the beginning of the journey.

Agile approaches are useful when project requirements are changing and ambiguous. There are similarities between running an agile project and an agile transformation. In both cases, the requirements are not clear at the start and the end state may not be what was envisioned at the start. If the transformation is regarded as a project unto itself, then as with any project, there is high uncertainty at the start and chances of success are low. As uncertainty increases so too does the risk of rework and the need for a different approach (PMI, 2017). An agile transformation should follow an incremental approach, much as one would run an agile project.

A fully experimental transformational approach without prior planning is not recommended and can result in chaos due to high outcome uncertainty. Up-front planning reduces risk by lowering the level of uncertainty and moving the arrow from chaos to the complex (Figure 8-2). A balance must be achieved between planning the transformation journey too much and not enough. The transformation strategy should balance “goal directedness” and experimentation, which is constantly assessed to ensure the organization is progressing towards the goal (Reeves, Levin, *et al.*, 2018) (see 3.3.2.3 Full Deployment, Corporate Culture Impediments). Most organizations assume that agile adoptions can be achieved in little time (Freeland, Danoesastro and Rehberg, 2018). They tend to overlook the fact that leaders have spent years in planning and executing the agile journey. The key to avoid agile traps is good planning and better execution (Freeland, Danoesastro and Rehberg, 2018).

Figure 8-1 - Agile Adoption Framework

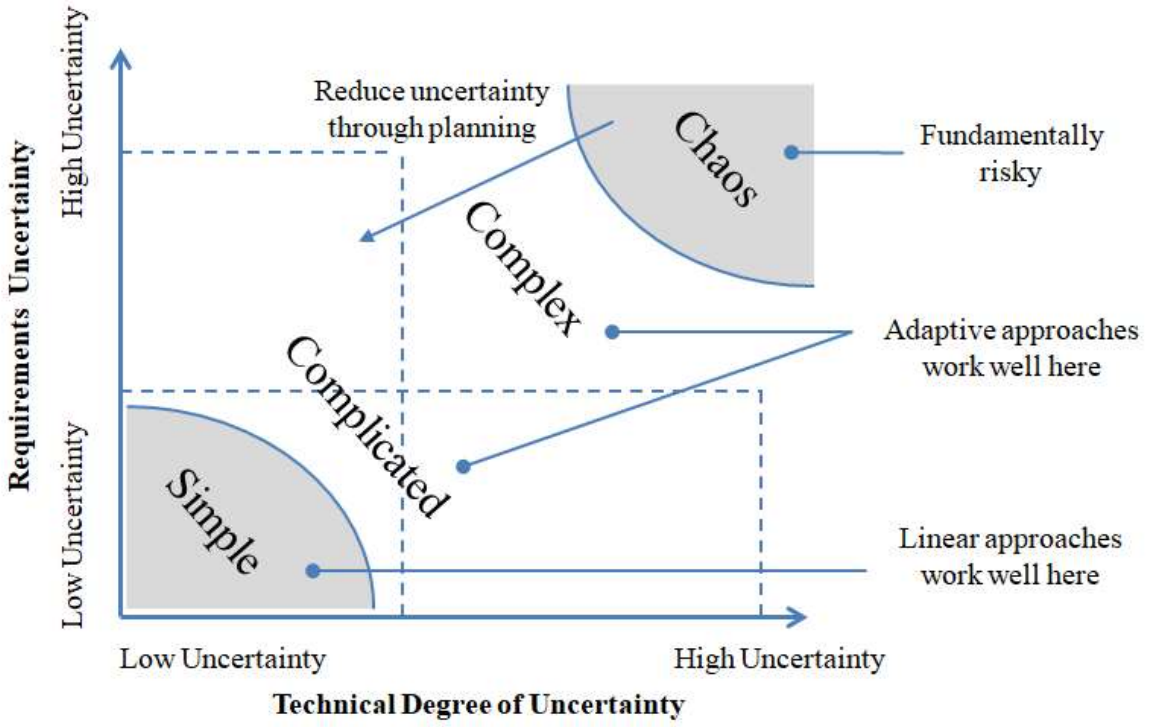


Source: Author (2018)

Agile practices are ideal for projects with high uncertainly. One way of viewing the transformation is to consider each change stage as a series of sprints. When starting initiatives with inherent high uncertainty, it is recommended to decompose the initiative into smaller incremental steps (PMI, 2017).

As with agile practices, a retrospective is held after each stage and the feedback used to improve the next stage. As well, the practitioner must have a definition of "done" for each stage. The definition should apply at the LOB level, as the entire bank may not be in lock-step as regards agile transformation progress. Some areas will progress faster than others. Definition of “done” defines when the activities of one stage completes and the transformation can move to the next stage.

Figure 8-2 - Uncertainty and Complexity based on the Stacey Complexity Model (Stacey, 1996)



Source: Author (2018), adapted from PMI (2017)

A change management strategy has a clear idea of the end and the means to achieve it (Reeves, Levin, *et al.*, 2018). It is a planned journey which is predictable, comprehensible has a series of actions and milestones to meet the aim and is easy to communicate to employees. In practice, the best plans run into barriers and unforeseen complications which

require flexibility to overcome. An overly rigid planning approach can be detrimental to adaptive and experimental strategies. The proposed agile change management framework herein, leverages concepts from a (Reeves, Levin, *et al.*, 2018) strategy which recommends the following 11 practices:

1. Describe the overall vision.
2. Communicate the vision widely and persuasively.
3. Define the success metrics that follow from the vision.
4. Set and track milestones.
5. Define the change into stages.
6. Define clear accountabilities at each stage.
7. Manage the change centrally from a program office against the plan.
8. Pilot with an end-vision of scaling the practices.
9. Encourage a culture that values experimentation and learning over prudence.
10. Adopt a systematic approach to learning and practices improvement through feedback loops.
11. Learn from other organizations that have undertaken similar agile transformations.

8.3.3 Stage 1 - Planning for Change

8.3.3.1 Introduction

The planning phase considers the best practices and activities required for planning an agile transformation. This phase is about planning the change than actually performing the change. Activities such as setting the vision for change, identifying what LOBs would be best first adopters, socializing the change with business and technology groups, selecting consulting or coaching partners to assist with the agile transformation and planning for the agile CoE / PMO are some of the activities. A concise and clearly thought out plan provides an initial roadmap for transformation, with the understanding that this plan is fluid and will evolve over time to consider the bank's culture and processes. One of the study participants (RS17) commented that successful agile adoptions were those that did not overly deviate from foundational agile principles. An article noted that;

"the transformation must be well thought through and carefully planned, but leaders must also be open to modifications along the way" (Danoesastro, Rehberg and Freeland, 2018, p. 1).

Decisions on whether the agile adoption is supported by the central PMO or a dedicated CoE are made at this stage. The number of staff, full time and contract, required to support the transformation are decided along with who provides the training and the level of training required. The detailed planning and sequencing as to when to bring in an external agile transformation partner, when to staff the agile CoE, how many staff and many other decisions are components of this planning stage.

Participant feedback indicated that agile transformations seem to be run as experiments, lacking up-front planning. Extensive up-front planning is an agile anti-pattern and perceived as something that can be skipped in favor of feeling one's way through the adoption. However, lack of planning can result in failed transformational attempts, lost effort and entrenchment of the status quo.

Agile transformations are often thrust into banking divisions by their CIOs. The ensuing organizational changes to structures and roles are disruptive. The first two stages of this framework emphasize a heightened level of planning, socialization of the change and training prior to executing agile projects. A lack of a visible transformational strategy, agile roadmap and adequate training were weaknesses highlighted by participants.

Executive support and commitment is key at this stage. The executive leading the transformation must consider the organization's adaptability and readiness for change, develop a formal structured transformation program and articulate a compelling purpose to drive the transformation (Burkner *et al.*, 2017) (see 3.3.2.2 Strategic Commitment).

8.3.3.2 Best Practice Mapping

The best practices aligned to this stage are OP1, OP2, OP4, OP13, OP14 and OP28. Using Kotter's eight stages for leading change; K1 through K4, are applicable.

OP1 is the requirement for executive support for making the change from established practices to agile. This support is required as there are many challenges on the transformation journey. An executive will have position power to force the required organizational change.

One article suggests that assigning the transformation to a new executive improves the chances of success (Reeves, Faeste, *et al.*, 2018) (see 3.3.2.3 Corporate Culture Impediments). The authors suggest that new, external leadership improves the odds of transformation success. Bower wrote;

"Insiders know the company and its people but are often blind to the need for radical change. Outsiders see the need for a new approach but can't foster change because they don't know the company or industry sector well enough" (Bower, 2007, p. 1).

Another article on CEO involvement in agile transformations commented that:

"CEOs need to recognize that agile transformations almost certainly require at least some changes in the composition of the leadership team. These are tough decisions because the executives in question haven't done anything wrong" (Danoesastro, Rehberg and Freeland, 2018, p. 1).

At TD Wealth Management, the incumbent CIO was replaced prior to its agile transformation. The literature notes that real process change requires a break with the past (Mathaisel, 2013). These change decisions, although disruptive, send a clear message to others who may be sitting on the fence (Danoesastro, Rehberg and Freeland, 2018).

Executive support is a component of Kotter's change management step K2 wherein Kotter suggests that a powerful guiding coalition is needed to guide the change. Assembling a team with shared commitment for change and with the requisite power to make the change is critical. Kotter's K3 stage of change suggests that a vision be created to guide the change effort and to develop strategies for realizing the vision; this is a pre-condition to initiating change.

OP2 suggest a sense of urgency be created as a catalyst for change. This corresponds with Kotter's K1 change stage which also defines the need for creating a sense of urgency. At TD Wealth Management this sense of urgency was established by the incoming CIO as a need to change product development to adapt to a faster competitive FinTech environment.

OP4 defines the need for intensive communications and having a communications strategy. As this stage the communications strategy needs to be defined and socialized with executive level stakeholders. For this stage, the communication will target senior stakeholders rather

than line managers and their subordinates. Kotter suggests that the vision must be communicated and to use every possible vehicle to communicate the vision and strategies for achieving it.

OP13 is a best practice on training and the need for differentiated training to executives, line managers and agile teams. A comprehensive training program must be planned at this stage so that it is ready for execution at the next stage. Comprehensive on-going training involving both business and technology stakeholders was identified as a best practice requiring improvement.

OP14 suggests that tooling for automation should be in place. At this stage tools should be planned to facilitate agile story tracking and management reporting. This phase defines the planning for and acquisition of tools. Automated QA testing facilitates rapid product delivery. Tools for managing user stories, agile portfolios and KPI reporting should be considered. DevOps is an aspirational end-state and many banks are on the journey to maturity. Introducing DevOps as part of a transformation may cause more process chaos and should be considered once the organization is agile mature.

OP28 denotes that the transformation should be a gradual and incremental process. Planning, stakeholder analysis, communications strategy and assessing the firm's environment for change are best practices in this stage. For example, the bank may want to evolve the organizational structure into a product based model from a current functional model. This end state may be feasible once agile teams are mature but could cause chaos if too many changes are introduced early on.

8.3.3.3 Suggested Activities

The following are a list of activities suggested for this phase. This is not a comprehensive list, but provides an initial sample of activities to be considered for each dimension.

Table 25 – Stage 1: Plan the Change

Aim	The aim of this phase is to create the future state vision of the agile transformation by developing an implementation strategy.
Strategy	1. Executive support and long-term commitment for change.

	2. Create the Transformational roadmap. 3. Clearly articulate vision statement; e.g. define the Future State Vision. 4. Create a communication plan. 5. Identify which LOBs are more accepting of change as a basis for initial adopters. 6. Incremental funding model adopted for agile projects (quarterly funding vs. annual funding).
Process	1. Journey map for each stage. 2. Measures (KPIs) for agile transformation success have been defined (number of teams trained, number of pilot projects completed, reduced lead time, rate of velocity improvement, etc.). 3. Funding estimates for next stage and full agile transformation. Transformation initiative funding should be provided at the CIO level and not left for LOBs to fund. Change needs to start at the center. 4. Define agile practices to meet the bank's needs; minimum project artifacts, yet meeting audit and regulatory requirements. 5. Adopt baseline agile practices (SaFE, LeSS, Scrum, etc.) for tailoring to the bank's environment. 6. Plan for physical environment changes to improve team collaboration. 7. Select and purchase agile tools for story management, sprint planning, velocity tracking and burn-down reporting (e.g. Jira, Confluence, VersionOne, SharePoint, etc.). 8. Create an agile / plan-based project selection criteria (methodology fit assessment matrix).
Linkages	1. Select and engage an agile transformational partner (e.g. McKinsey & Company, KPMG, Deloitte, etc.) for guiding the change journey. 2. Engagement of Finance, Operations and Control Functions such as Audit and Information Security in proposed agile approaches and artifacts. 3. Human resources defines roles, supports the re-organization and suggests hiring criteria for agile teams.

People	1. Decide on CoE / PMO staff roles and numbers. 2. Identify early stage LOB staff champions. 3. Human Resources defines roles and responsibilities for agile teams.

8.3.4 Stage 2 - Initiate Change

8.3.4.1 Introduction

This stage follows from the Planning stage and shifts the transformation from planning to leading it (Burkner *et al.*, 2017). The key to initiating this change is to raise awareness of agile fundamentals by using every possible channel for communicating it. By this stage the bank should have initial agile practices which are tailored to the bank's requirements and culture.

8.3.4.2 Best Practice Mapping

The best practices aligned to this stage are OP1, OP2, OP4, OP10, OP11, OP13, OP14, OP16 and OP28. Using Kotter's eight stages for leading change; stages K1, K2 and K4 are applicable.

OP1 is the requirement for executive support for augmenting established practices with agile principles. To initiate the change for adopting agile practices a powerful executive champion is needed; more so at this stage where the change now actually starts to impact stakeholders. As with the previous stage, a powerful guiding coalition is needed to continue the change according to Kotter’s K2.

OP2 suggest a sense of urgency be created as a catalyst for change. This needs to continue through this stage and the vision be explicitly communicated to all staff and senior managers that the status quo is not an option. Organizational change management is key at this stage and must take into account the pace of change and disruption it may cause to staff with in-progress projects and day to day activities. The organization should also consider what time of year is least disruptive to initiate this change. This step continues to align with Kotter's K1 stage insofar as a sense of urgency is needed to convince management of the need to change.

OP4 defines the need for intensive communications and having a communications strategy. Kotter's K4 stage emphasizes that every possible vehicle must be used to communicate the

vision and strategies for achieving it. Executives must use every opportunity (town halls, e-mail, events) to champion the need for change.

OP10 suggests identifying champions that are accepting of agile practices to act as agile evangelists and mentors. Management should identify internal agile champions and consider using them as future coaches or to initiate agile supporting Communities of Practice (CoPs). This aligns to Kotter's stage K2 recommendation which is to assemble a group with shared commitment to lead the change. An agile adoption has better chances of succeeding if introduced into a group that is accepting of change rather than one that resists change.

OP11 recommends that an agile CoE or PMO function be established to guide a successful agile adoption. The participant feedback indicates that an agile PMO is critical to the success of sustaining an agile transformation. The PMO needs to be staffed with experienced agile practitioners in this stage. Some banks augment the PMO's full time staff with external experienced agile consultants.

OP13 is a best practice on training and the need for differentiated training to executives, line managers and agile teams. Training is provided to stakeholders on the tailored agile principles. The proposed agile practices are documented, tested during this stage and stable by the Sustain and Optimize stage. The agile practices will evolve through the various stages. At BNS, a half day orientation was held for executives. An external training firm provided Scrum Certification training to agile project teams, until BNS could develop its own curriculum. RBC's agile transformation created an internal certification program for training staff. The two day course was based on a Scrum Master Certification outline. After the course, participants wrote an exam and received a certificate of competency.

Executive education on agile principles is required. The research indicated that senior managers could be the biggest obstacle to adopting agile in teams because they did not understand it. Training is focused on agile teams who need to master agile practices and supporting tools. Team members are trained on the use of agile tools to manage user stories, plan sprints and provide management metrics/KPIs on progress (velocity, burn-down charts, etc.).

The study indicated that on-going training of both technology and business stakeholders was weak. A comprehensive training program is a necessity for entrenching agile practices.

Training is needed for new hires as staff turnover of experienced agile practitioners is inevitable.

OP14 suggests that tooling for automation should be in place. Tools should be provided for agile story tracking and facilitate management reporting. Most agile transformations start without tools. At TD and RBC, Excel was initially used for user story tracking. Kanban boards on walls were used for tracking project progress. Confluence and Jira are popular tools used by most banks.

OP16 suggests that established agile practices should be used. The research indicates that the majority of banks are using Scrum principles that are then tailored to fit the bank's project management processes. Scrum Master Certification, and PMP, were the predominant certifications study participants held. This is not surprising as most banks start with Scrum principles. The bank's foundational agile methodology must be defined early on in this stage so that training can be developed.

OP28 denotes that the transformation should be a gradual and incremental process. A gradual adoption approach of adapting and observing continues through this stage and is fundamental to this framework for process improvement.

8.3.4.3 Suggested Activities

Table 26 – Stage 2: Initiate the Change

Aim	The aim of this stage is to initiate the agile transformation.
Strategy	Intensive communications: town halls, e-mail campaigns and events are used by executives to communicate the agile transformation.
Process	1. Train business, technology executives and senior managers on agile principles. 2. Train line managers and project staff on agile principles and the bank's own tailored agile practices. An assumption is that the agile transformation starts at the LOB level first before being deployed to the wider bank. 3. Product Owner (business) and Scrum Master (technology) training is provided for those LOBs adopting Scrum practices.

	4. Measures to track what percentage of staff have been trained (KPIs). 5. An agile framework is available to be used by pilot projects in the next stage. 6. Allocate funding to support the next stage. Pilot project funding should come from the business but supplemental funding must come from the agile transformational PMO for training and providing Scrum Masters and coaches to projects. Initial projects should not be burdened with transformational overhead costs.
Linkages	Identify where to source agile coaches for the next stage.
People	1. The agile PMO is staffed with an experienced agile leader and a small number of agile coaches to support the pilots (one coach can support 3 to 4 agile pilots). 2. Agile teams are trained on the bank's agile methodology.

8.3.1 Stage 3 - Pilot the Change

8.3.1.1 Introduction

This stage uses small projects, with minimal external dependencies, to pilot the agile practices defined in the Planning stage and communicated in the Initiation stage. One firm refers to these initial exploratory pilots as "lighthouse" projects (Catlin *et al.*, 2017). This stage evaluates the organizational changes related to co-location, new roles, processes and tools to ensure that what was planned will work in practice.

The reason for this stage is to ensure the agile practices, training and coaching provided to agile project teams enable them to successfully deliver projects. The aim of the pilots is to evaluate and evolve the bank's tailored agile practices, training and project execution. PG's bank piloted their agile framework for almost one year.

The pilot projects should be self-contained to one agile project team with minimum to no external dependencies. Multiple pilots can run concurrently within an LOB. It is important that early stage pilots are not hindered by dependencies on non-agile teams. The author observed that on one project, there was frustration due to a dependency on an external vendor

whose SLA for a response to queries was two days; an excessive amount of time to for a time-boxed agile project. Only a small suite of projects may qualify for agile pilots within an LOB. The agile team must first develop execution competence before engaging projects with dependencies on non-agile teams. As previously noted; “to fly, you need pilots”.

The participant feedback indicates that agile coaches are an important aspect of an agile adoption and need to be engaged to support early adopter pilot projects. Feedback from participants indicates that an experienced coach can support 3 to 4 small agile projects.

Retrospectives are an important component of agile projects during this stage for both the client and the PMO. The agile PMO reviews the feedback from team retrospectives conducted after each sprint. The feedback indicates what is working well and what challenges are being experienced by early adopters.

8.3.1.2 Best Practice Mapping

The best practices aligned to this stage are OP1, OP4, OP7, OP10, OP11, OP13, OP18, OP14, OP15, OP16, OP25, OP28, TP2, TP4, TP7, TP15, TP20 and TP23. Kotter's change stages K4 through K7 apply here.

OP1 is the requirement for executive support for making the change from established practices to agile. Executive support for the agile transformation must continue through this stage to prevent agile teams from falling back to their comfort zone.

OP4 defines the need for intensive executive level communication. Kotter's stage K4 of change emphasizes that every possible vehicle must be used to communicate the vision and strategies for achieving it. Meaningful executive support and communication for the change through pilot projects is required. At RBC, the CIO challenged LOB executives to identify and initiate at least one agile project in their area.

OP7 suggests that pilot projects be used to experiment which practices work best and which need to be tailored to the organization. The projects should start with small teams of 5 to 9 staff and be self-contained with few external linkages. Develop the culture and best practices on small projects before considering scaling to practices such as Scrum of Scrums (Burba, 2015).

Kotter's stage K5 suggests that systems or structures undermining the vision should be removed. Taking risks, encouraging non-traditional ideas, activities and actions are encouraged at this stage. PC indicated that agile pilot projects were successful at his bank only by breaking all the existing rules. New processes and practices were used that contradicted established plan-based practices.

OP10 suggests to use experienced staff and coaches for early stage projects. Experienced staff and coaches are needed here as these pilots need every chance of success to build short term wins and build momentum for the next stage. Team members will already be trained by this stage but the role of experienced staff and coaches should not be underestimated as pre-requisites for ensuring pilot project success.

OP11 proposes that an agile CoE or PMO function is needed to guide a successful agile adoption. The agile PMO is critical at this stage as it will provide the resources (coaches, guidelines, etc.) to support agile pilots. Feedback from several study participants indicated the PMO was critical to the agile adoption. An integrated agile and traditional project PMO resulted in less conflict.

OP13 is a best practice on training and the need for differentiated training to executives, line managers and agile teams. The training must be in place for this stage, particularly as new people may join the agile pilot. Coaching support as a follow-up on the training is required. Agile project coaches must be available to provide guidance to newly trained practitioners. Coaches can guide agile teams on overcoming barriers and play an important part of the sense and adapt feedback loop. They provide on-going feedback to the PMO on the challenges experienced by pilot teams so the PMO can adapt its training and practices to correct for any shortcomings.

OP14 suggests that tooling for automation should be in place. Some level of tooling should be in place to support agile pilots. As previously mentioned, some banks start with rudimentary sprint planning and burn down chart tracking through Excel and Kanban boards. Another aspect of automation is automated regression testing. Each sprint creates new application functionality. As the application complexity increases the number of regression tests increases with every sprint. Without automation, the manual regression testing effort can easily outpace an entire sprint.

OP15 emphasizes frequent client demos to gather feedback and correct deviations. This is the basis of a sense and adapt philosophy. Project demos gather early stage feedback from clients on product development. Retrospect meetings gather feedback for process and practice adjustments.

OP16 suggests that established agile practices should be used. At this stage tailoring of the selected practices is possible as feedback from agile projects may require further tailoring of the agile practices. One participant cautioned that overly changing agile foundational principles was a reason for agile adoption failure at some banks.

OP18 encourages the creation of CoPs to promote agile successes, share learning and offer support. The CoPs in the Pilot stage are useful for providing peer practitioner support for agile team members and newcomers to the agile practices. The feedback indicates that CoPs are important for supporting the agile adoption. They are most effective during the early stages of adoptions.

OP25 states that management must empower the teams to do their work without constant direction. However, the feedback indicates that in banking, oversight for either plan-based or agile projects is the same. The nature of a regulated public organization is such that a high degree of management reporting is required and this should be assumed to be the norm. TD Bank retains the PM role in agile projects for management reporting and managing the budget.

Agile coaches and Scrum Masters should communicate any issues to their management rather than giving management direct oversight of agile teams. The pilot projects are valuable for ensuring management receives the reporting they need and empowers the teams to deliver their projects.

OP28 denotes that the transformation should be a gradual and incremental process. The basis for this framework is an incremental staged approach to agile transformation using pilot projects. Kotter's stage K6 suggests to plan for and create early wins. The intent of the Pilot stage is to test the bank's agile methodology under practice and gather feedback for improving the practices. Achieving early wins is important for ensuring acceptance of the agile practices. Using experienced resources and coaches improves the odds of success.

TP2 denotes that close client interaction is required with the client on site. In the case of banking, the proxy client is the Product Owner. Technology improvements in video conferencing and instant messaging reduces the need for on-site Product Owners. The Product Owner needs to be available to the agile team, especially during this phase where business and technology are learning new ways of working. When possible, it is preferred that a Product Owner be on-site.

TP4 suggests that agile projects use incremental product releases made possible through continuous integration and daily continuous builds. If the bank already has established DevOps practices and tools then these can be part of the Pilot stage. For those banks that don't yet have DevOps practices in place, adding this level of complexity to a Pilot stage introduces risk. DevOps is therefore recommended only for banks who already have a mature practice. The research indicates that DevOps is a nascent practice in banking and most have not yet achieved a level of maturity that can be widely applied. A subset of DevOps inspired practices may be more suitable as a start.

What can be practiced at the Pilot phase is incremental releases through MVP. MVP does not require DevOps but does require a principled incremental product delivery model whereby new functionality is released incrementally, not in weeks, but perhaps in months.

TP7 recommends that agile projects allow time for code remediation and to avoid excessive technical debt when building applications with a long life cycle. Pilot phase projects should prioritize defect remediation over new functionality. Excessive technical debt should not be carried from sprint to sprint as excessive code remediation effort at the end can delay project completion.

TP15 notes that the Product Owner be committed to devote a high percentage of their availability to the project. This is similar to TP2 insofar as the Product Owner must be available to the agile pilot project team. This is a requirement for the Pilot stage as it is for all subsequent stages. Product Owner participation is a key requirement for successful agile projects. Some project selection methods will not qualify a project for agile execution if the Product Owner cannot guarantee dedicating a high percentage of their time to the project.

TP20 requires that project stakeholders participate in daily stand-up team meetings. With small teams daily stand-ups should not exceed 15 minutes. Initial pilot project teams are

small and the daily stand-ups are a required ceremony. Business participation in daily stand-ups is essential to observe agile ceremonies in practice and improve collaboration with technology teams.

TP23 recommends that project delivery success measures be used. Quantitative and qualitative measures are collected at the end of each pilot project to assess success. One qualitative measure for pilot success is client satisfaction with the end product. However, banking remains entrenched in quantitative measures. On time, on budget and quality measures are still required by management and should be accepted as the nature of running projects in banking. Agile project team metrics such as velocity should be captured periodically during the project. Qualitative client satisfaction measures should also be valued as a project can meet all quantitative criteria yet not satisfy the client's requirements.

Kotter's K7 stage is about consolidating improvements and producing more change. The improvements to the bank's tailored agile practices are captured during the pilot stage to prepare the transformation for larger projects. As Kotter points out, credibility from these early wins improve systems, structures and policies underpinning the vision.

8.3.1.3 Suggested Activities

Table 27 – Stage 3: Pilot the Change

Aim	The aim is to evaluate and evolve the bank's agile practices, training and project execution.
Strategy	1. Define qualitative and quantitative project success measures. 2. Define what measures are needed for tracking progress on agile teams (KPIs). 3. Define measures to assess an agile team's level of practice maturity. KPMG's five levels to maturity is a good basis to follow for those banks already comfortable with CMM like maturity models (KPMG, 2015). TD Bank uses a file level agile maturity model similar to KPMG's. 4. Create management reporting standards for agile projects. 5. Agile practices are improved based on feedback from Pilots.

	6. Schedule periodic stakeholder management reviews to ensure new practices are meeting expectations of quality and speed. 7. Executives use town halls, e-mail campaigns and events to communicate the success of agile pilot projects.
Process	1. Provide Pilot project artifacts to Audit and Governance teams to ensure satisfactory compliance with bank policies. 2. Agile practices are improved based on feedback from Pilots. 3. Agile training is improved from feedback and available to all staff. 4. Agile project success is measured through KPIs.
Linkages	Consulting firm partner assists with guidance and oversight of pilot projects.
People	Agile CoE / PMO is staffed to support initial agile pilots.

8.3.1.4 Agile Maturity

Using KPMG's (2015) maturity model, this stage should develop agile teams into levels L01 and L02. L01 involves the planning of agile pilots and requirements; this is the first step and draws on the work performed in the previous two stages. At L02 requirements engineering, collaboration and planning practices have improved. Project retrospectives conducted after each sprint provides feedback for improving team practices. PMO led quarterly retrospectives, with collected agile pilot feedback, is documented and practices applied to future projects.

As the pilot stage can last up to twelve months, it is necessary that the PMO review the feedback from agile teams every quarter and adjust the agile practices to correct shortcomings. In effect, every quarter is an agile retrospective to review what practices are working well and which need remediation. Waiting until the end of a stage to remediate guidance from lessons learned is too late. A periodic sense and adapt strategy through quarterly retrospectives is recommended, thus ensuring agile practices continue to meet the bank's agility aims.

8.3.2 Stage 4 - Scale to Larger Projects

8.3.2.1 Introduction

The Scaling stage is a continuation of the piloting phase but with larger projects. A larger project is composed of multiple agile teams whereas the pilots are smaller self-contained teams. A project with multiple teams requires new ways of breaking down the work into sub-teams with multiple scrum masters. A typical large agile project structure in banking is based on Scrum of Scrums; multiple small agile teams each with a Scrum Master. Consultancies refer to these smaller agile project teams of 4 to 7 people as Pods (PwC, 2014).

The challenge with larger projects in banking is dependencies on other parties; internal non-agile teams and external vendors. These parties are often not agile and can impede project agility if sprint planning does not account sufficient contingency for timely delivery of their components.

Project teams within an LOB have their own priority work and requests from other projects. Supporting new agile projects may not be a priority for them. Banks are a collection of silos that co-operate to deliver client value through their products and services. Agile project teams in banks must cooperate with other teams who don't follow agile principles and are not necessarily in lock-step with their project schedules.

8.3.2.2 Best Practice Mapping

The best practices aligned to this stage are OP1, OP10, OP11, OP13, OP14, OP15, OP16, OP18, OP25, TP2, TP4, TP7, TP14, TP15, TP20, TP23 . Using Kotter's eight stages for leading change; stages K6 and K7 apply here.

OP1 is the requirement for executive support for making the change. Executive support is not as intense as at the beginning of the transformation but the support must be visible to get the participation of non-agile teams and continue momentum on the transformation.

OP10 suggests to use experienced staff and coaches for early stage projects. Experienced staff and coaches are needed as the practices are scaled up. Team members are trained by this stage but experienced staff and coaches are needed to successfully scale the practices to coordinate the work of multiple project teams. Not succeeding in scaling agile practices may result in teams falling back to traditional program management practices.

OP11 denotes that an agile CoE or PMO function is needed to guide a successful agile adoption. The agile PMO is critical as it needs to provide the resources (coaches, guidance, practices, etc.) to support a scaling effort. Coaches with experience on larger agile programs are required here.

OP13 is a best practice on training and the need for differentiated training to executives, line managers and agile teams. As the agile practices are applied on larger projects, training on managing programs versus projects is needed for business, technology managers and their teams. As well, continued training on the bank's agile practices must be in place as new people join agile teams.

OP14 suggests that tooling for automation should be in place. As agile projects scale into programs, tooling is a must to manage sprint planning, a larger number of user stories and progress tracking across multiple teams. Additionally, automation of QA regression testing at this stage is a must. Whereas tools such as Jira may work well for managing agile projects, a bank may want to invest in agile portfolio management tools for large programs.

OP15 emphasizes frequent client demos to gather feedback and correct deviations. This requirement applies to this stage and subsequent stages. Retrospectives, daily stand-ups and client demos are agile ceremonies that should be entrenched team practices.

OP16 suggests that established agile practices should be used. In this stage, further tailoring of agile practices may be required to accommodate any issues that arise from running larger agile programs. However, a tectonic shift away from base agile principles is not recommended.

OP18 encourages the creation of CoPs to promote agile successes, share learning and offer support. The CoPs are influential at the start of the stage to support the scaling of practices to the program level. However, CoPs are a lesser priority as agile practices mature upon completing this phase. CoPs when sustained at later stages, can be valuable as knowledge sharing communities for new employees.

OP28 denotes that the transformation should be a gradual and incremental process. As with the pilot stage, scaling up to larger programs should start with a limited number of large projects. Failure to meet client requirements for a program is far more costly and impactful

than for a pilot project. Hence, the number of initial agile programs should be the small in size and cost where new approaches can be tried and failure does not result in excessive risk to the bank. For example, banks should avoid regulatory, strategic or time sensitive projects to experiment with scaling. Tactical programs are preferred over large strategic initiatives to lessen the impact of failure. Kotter's K6 stage recommends to plan for and create short term wins. Program level agile initiatives should demonstrate success quickly.

TP15 suggests that the Product Owner be committed to devote a high percentage of their availability to the project. This becomes more critical at the program stage as there are more teams and communication touch points needing access to one or more Product Owners.

The best practice OP25, TP2, TP4, TP7, TP20 and TP23 as described in previous sections remain constant in this section. For brevity, they are not be repeated here. This stage carries forward the practices applied in the previous stage.

Kotter's K7 stage is about consolidating improvements and producing more change. This applies to the lessons learned during this stage which are incorporated as practices into the bank's agile methodology playbook.

8.3.2.3 Suggested Activities

Table 28– Stage 4: Scale to Larger Projects

Aim	The aim of this stage is to scale the agile practices for use on larger projects and programs. This stage builds upon agile practices developed during the pilot stage and uses such practices as a foundation for scaling.
Strategy	1. Use small programs to test scalable agile practices. 2. Lessons learned from larger agile projects are incorporated into the CoE agile practices. 3. PMO defines, adopts or tailors a program level agile methodology (LeSS, SaFE, etc.) that can be applied bank-wide.
Process	1. Updates to agile practices are documented and socialized with agile teams. 2. Updates to agile practices are embedded in the Agile CoE playbook. 3. Tools are available to support larger agile projects. 4. Management reporting is updated for large projects. 5. The agile training curriculum is updated with guidance for large projects. 6. Agile program success is measured through KPIs, including qualitative factors.
Linkages	1. Consulting firm partner assists with guidance and oversight of large project initiatives. 2. Define a contracting strategy for third party service providers that is tailored for agile delivery (Office of the Inspector General, 2018).
People	1. Coaches with large project experience are hired. 2. Agile teams are trained on scaled agile principles.

8.3.2.4 Agile Maturity

By this stage, the agile practices are developing into maturity levels; L03 (being agile) and L04 (thinking agile). At an L03 level, the bank will have completed the following;

1. Agile planning and requirements practices are mature and documented (KPMG, 2015).
2. Agile process, roles and responsibilities are defined at the enterprise level.
3. Working software is delivered frequently and reviewed by sponsors.
4. Business and technology collaboration practices are mature.

It is normal at L03 that agile teams struggle with issues such as large program scaling strategies and working with distributed agile teams. At the L04 level the bank will have achieved the following four milestones;

1. Agile project measures (KPIs) are defined at the enterprise level and tracked by project teams.
2. Automated testing is in place.
3. Agile teams are more empowered and rewarded.
4. Focus continues on scalability.

8.3.3 Stage 5 - Sustain and Optimize the Practices

8.3.3.1 Introduction

This is a continuous improvement stage in perpetuity whereby the LOB now has tailored the agile practices through several small and large projects. However, as with the pilot stage, the PMO must continuously sense the feedback from agile project team retrospectives and optimize the practices to remediate any shortcomings. This is a perpetual stage of continuous improvement and never achieves a steady state; it is the new normal. The aim of this stage is to sustain the bank's agility and adapt new practices as part of a continuous improvement mindset.

The best practices aligned to this stage are OP1, OP11, OP13, OP14, OP15, OP16, OP25, TP2, TP4, TP7, TP14, TP15, TP20 and TP23. Using Kotter's stages for leading change; K6 through K8 are applicable.

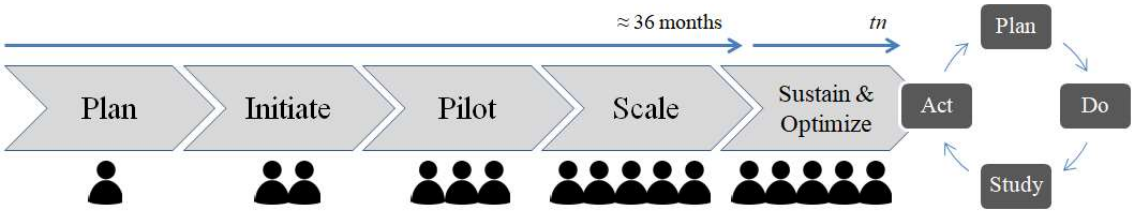
This stage carries over practices from the previous Scaling stage. As the application and best practices do not change for this stage, the descriptions from the previous section apply and are not be repeated here. However, some practices are not carried over from the previous Scaling stage. For example, OP10 suggests that experienced staff be used in the early stages of an agile adoption. The bank is expected to have already developed a level of agile maturity

by this stage. It should have experienced staff, coaches and a mature CoE supporting agile projects.

Likewise, OP18 encourages the use of CoPs. At this stage CoPs may play a lesser role but could be still valuable in sustaining agile enthusiasm and foster a knowledge sharing community, particularly with new staff. Although CoPs are most valuable at the initial transformation stages, it takes sustained effort to keep these communities active. Most study participants did not have active CoPs, but did so at the early agile adopting stages.

Kotter's change stages continue to apply as this is a perpetual continuous improvement stage. Continuous improvement cycles are quality enabling processes and generally follow a variation of the PDSA (Plan, Do, Study, Act) cycle (Deming, 2016) as illustrated in Figure 8-3.

Figure 8-3 - Agile Practices Continuous Improvement Cycle



PDSA Stage	Activities
Plan	Agile CoE project guidance, artifacts and training are established. Institutionalize new approaches (K08).
Do	Execute projects in agile using the CoE guidelines and training.
Study	Sense if any changes are required to agile practices from project and training feedback, from rapid product development and delivery process improvements or from new management requirements.
Act	Assess what changes are needed and adapt them to improve the agile guidelines and training. Consolidate improvements and produce more change (K07).

Source: Author (2018)

Changing business environments and new practices for agile development will continuously challenge the bank to evolve its practices in an adaptive manner. Kotter's K6 stage encourages practitioners to plan and create short-term wins. Kotter encourages using credibility form early wins to change systems, structures and policies. Defining and engineering visible performance improvements can be achieved with a PDSA continuous improvement cycle.

Kotter's K7 is about consolidating improvements and creating more change. Kotter's last stage, K8, is to institutionalize the new approaches. As changes to agile practices evolve, these need to be institutionalized as new ways of working.

The Sustain and Optimize stage is a perpetual continuous improvement stage that follows a PDSA cycle. Kotter's last three stages of change apply well to a continuous improvement cycle by using a sense and adapt philosophy.

8.3.3.2 Agile Maturity

A bank at the L05 stage, according to KPMG, should be "culturally optimized". This implies the following practices are in place:

1. Management decisions are made based on agile KPIs.
2. Agile tools are utilized throughout the project lifecycle.
3. Scalability issues are addressed.
4. Agile processes are optimized.

At this stage, the bank should be less dependent on external consultants and coaches. It is expected that agile project practices are stable and full time staff are experienced in the bank's agile methodology. Sufficient numbers of internal coaches are available to support the agile projects and trained full time Scrum Masters are available to staff agile projects.

8.3.4 Summary

This section proposed an incremental and gradual approach to agile transformations for banking. The best practices for agile adoption and how they align with the proposed adoption framework herein can be used as a roadmap for moving from plan-based project management methods to agile methods for product development.

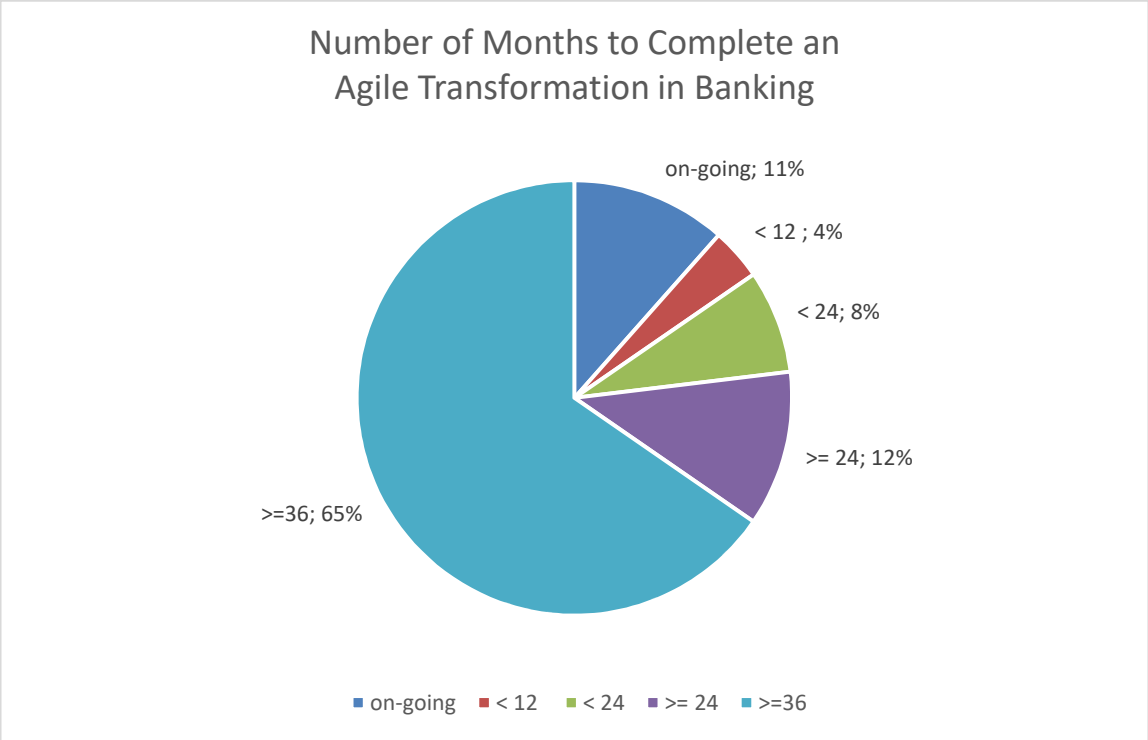
The distinctive principles of this transformation framework are emphasis on planning and initiation of change through a gradual and incremental adaptive process. Given the size of Canadian banks, impactful and sustained change takes time. The next section examines how long agile transformations may take.

8.3.5 Agile Adoption Duration

Survey question Q40 asked participants how long they believe it would take to complete an agile transformation in a Canadian bank LOB. Seventy seven percent indicated it would take 24 months or more from inception to a level of predictable process execution (Figure 8-4).

One publication (Ambler and Lines, 2017) comments that an organization could take up to three years before it is in a continuous Sustain and Optimize mode. Another article on large scale agile transformations notes that creating a more agile way of working can take two to three years to complete (BCG, 2018a).

Figure 8-4 - Survey Q40: Number of Months to Complete an Agile Transformation



Source: Author (2018)

In summary, for banking, a reasonable time expectation to achieve agile project maturity, from inception to sustainment, is approximately 36 months. PG commented that his bank *"still has 3 to 5 years in its transformation".*

8.4 Validation Study

8.4.1 Introduction

A validation study was conducted on the framework. The purpose of the validation study was to understand, from an executive perspective, if the proposed agile transformational framework was a fit for a Canadian bank planning an agile transformation.

8.4.2 Validation Study Participants

Three executives with Canadian banking agile transformation experience participated on the validation study. For the validation study, the executives were referenced as VS1, VS2 and VS3. Participant VS1 was formerly a VP of Transformation at a major Canadian bank. Participant VS2 is currently a software development executive who previously led the agile transformation at a major Canadian bank. VS3 is an executive within the EPMO of a large Canadian bank, currently leading its agile transformation.

The participants were e-mailed section 8.3 of the thesis along with Appendix J and K. The participants were asked to review the framework prior to a telephone interview. Each executive had two weeks to review the framework prior to the interview. The validation interviews were expected to last no more than 20 minutes, but for V1 it lasted an hour, V2 was 30 minutes and V3 completed within 20 minutes. Comments were noted and transcribed into a document for each interview. V1 also provided written comments.

8.4.3 Validation Questions

The interview time for gathering feedback was specified as 20 minutes due to the executive's limited time availability. Only three questions were posed, two close-ended and one open-ended question. The aim was to validate the proposed framework and seek any additional feedback for improvement. The validations questions were:

VQ1: Do you believe the roadmap provides a good framework for an agile adoption in a Canadian bank?

VQ2: What areas for improvement would you suggest, if any?

VQ3: Is the proposed timeline for an agile adoption realistic based on your experience?

8.4.4 Responses

Participant responses were transcribed and are summarized below.

Responses to VQ1 were positive. VS1 commented that *"by and large found it (framework) very good and coherent. It is a good document and enjoyed reading it"*. VS1 also noted that the approach demonstrated integrative thinking versus a regurgitation of what others are saying.

VS2 commented that *"there are a lot of good things in there (framework). I like a lot of what I see, but I would have suggested the concept of a product backlog for the transformation"*. VS3's comments were; *"I loved the work that you did, I enjoyed reading it. It was well put together and thought out"*.

Responses to VQ2 were many and varied as each participant had a different perspective on what could be improved. Some of the feedback provided was subsequently integrated into the framework.

VS1 suggested that the role of the product Owner be explained in more depth. As well, some background on John Kotter would benefit the reader. VS1 did not fully agree with the notion that CoPs were less useful at the end of a transformational journey. There is value to continue CoPs to establish a sense of community and support new users. VS1 cautioned on the notion that the definition of "Done" should not be holistically applied across the entire bank or LOB but rather on each initiative or project as some groups could develop maturity faster than others in their agile practices. To think that the whole back can reach maturity in a lock-step manner is unrealistic.

VS1 also commented there should be some focus on explaining the difference between direction and empowerment. An agile coach would understand the issue of team empowerment but a management audience may need a bit of help to understand the nuance here that empowerment does not mean lack of direction. Some level of direction is still needed (the order), but this does not take away from team empowerment. The difference is the "order" versus the "goal". The team is goal focused and should have wide latitude in how to accomplish it; similar to the concept of goal-directedness; *"Oversight sounds like supervision and this is what we are trying to get away from"*.

VS2's feedback related to the framework staged approach and comments on the "What" versus the "How", where the "What" is the aim. VS2 commented that there was a lot of focus on the "How", the activities, versus the higher level aims the "What". This is similar to VS1's feedback that the focus should be on the aims and the teams should be empowered on how they accomplish them.

VS2 would have implemented the framework differently using a more agile approach versus a traditional step-wise method. VS2 felt that the staged framework approach was too prescriptive and would use an agile style backlog instead with the aims as agile epics. The backlog would have held the outcome based features the "How" versus the "What". In summary, less of the how to accomplish the task and more focus on defining the aim. VS2 noted that *"if anyone wants to transform a bank, they must have the notion of the desired outcome. There is a lot of baggage at a bank. But whoever needs to do a transformation will face challenges".*

VS3's feedback was that BCG's planning approach to transformations was too "*waterfalish*". The suggestion was to break the plan into a series of MVPs which are fundamentally experiments. Run each MVP as an experiment and see what works before moving to the next stage. The other aspect of feedback was on the centralized change model versus a federated change model. VS3 notes that *"one of the challenges with transformations is that a central CoE cannot always get out into other parts of the organization without a lot of difficulty".* VS3 suggested a federated model where the central CoE supports segment CoEs (SCoEs) in each LOB. The SCoEs have a dotted line reporting into the central CoE. The CoE defines the controls and base minimum delivery standards, removes enterprise level hurdles, and ensures the bank's controls are satisfied. The SCoEs work closely with the business to drive agile adoption within each business segment. VS3 also emphasized the need for continuous communication throughout the entire transformational phase.

Responses to VQ3 were uniform insofar as there was uncertainty as to how much time is required for reaching agile maturity. VS1 commented that there is not much case study data available. There are not many studies to cite from to unequivocally support the timeframe, but three years seemed reasonable.

VS2 commented that *"I don't think that you can say agile is an on/off switch, it is more of a dimmer. You still have to put the dimmer on the wall. In 36 months I don't believe that the bank can be agile. However, at the team level you will have some teams becoming more mature than others and will get there faster".* VS3 suggested that the framework activities were right but the timelines are a guess as to how long it would take. His bank has been on an agile journey for 7 years and he expects it will take 3 to 5 years more. There are too many factors and variables in a bank that can affect the timelines. It depends on the organization's appetite for change and how far the executives want to push the transformation.

8.4.5 Conclusion

The feedback from the validation study indicates that the research provides a suitable framework for agile adoptions in Canadian banking. There were differences of opinion on how participants would have implemented their own transformations, but consensus was that the framework was well thought out.

8.5 Summary

This chapter presented an agile transformational framework that can be used as a guide for Canadian banks adopting agile practices. The framework was presented at a high level as the granular detail of an implementation is particular to any one bank's approach and beyond the level of detail for a thesis. The differentiating aspects of this framework is the emphasis placed upon up-front planning and using an incremental change framework for agile transformations. Kotter's eight stages for change management aligns well with the five agile adoption stages and is a recommended change framework for banking. It espouses a gradual change philosophy by: creating a vision, realizing quick wins, securing executive support, establishing a sense of urgency and consolidating change.

9. Conclusion

The discussion on the research findings was summarized in Chapter 7 with the review of which best practices are working well and what challenges are being experienced by practitioners in banking transformations. This chapter discusses how the research question was answered through completion of the research objectives, the contributions to theory, contributions to practice, limitations of the research and recommendations for future research.

9.1 Introduction

The research aim was to study agile adoption best practices used by large Canadian banks and subsequently develop an agile adoption framework suitable for Canadian banks. This was completed through a methodical step-wise approach starting with an extensive literature review of agile practices used by large firms. The study also reviewed what exogenous factors drove banks to embrace innovative agile practices for rapid product development.

9.2 Contribution to Theory

It is hoped that this study contributes to the knowledge of implementing agile adoptions in D-SIB Canadian banks. Banks contemplating agile adoptions can benefit from the challenges identified, best agile practices used in banking transformations and the agile adopting framework developed through this study. This research represents the first academic study of Canadian banking agile transformations. No peer reviewed literature exists at the time of this writing.

This study documented the best practices and challenges with agile adoptions in Canadian banking from the perspective of agile practitioners; executives who led agile adoptions in their banks, agile coaches and project members participated on this study. Participants provided feedback on practices working well at their banks and expressed the challenges therein through interviews and a survey. The challenges are many with Canadian banking agile adoptions, in particular a risk averse and change resistant culture are barriers to innovation. The same challenges were also evident in the literature review. Surprisingly, participants commented that most large Canadian banks in this study had not yet achieved agile maturity.

The research was structured as a single case study of agile practices within the banking industry. The study is primarily a qualitative approach supplemented by survey data using a mixed methods approach. A phenomenological exploratory research process was used, comprising of questionnaires, interviews, a survey and observation as data primary sources. The Framework Method (Gale *et al.*, 2013) was used to combine the research data from the various instruments for analysis and to draw conclusions from.

Framework Differences from Other Agile Adopting Models

The proposed agile adoption framework is similar to other agile adoption models reviewed in the literature as regards the various factors to consider in an agile transformation and strategies to use. The models reviewed acknowledge that transformational change is difficult. These changes are multi-year initiatives and concurs with the findings herein. Factors such as people, organizational issues and technical aspects must also be considered (Meredith and Francis, 2000; Misra, Kumar and Kumar, 2006; Bermejo *et al.*, 2014).

The models reviewed in the literature also advocate a phased approach to agile adoptions. Ambler and Lines (2014, p. 155) use a four step process for agile transformation ending in a continuous improvement cycle. One publication discusses a three stage model as defining the value, launch/accelerate and scaling up (Catlin *et al.*, 2017) while another proposes a four stage model (Aghina, Ahlback and Jaenicke, 2018). Other adoption models also propose a phased, gradual transformational process over several stages (Sidky and Arthur, 2007; Gandomani and Nafchi, 2015; KPMG, 2015; Catlin *et al.*, 2017) resulting in a continuous improvement "end-phase" similar to Deming's (2016) PDSA cycle (Gandomani and Nafchi, 2015).

There are however several differences between the adoption models in the literature and the one derived from this study. One major difference is whereas adoption frameworks in the literature were industry and firm agnostic, the framework herein was derived for one industry and specifically for D-SIB Canadian banks. One study's agile adoption model was developed with 49 participants from 13 countries (Gandomani and Nafchi, 2015). The study included banks from Spain, Bulgaria, India and USA, however, the banks were much smaller in size (5000+ employees) compared to Canadian D-SIB bank (70,000+ employees).

Likewise, the literature proposes a staged approach to agile implementations but is light on best practice detail and when in the roadmap to apply the practice. The guidance provided is also industry agnostic. This framework emphasizes a well thought-out planning phase and a roadmap outlining when to implement the People, Process, Strategy and Linkages best practices. There is direct traceability of agile adopting best practices from the literature review, to the data gathering phase, analysis and into the proposed framework stages.

Some literature emphasizes that firms needs to consider their cultural readiness to accept agile practices (Sidky and Arthur, 2007; Gandomani and Nafchi, 2015), whereas in banking, agile transformations are driven top down by its CIO; regardless of readiness for change. This framework excludes any change readiness assessments in its planning stage.

The proposed agile adopting framework utilized AWRM as a basis for identifying process areas and best practices for agile adopting firms (Meredith and Francis, 2000). The author's review of academic articles relating to the application of AWRM indicates that it has been primarily applied for manufacturing agility assessments. Yet, the AWRM addresses the organizational structure, factors and suggested best practices applicable to software development firms. This research may be the first to re-contextualize the AWRM model as a basis for researching agile best practices in software product development as it has not been used by other researchers for this purpose. It is hoped that the reader recognizes the utility of AWRM beyond an agile auditing tool. Its focus on people, processes, strategy and linkages encompasses endogenous and exogenous factors that agile transformations should consider.

A global survey on organizational agility indicated that the reason firms have not started an agile transformation is because they lack an implementation plan (Ahlbäck *et al.*, 2017). The differentiating aspect of this framework is its industry and firm specific focused roadmap outlining the application of best practices for a measured agile transformation in banking.

Research Question

The research was based on a single question:

What are the factors that influence the successful adoption of agile practices in Canadian banking?

The research question was addressed through the aim and objectives outlined at inception. The following sections reviews how the aim and objectives were addressed by this research.

Research Aims

The research aims were to develop and document an agile adoption framework inclusive of best practices that influence the successful adoption of agile product development practices in the regulated Canadian banking environment. This was accomplished through an analysis of best practices identified by the literature review and corroborated with data gathered in the study. An analysis of which practices applied to Canadian banking ensued. The best practices were then laid out along a timeline to create a step-wise agile transformational framework. The framework was validated for fit by three Canadian bank executives with agile transformational experience (see 8.4.2 Validation Study Participants). This framework contributes to the knowledge base of agile transformations for large Canadian banks; it is specific to an industry and firm.

First Objective – Agile Adoption Factors

To leverage the results of the literature review for understanding the agile adoption success factors and challenges across several adopting industries.

The literature reviewed consisted of research on agile transformations in financial services firms, FinTech disrupting firms, government agencies involved in agile adoption, the adoption experience of the regulated medical devices industry and agility best practice guidelines from AMRG's framework. The review identified 54 agile adopting best practices at the organization and team level. It also identified 32 different challenges that agile adopting firms encountered.

The AWRM (Meredith & Francis 2000) model anchored the agile adopting best practices identified across multiple industries in the review into four factor quadrants and sixteen dimensions. Several other models (McKinsey & Company 2008; Misra et al. 2006; Sidky & Arthur 2007) were examined but the author found they were not as extensive in their coverage of people, process, strategy and external factors as AWRM.

Second Objective – Organizational and People Challenges

To identify the organizational and people challenges experienced in adopting agile practices in Canadian banking by collecting the experiences of current agile practitioners through interviews and surveys.

Interviews and a survey with experienced agile practitioners in Canadian banking was conducted to understand the best practices for applying agile methods to banking and the challenges therein. The identified agile adoption best practices from the literature formed the basis of the study questions. These were compared against the interview and survey data to understand if agile practices used by other industries applied to D-SIB, regulated Canadian banks.

Overall there was agreement between the interview and survey data. The survey supplemented the interview data to strengthen the study's findings. Seven participants were interviewed using a semi-structured questionnaire with a one-hour time commitment. The internet based survey resulted in 46 surveys of which 27 were used in the analysis. The interviews involved senior agile practitioners and executives. The survey targeted mostly agile practitioners such as project managers and Scrum Masters involved in agile projects within Canadian banks.

Third Objective – Agile Adoption Strategies

To understand if Canadian banks follow the same adoption strategies as other industries or whether a differentiated approach is needed.

The research on adoption strategies of banks versus other industries concluded that banks don't follow the same rapid adoption approach that smaller firms have. The challenges are the size of banks; implementing bank-wide change across several LOBs is fraught with risk to timely product delivery. Banking adoptions are much more measured meaning that change is generally implemented at the LOB level in a gradual manner. Most literature assumes that a firm wide agile adoption approach is the norm. Geographical challenges also impeded teams from being co-located, although recent innovations in collaboration tools and video conferencing have minimized these barriers.

Unlike other industries, banks need to include stakeholders from Risk, Audit and Compliance as influencers in their tailoring of agile practices. The research reveals that business leaders often take a back seat to agile adoptions and are not as involved as they should be from inception. As well, the level of management reporting and project oversight has not changed from the waterfall methodology. One practitioner commented their bank's agile methodology was "Scrum Fall"; indicating a blend of agile and waterfall practices.

At the time this research was conducted, some Canadian D-SIB banks were not yet agile mature. Fifty nine percent of survey respondents working in banking indicated they had less than 5 years of agile experience (see Figure 6-2); an indication the practices are relatively new to banking. The survey and interview results indicated that in banking it may take as much as 36 months to achieve agile maturity (see Figure 8-4). By contrast, smaller firms are not hindered by culture, reporting, legacy systems or the regulatory controls of a public listed D-SIB bank. In conclusion, the research indicates that banking requires a differentiated approach to agile transformation. The literature review indicated other financial institutions also tailored their agile methods. The research found that diverging too much from base agile principles was a cause of agile adoption failure.

The challenges larger firms experience in adopting agile are the same as those experienced by Canadian banks. Culture change, weak executive and middle management support, lack of business partner engagement, inadequate training and insufficient stakeholder communication are not unique to banking. Where banks differ from others is the high degree of planning required for an agile transformation. Due to their size, the length of time it takes to achieve agile maturity and the time required to effect a culture change is greater. Likewise, rather than initiating transformational change on their own, banks prefer to use external advisory partners (Coaches and Consultancies) to augment their agile knowledge and assist with the transformation to reduce risk of failure. Smaller firms may elect to go at it alone.

The literature review highlights that one of the biggest barriers to agile transformation in all firms is a change resistant culture (Misra, Kumar and Kumar, 2006; Shore and Warden, 2007; Sidky, 2007; Lal, 2011; Blackman, O'Flynn and Ugyel, 2013; Osak, 2014). The research recognizes that senior executive support in banks is required to overcome change barriers and navigate the political minefield caused by this change.

Fourth Objective – Best Practice Framework

To provide a best practice based framework suited for Canadian banks pursuing agile adoption strategies.

The result of the research was a proposed agile adoption framework (see 8.3 Agile Adoption Framework). The framework's approach consists of a five stage measured implementation journey. Upon completing each stage, the bank achieves a higher agile maturity level. The AWRM model, identified in the literature review, was applied in subsequent research phases to organize the analysis into the four quadrants of people, process, strategy and linkages. The best practices form the literature review were compared with findings from the primary data gathered to assess where the literature and study data agreed. The framework's development stems from the agile adopting best practices identified by the literature and primary data.

The best practices identified through the literature review were the basis of the questions for interviews and a survey. The data obtained from the application of the mixed methods approach aided in identifying which best practices were applicable to Canadian banking. The resulting proposed framework was formed through the synthesis of best practices, a change management strategy and an agile maturity model.

A change management strategy is a critical component of an agile transformation due to the impact a transformation will have on people's roles, corporate processes, organizational structure and culture. John Kotter's change model aligned well with the incremental change philosophy proposed by this framework. Change management is a critical component of an agile transformation but the literature review indicated little evidence of established change management models in use.

Contribution to Methodology

The literature review identified methodologies use by previous researchers. Grounded Theory approaches seemed particularly common to research on agile practices (Cockburn, 2003; Mnkandla, 2008; Gandomani, Zulzalil, Ghani and Sultan, 2013a; Gandomani and Nafchi, 2015). This research utilized the Framework Method (Gale *et al.*, 2013) for qualitative content analysis. This model was developed in the 1980s by two researchers from the Qualitative Research Unit at the National Centre for Social Research in the UK. Although

this method is widely used in social research, it is likely the first time it has been applied for investigating agile practices.

Summary

In retrospect, the research has contributed to the literature by uncovering new facts on agile transformations particular to Canadian banks. Banking practices and challenges uncovered through this research are similar to those experienced by other firms. The differences are how the best practices are applied; incrementally versus firm-wide. Likewise, some practices evident in the literature, such as dedicated product teams are not yet widely used in banking.

There were references from participants on large firms being optimized for economies of scale. This applies more so to manufacturing, but this researcher suggests that banks are designed for economies of scope, wherein specialist resources are applied across various product creating/enhancing projects. A bank's matrix organization generally supports the shared model of allocating resources across multiple products. By contrast, product based teams have resources dedicated to one product and continuously evolve the product iteratively as a self-contained team.

9.3 Contribution to Practice

The agile adoption framework is a synthesis of agile best practices and transformational approaches researched during this study from participant data and published literature. The framework is valuable for initiating an agile adoption whereby a sponsoring executive along with the EPMO must consider the best practices, strategies, processes and people required to initiate and sustain an agile transformational journey. It provides a list of best practices, change management guidelines for a gradual, phased approach for strategically evolving an agile culture. The research also identified challenges that executives should heed in their planning.

A staged approach is familiar to bank executives as a way to gradually implement change to minimize disruption. The framework outlines an incremental adoption and change strategy presented as a set of five high level stages for planning and implementation. Practitioners may use the recommendations as a basis for developing their own transformational strategies suited to their bank's culture and propensity for change. The overall transformation should be planned at a high level to allow for adjustments in strategy along the change journey. The

research indicates that agile adoptions are multi-year initiatives; creating a detailed roadmap encompassing a three year, or longer, transformation is not recommended as it does not provide the flexibility required to address barriers encountered along the journey.

The underlying philosophy of this framework is a sense and adapt strategy that ensures each transformation stage considers past successes and pitfalls to best improve success in subsequent stages. The agile adoption should be run similar to an agile project wherein lessons learned from one stage optimizes the implementation of subsequent stages. This framework is not intended to be an overly prescriptive plan but as a guideline for adapting agile practices in large Canadian banks.

The validation study participants indicated the framework was well thought out and suitable for Canadian banks. The framework fulfills the aim of providing a roadmap for practitioners to tailor their own agile transformational journeys in practice.

9.4 Limitations

Although this study concluded with a new agile transformational framework based on a detailed study of agile best practices in Canadian banking, it was not without its limitations. This section highlights some of the study's limitations.

Sample Size

Eliciting participants for this research was challenging but not unlike what another researcher (Wiss, 2008) experienced in conducting research of financial firms in Switzerland. Executives were reluctant to participate in case their bank was associated with failed agile transformational experiences, which in retrospect was commonplace. Others cited concerns about information sharing. Despite efforts to increase number of interview participants beyond seven, challenges with time availability and confidentiality concerns limited participation.

Survey participation was lower than expected given the number of public agile venues attended; a Scrum Conference, personal appeals made, appeals for participation to PMI Chapters in Canada and appeals for participants from Scrum Alliance and Agile Alliance. It was also disappointing that out of 46 surveys responses only 27 were completed. Some

respondents indicated they had no Canadian banking exposure, while others left the survey incomplete.

Number of Best Practices

There were 54 best practices identified through the literature review whereby 20 key best practices were studied. The assessment of all 54 best practices would have required an extensive study, extensive data collection effort and was beyond the scope of what can be accomplished through this study. However, all best practices are valuable and a reader should consider them.

Research Bias

The researcher being employed in banking as a project manager and agile practitioner is aware that previous experiences in working with plan-based and rapid methodologies can bias the independent lens by which research data should be objectively interpreted. Best practices were followed in collecting and analyzing data as described in Section 6.2. The most significant sources of error in research are in the misinterpretation and over-interpretation of data (Epigeum, 2012). If there was any possibility of researcher bias it would be in the analysis phase where qualitative and survey data were reviewed for deriving conclusions of practice fit for Canadian banks.

The nature of qualitative research requires an objective analysis of data to draw conclusions from. However, it is difficult to remove the subjective lens by which a researcher draws conclusions in qualitative studies. Despite best practices employed to remain unbiased the research acknowledges this qualitative study may not be immune of bias.

Framework Validation

The agile adoption framework was reviewed by three executives. The feedback was positive and indicative that such a framework could be applied to Canadian banks. However, a validation of the framework in an actual bank transformation would be more valuable in assessing its effectiveness. Unfortunately, this was impractical as such a validation may require more than two years to complete.

Applicability to Other Industries

The proposed framework suggests a gradual and incremental adoption roadmap at an LOB (divisional) level. In Canadian Banks, each LOB typically has its own CIO who initiates corporate transformations within their domain of authority. The EPMO supports LOBs through an established playbook of agile practices, coaching, training and process oversight; hence the need to establish a foundational support structure before initiating a transformation.

Bank divisions, due to their large size (often up to 1000 staff per LOB), are organized as multi-divisional (M-Form) organizations (Bustamante, 2016). The agile adoption framework could be equally applied to banks in other countries as these organizations are organized similarly and follow both national and international regulatory requirements (e.g. Basel accord for capital adequacy). A large German bank such as Deutsche Bank is organized similarly to a Tier 1 Canadian and could face the same transformational challenges as home banks do. The framework could fit well with other international financial services firms (e.g. insurance) exhibiting a similar culture and organizational structure.

Other regulated industries such as medical device manufacturing, pharmaceuticals, aircraft and automotive manufacturing could find the agile adoption roadmap valuable for their transformations (see 3.3.4.3 Aligned Suppliers, Regulated Industries). Government organizations have also investigated agile practices for managing their projects more efficiently and could benefit from the roadmap and lessons learned from this study.

Where the framework may not fully apply is to smaller regional banks (US) and credit unions (Canada) who offer limited services (e.g. loans and deposits) and can initiate firm-wide transformational initiatives quicker due to their smaller size and limited national reach. Similarly, small product based organizations, such as FinTechs, will have already started with rapid agile development practices due to the lack of pre-existing legacy methodologies, their smaller size, change accepting culture and focus on a smaller suite of financial products and services. These firms may be focused on one or more business products and in their early stages are characteristic of U-Form organizations.

9.5 Recommendations for Future Research

One important aspect of the research that was not possible to accomplish within the scope of this study was the practical application of the framework to a banking agile transformation. The proposed framework could be best validated and further developed through an actual banking implementation. A robust assessment of the framework through an actual implementation would improve its utility significantly.

Another suggestion would be the application of the adoption framework to larger firms in other industries who develop software for their products. For example, automotive and aircraft manufacturing are industries which rely heavily on software development to support their manufacturing processes and for firmware within their products. The adoption model could be tailored to meet the agile adoptions of these industries.

9.6 Summary

The aim of this study was to identify what agile adoption best practices applied to the Canadian banking industry and propose an agile transformational framework suitable to this industry. Agile practices adoption by banks have been fraught with many challenges, primarily due to culture change, weak executive and middle management support, lack of business partner engagement, inadequate training and insufficient stakeholder communication. It is hoped that this study has contributed new knowledge to the subject of agile adoptions in Canadian banking.

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10.APPENDICES

10.1 Appendix A – Heriot Watt University – Discovery Literature Searches

Searches on the Discovery site were made to locate applicable literature. The criteria used were for publications from the last 10 years and in the English language. The document title had to contain the word "Agile" or other variations. The subject field contained a binary word string combination for locating applicable literature for this review. The search results indicated that no literature was available specific to agile adoptions or transformations in Canadian banking.

Table 29 - Search Terms for Academic Agile Research

Title Contains	Subject Contains	Results from Newspaper Articles, Conference Proceedings, Books and Reviews
Agile	"Software development"	2,828 results (517 peer reviewed journals, 791 conference proceedings)
Agile transformation	banking AND software	4 results (1 is a peer reviewed journal)
Agile transformation	Finance AND software	217 results (44 peer reviewed journals, 32 conference proceedings)
Agile adoption	banking AND software	3 results, no peer reviewed articles
Agile adoption	Finance AND software	3 results (1 peer reviewed journal)
Agile	Finance and software	217 results (32 conference proceedings, 44 peer reviewed journals)
Agile	"software development" AND "Capital Markets"	4 results (1 conference proceeding)
Agile	"Software development" AND "Canadian Banking"	0
Agile	Software development AND "Canadian Banking"	0
Agile	Software development AND "Canadian Finance"	0
Agile	Software development AND "Bank of Canada"	0

Agile	“project management” AND “Canadian Banking”	0
Agile	“project management” AND “Canadian Banks”	0
Agile	“project management” AND “Canada”	5 results (2 peer-reviewed journals). Subject field was selected as Canada.
Agile	“software development” AND banking	98 results (26 peer reviewed journals)
Agile	Software development AND “regulated environment”	10 results (3 peer reviewed journals)

10.2 Appendix B – Agile Best Practice Selection Method

Part 1 - A spreadsheet of 57 best practices was created and provided to three independent reviewers (R1, R2, R3). The researcher (Author) scored the initial sheet. The aim was to identify the top 20 key practices form a list of 57 best practices. In Table 30, the "AVG ALL" column provides the average score.

Table 30 - Part 1: Best Practice Scoring Table

Best Practice	Description	Author	R1 Scale	R2 scale	R3 Scale	AVG A,R1,R2	AVG ALL
OP1	Obtain executive commitment and support for making the change of established practices to agile. Agile adoption is an impactful culture change for agile adoption and executive support is necessary to navigate through political challenges that will ensue.	10	10	10	10	10.0	10.0
OP2	Create a sense of urgency. The executive provides a compelling and convincing reason for the change to agile practices. It can act as a catalyst for change that people can rally behind and buy into the necessity for the change. For example, persistent project failures, late project delivery or competitive threats from nimbler FinTechs are compelling catalysts for change. Executives must make it clear that change is non-negotiable.	10	8	8	10	8.7	9.0
OP3	Focus on culture change methods. Cultural change management processes for transitioning to agile have been implemented for all internal stakeholder groups. Ensuring audit, risk and governance groups are involved in the change.	8	8	7	7	7.7	7.5
OP4	Communications Strategy - over communicate the agile adoption journey. Create a communication plan for adoption and sustainment of agile practices, e.g. town halls, newsletter, quarterly seminars, social media, wikis, etc. Intensive communication was emphasized in a number of studies (Dikert et al. 2016). Establish regular town halls for communicating successes. Invite external speakers to explain their use of agile practices.	10	10	8	10	9.3	9.5
OP5	Define roles and responsibilities for agile staff. This will involve job descriptions for new roles such as Product Owner and Scrum Master. Identify who in the business assumes the Product Owner role. Set expectation on level of involvement required on agile projects. Business partner engagement is critical to success. CEB's survey (Gibson et al. 2016) indicates that 60% of firms struggle to engage their business partners in agile projects.	8	8		5	8.0	7.0
OP6	Identify which area of the organization will be first to adopt agile. Information Technology areas are prime candidates for agile adoption as they develop software and may be more open to change.	8	6		7	7.0	7.0
OP7	Use pilot projects to experiment what practices work best and which ones need to be tailored to the organization. Pilot projects help increase the confidence in agile practices and improve management confidence. Having pilot projects was reported as a significant success factor (Dikert et al. 2016; Burba 2015). The projects should start with small teams (5 to 9 staff) and be self-contained, with few external linkages, before applying agile practices to larger projects with larger teams. Develop the culture and best practices on small projects before considering scaling to other practices such as Scrum of Scrums (Burba 2015).	10	7	10	10	9.0	9.3
OP8	Develop guidelines for a minimal level of project documentation based on project complexity, risk and regulatory environment.	7	7		5	7.0	6.3
OP9	Performs frequent agile adoption assessment and correction. Tailor the methodology to the culture of the firm. Banking may require a differentiated agile approach due to the needs of other groups such as compliance and audit. Use a fail-fast model to tailor and continuously improve on an ongoing basis (Valade 2008).	7	9	7	5	7.7	7.0

Part 2 - The original 57 practices were sorted by average to indicate the key practices. Feedback from the three participants outlined duplicates and practices that could be combined, thus reducing the list to a handful of practices (Table 31).

Table 31 - Part 2: Best Practice Scoring Table

Best Practice	AVG ALL	Include	Notes
OP1	10.0	yes	
TP2	10.0	yes	
TP8	10.0		Same as OP15 and should be combined
TP15	9.8	yes	OP15 and this one address different issues, will not combine. Peter recommends combining.
OP4	9.5	yes	
TP23	9.3	yes	
OP7	9.3	yes	
OP15	9.3	yes	
OP23	9.3		Combine with OP10 - similar issue with having senior staff available
OP2	9.0	yes	
OP10	9.0	yes	
OP13	9.0	yes	
TP7	9.0	yes	
TP14	9.0	yes	
OP28	8.8	yes	
TP25	8.8	yes	
OP14	8.7	yes	
TP12	8.7	yes	Should be combined with OP14 - similar wording

Part 3 - The best practices were further reduced to a list of 20 by selecting those with the highest scores. The list of 20 key practices was then used as a basis for interview and questionnaire development. The tale below shows the mapping of best practices to question number for both interviews and surveys.

The interview is focused on a set of 20 best practices. The survey is also based on the same best practices but consist of 32 questions of which 28 can be mapped directly into the 20 best practices (Table 32). Four questions in the survey were added after the participant interviews. These questions provided more data on business partner engagement and carry-over of practices from waterfall.

Table 32 - Part 3: Mapping Interview Questions to Survey Questions

Interview Question #	Interview Question to Best Practice Mapping	Survey Planning Question #	Survey Monkey Question Mapping	AWRM Agile Dimension
1	OP1	1, 1.a, 1.b	Q9, Q10, Q13	Strategy
2	OP2	2, 2.a	Q11, Q12	Strategy
3	OP4	3, 3.a, 3.b	Q14, Q15, Q16	Strategy
4	OP7	4	Q17, Q18	Strategy
5	OP10	5, 5.a	Q19	People
6	OP11	6, 6.a	Q20, Q21	Strategy
7	OP13	7	Q22	People
8	OP14	8	Q23	Processes
9	OP15	9	Q24	Processes
10	OP16	10	Q25	Processes
11	OP18	11	Q26	People
12	OP25	12	Q27	Strategy
13	OP28	13	Q28	Strategy
14	TP2	14	Q29	Linkages
15	TP4	15	Q30	Processes
16	TP7	16	Q31	Processes
17	TP15	17	Q32	People
18	TP23	18, 18.a	Q36, Q33	Strategy
19	TP14	19	Q34	People
20	TP20	20	Q35	People
		21	Q37	Processes
		22	Q38	Strategy
		23	Q39	Strategy
		24	Q40	Strategy
		Demographics -->	Q2 - Q8	
		Open Ended -->	Q41 - Q43	
		Survey follow-up -->	Q44 - Q45	

Source: Author (2017)

10.3 Appendix C – Pilot Study Survey Data Analysis

Table 33 demonstrates the survey data analysis method used for the Likert scale responses. Columns for Q37, Q38 and Q39 are not shown to improve readability.

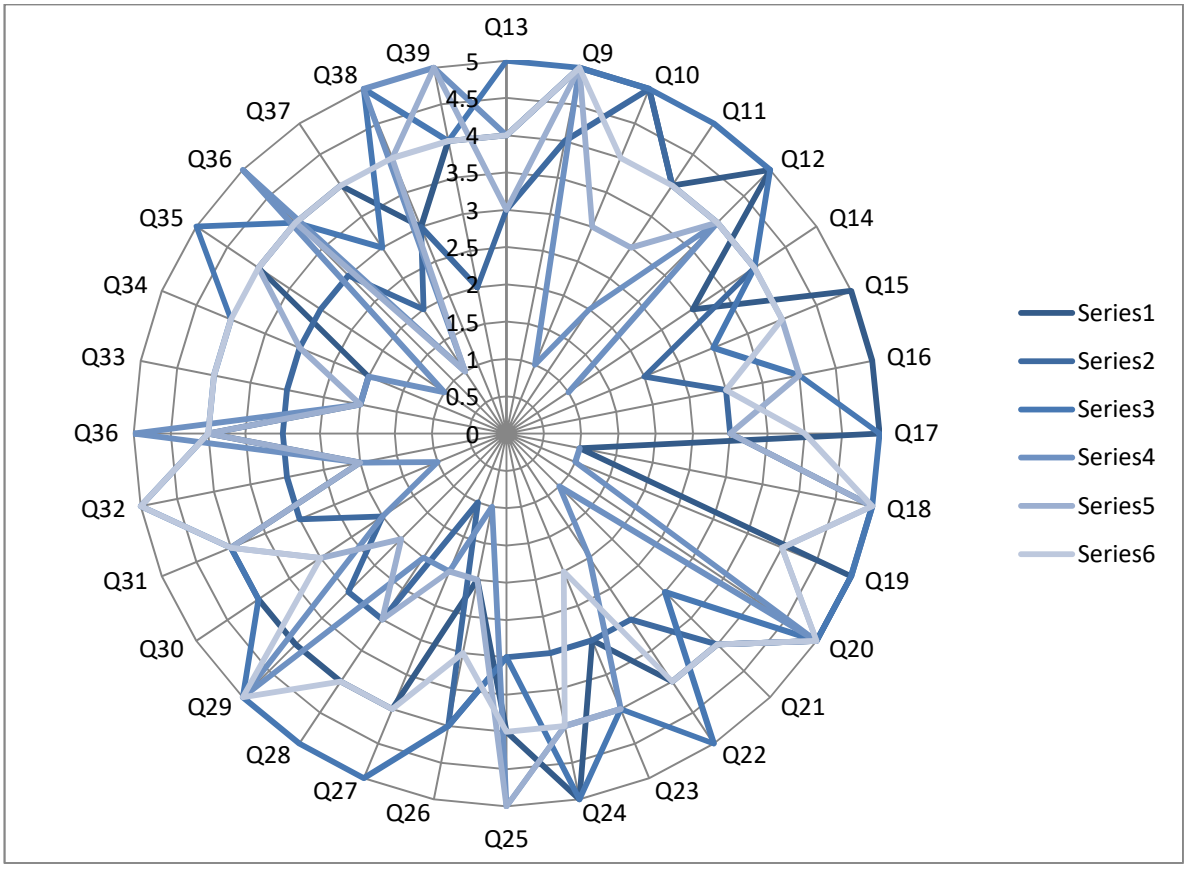
Table 33 - Survey Data Analysis Matrix

Respondent	Q13	Q9	Q10	Q11	Q12	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q36
1	4	5	5	4	5	3	5	5	5	1	5	5	4	4	3	5	4	2	4	4	4	4	4	2	4
2	3	4	5	4	4	4	2	3	3	5	5	5	4	3	3	3	3	4	1	3	3	2	3	3	3
3	5	5	5	5	5	4	3	4	5	5	5	5	3	5	4	5	3	4	5	5	5	4	4	5	4
4	4	5	1	2	4	1		2		1	1	5	1	2	4	4	5	1	2	2	5	2	1	2	5
5	3	5	3	3	4	4	4	4	3	5	4	5	4		4	4	5	2	2	3	2	3	4	2	4
6	4	5	4	4	4	4	4	3	4	5	4	5	4	4	2	4	4	3	4	4	5	3	4	5	4
	Q13	Q9	Q10	Q11	Q12	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q36
Average + varS	4.40	5.00	5.00	4.73	4.60	4.80	4.90	4.60	5.00	5.00	5.00	5.00	4.80	4.90	4.00	4.73	4.80	4.13	5.00	4.60	5.00	3.80	4.80	5.00	4.40
Average	3.83	4.83	3.83	3.67	4.33	3.33	3.60	3.50	4.00	3.67	4.00	5.00	3.33	3.60	3.33	4.17	4.00	2.67	3.00	3.50	4.00	3.00	3.33	3.17	4.00
Average - varS	3.27	4.67	1.27	2.60	4.07	1.87	2.30	2.40	3.00	0.00	1.60	5.00	1.87	2.30	2.67	3.60	3.20	1.20	0.60	2.40	2.40	2.20	1.87	1.00	3.60
Sample Variance	0.57	0.17	2.57	1.07	0.27	1.47	1.30	1.10	1.00	4.27	2.40	0.00	1.47	1.30	0.67	0.57	0.80	1.47	2.40	1.10	1.60	0.80	1.47	2.17	0.40
Population Variance	0.47	0.14	2.14	0.89	0.22	1.22	1.04	0.92	0.80	3.56	2.00	0.00	1.22	1.04	0.56	0.47	0.67	1.22	2.00	0.92	1.33	0.67	1.22	1.81	0.33
Strongly Agree	1	5	3	1	2	0	1	1	2	4	3	6	0	1	0	2	2	0	1	1	3	0	0	2	1
Agree	3	1	1	3	4	4	2	2	1	0	2	0	4	2	3	3	2	2	2	2	1	2	4	0	4
Neither agree or disagree	2	0	1	1	0	1	1	2	2	0	0	0	1	1	2	1	2	1	0	2	1	2	1	1	1
Disagree	0	0	0	1	0	0	1	1	0	0	0	0	0	1	1	0	0	2	2	1	1	2	0	3	0
Strongly Disagree	0	0	1	0	0	1	0	0	0	2	1	0	1	0	0	0	0	1	1	0	0	0	1	0	0
Sample Size	6	6	6	6	6	6	5	6	5	6	6	6	6	5	6	6	6	6	6	6	6	6	6	6	6
Strongly Agree	16.7%	83.3%	50.0%	16.7%	33.3%	0.0%	20.0%	16.7%	40.0%	66.7%	50.0%	100.0%	0.0%	20.0%	0.0%	33.3%	33.3%	0.0%	16.7%	16.7%	50.0%	0.0%	0.0%	33.3%	16.7%
Agree	50.0%	16.7%	16.7%	50.0%	66.7%	66.7%	40.0%	33.3%	20.0%	0.0%	33.3%	0.0%	66.7%	40.0%	50.0%	50.0%	33.3%	33.3%	33.3%	33.3%	16.7%	33.3%	66.7%	0.0%	66.7%
Neither agree or disagree	33.3%	0.0%	16.7%	16.7%	0.0%	16.7%	20.0%	33.3%	40.0%	0.0%	0.0%	0.0%	16.7%	20.0%	33.3%	16.7%	33.3%	16.7%	0.0%	33.3%	16.7%	33.3%	16.7%	16.7%	16.7%
Disagree	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%	20.0%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	16.7%	0.0%	0.0%	33.3%	33.3%	16.7%	16.7%	33.3%	0.0%	50.0%	0.0%
Strongly Disagree	0.0%	0.0%	16.7%	0.0%	0.0%	16.7%	0.0%	0.0%	0.0%	33.3%	16.7%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	16.7%	16.7%	0.0%	0.0%	0.0%	16.7%	0.0%	0.0%
Agreement Score	66.7%	100.0%	66.7%	66.7%	100.0%	66.7%	60.0%	50.0%	60.0%	66.7%	83.3%	100.0%	66.7%	60.0%	50.0%	83.3%	66.7%	33.3%	50.0%	50.0%	66.7%	33.3%	66.7%	33.3%	83.3%

Note: Likert scale responses of 1 to 5 were used, where 5 denotes “Strongly Agree”.

Data Analysis Steps: The scores from the survey questions for each of the 6 respondents were mapped into an Excel spreadsheet *(r.3 - r.8).* The average, sample variance *(r.13)* and population variance *(r.14)* were calculated. The scores were then mapped to the Likert scales to show the frequency of each score. For example, for Q12, six respondents noted that they *Stronly Agree* or *Agree* with the question. The Scores are then computed as percentages. The top *Strongly Agree* and *Agree* scores are added to create an *Agreement Score (r.29)*.

Figure 10-1 - Pilot Survey Response Mapping

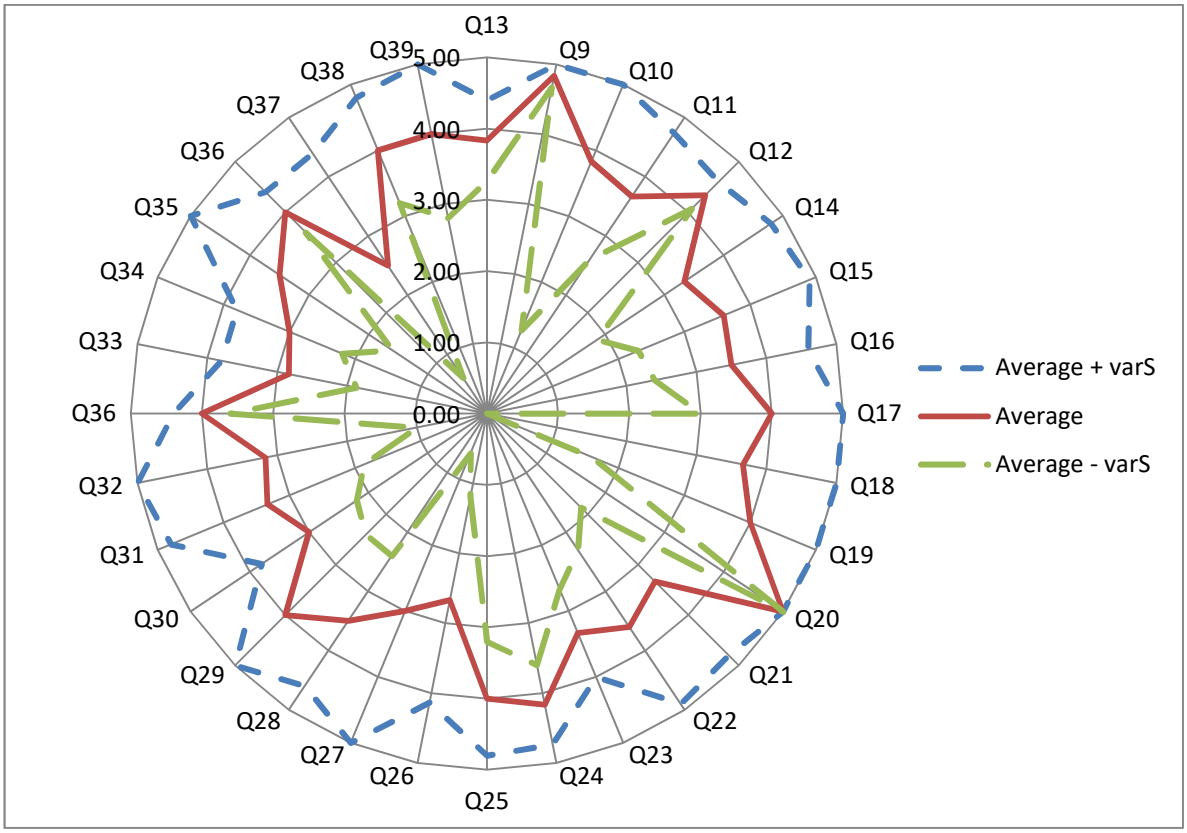


Source: Author (2018)

Figure 9-1 displays the six pilot participant responses (Series1 through Series6) as a radar chart. It provides a visualization of responses to examine if responses cluster around particular points, e.g. Q25, or whether the responses have high score variation and show higher dispersion as in the responses for Q26.

With Q25, the clustering of responses along the *Stronly Agree* and *Agree* scores indicate a high correlation of agreeement on the question. The Q25 responses indicate the majority of the population sampled agrees this is a valuable agile practice.

Figure 10-2 - Pilot Survey Variance Mapping



Source: Author (2018)

Figure 10-2, displays the average score of responses for each survey question. On both sides of the average line are the dashed sample variance lines. The variance indicates the rate of response dispersion for any one question. For example, Q26 has respondent scores that widely range from Strongly *Disagree* to *Agree.* The wider score dispersion results in a higher sample variance as displayed by the dashed variance lines.

Q24 by contrast shows that the variance points are very close to the mean. This indicates higher agreement among respondents. Q12 shows a similar pattern insofar as most respondents *Strongly Agree* or *Agree* with this question. A high variance from the mean indicates low response relatedness.

Chronbach's Alpha Calculation

Chronbach's Alpha was calculated using two methods to ensure the accuracy of the calculation. One used the population variance and the number of samples to calculate alpha with a result of 0.933. The second method was based on an Excel Add-In resource pack that featured the alpha calculation (Zaiontz, 2016) and it yielded a value of 0.937. Both methods produce a consistent alpha value. For this pilot study the alpha value is 0.93.

Table 34 - Chronbach's Alpha Results for Pilot Study

32	k	32
33	Sum of VARP	33.4911
34	VARP of sums	348.222
35	Alpha - Spreadsheet Calc	0.93298
36	Alpha - Resource Pack Calc	0.93648

Table 35 - Method 1 for Calculating Alpha

32	k	32
33	Sum of VARP	33.4911
34	VARP of sums	348.222
35	Alpha - Spreadsheet Calc	=(B32/(B32-1))*(1-(B33/B34))
36	Alpha - Resource Pack Calc	0.93648

Table 36 - Method 2 for Calculating Alpha

32	k	32
33	Sum of VARP	33.4911
34	VARP of sums	348.222
35	Alpha - Spreadsheet Calc	0.93298
36	Alpha - Resource Pack Calc	=cronalpha(B3:AG8)

10.4 Appendix D – On-Line Survey

The on-line survey was first crated on paper, updated with respondent feedback before being created on the Survey Monkey survey site.

The survey was available through the following link:
https://www.surveymonkey.com/r/AgileStudy2018

Figure 10-3 - Survey Landing Page

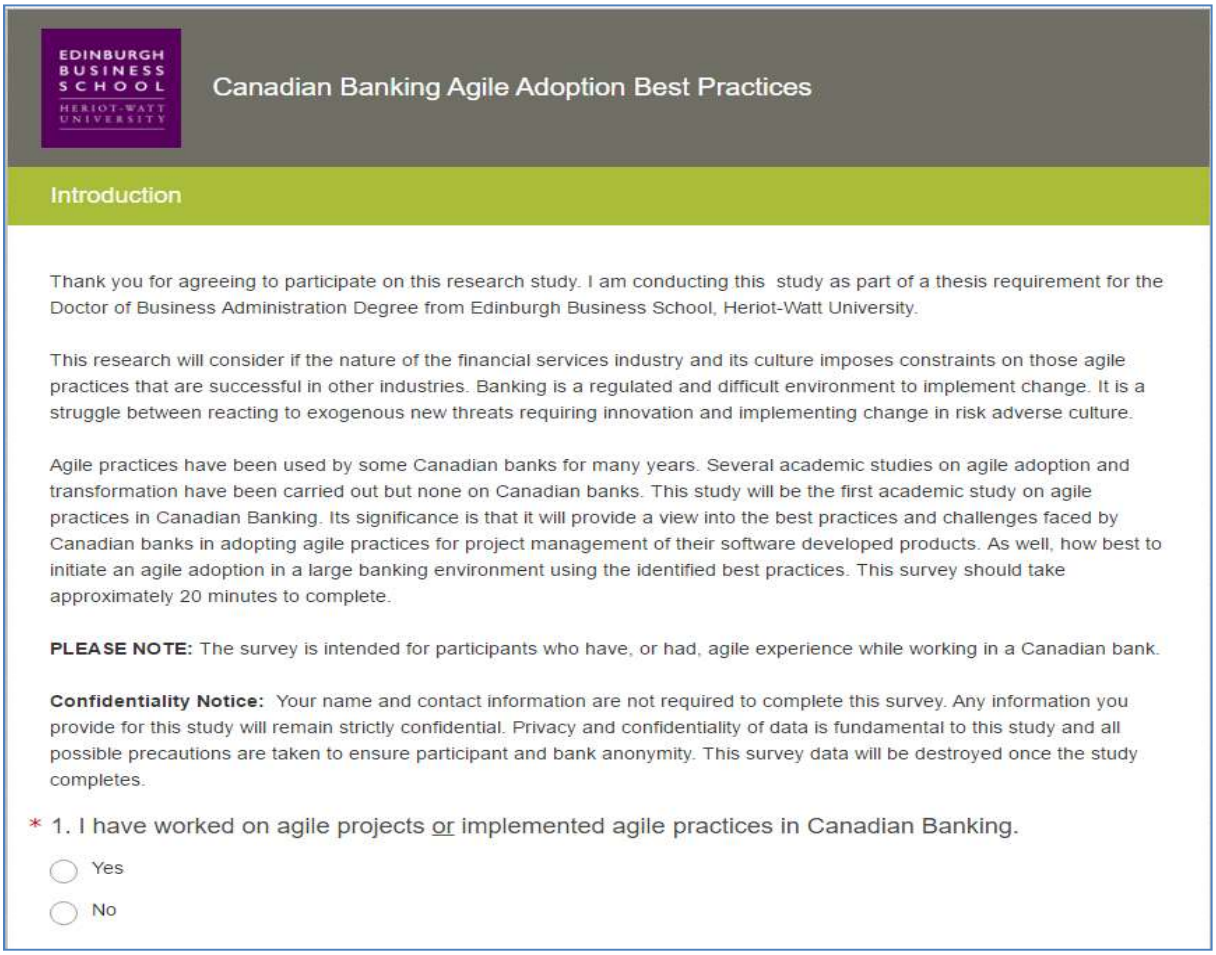


Figure 10-4 - Demographic Questions

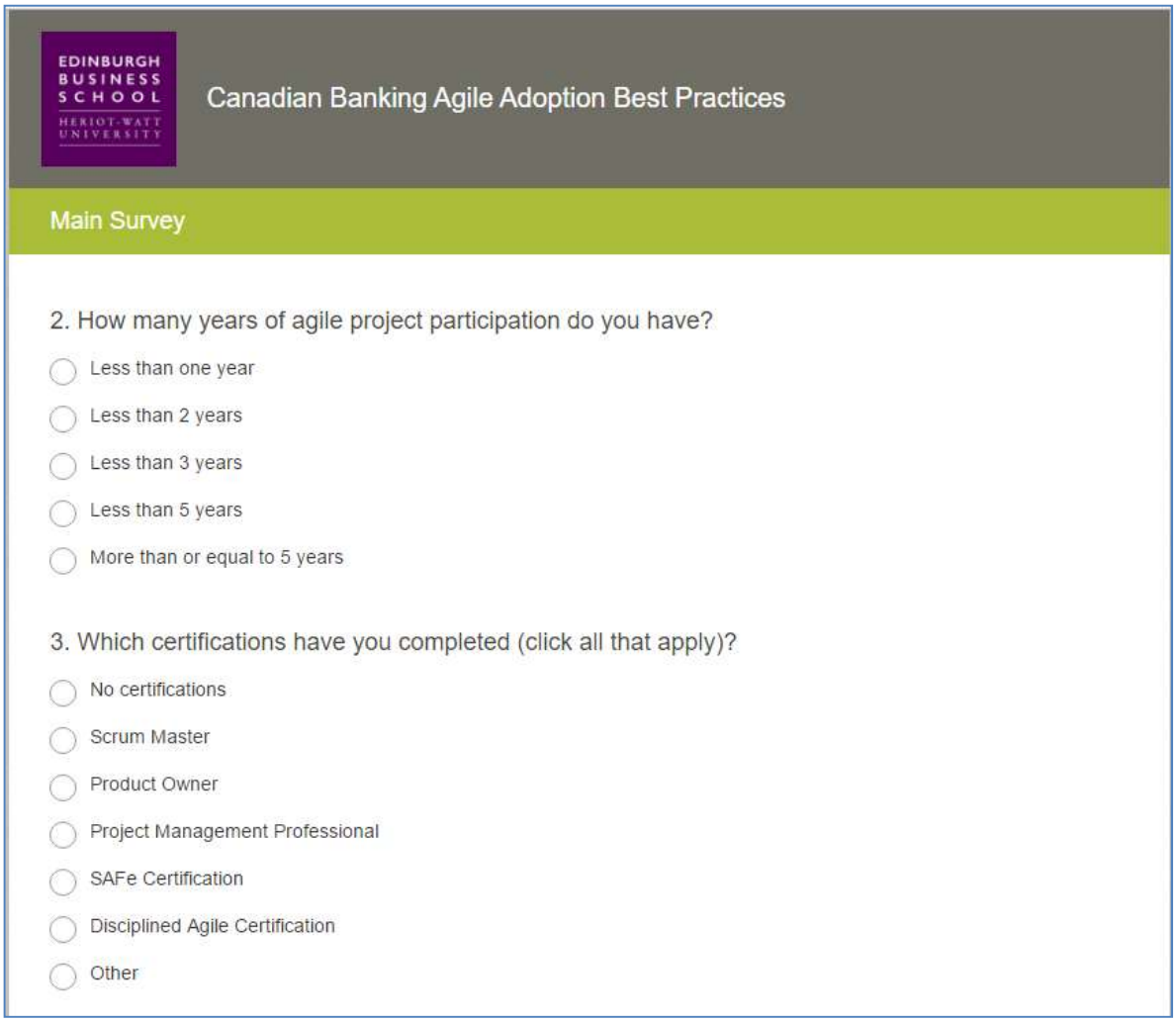


Figure 10-5 - Sample Survey Questions

Figure 10-6 - Survey Completion Times

Figure 10-7 - Survey Completion Page

10.5 Appendix E – Agile People Dimension Pilot Framework Analysis

4. Agile People						
Best Practice	OP10	OP13	OP18	TP14	TP15	TP20
Description	Use experienced staff. Identify champions that are accepting of agile practices and can act as early stage agile evangelists and mentors. If available, develop evangelists from staff that are already trained on agile practices. Use experienced agile coaches to assist with agile practices adoption and to provide methodology leadership on projects from the onset. External coaches are best to spot where corrections in the agile approach are needed. Their advice is better received as they are considered impartial. Ensure that experienced developers are engaged on initial agile projects. If the level of experience is not available internally, consider bringing that skill from outside (CEB 2012).	Training on agile principles. Provide comprehensive training tailored to different organizational stakeholders. Differentiated curriculum for executives, managers and developers. Several studies stated that training improved the chances of success for agile adoptions (Dikert et al. 2016). Ensure multiple opportunities exist for taking training, not a one-time event but a continuous delivery model (e.g. class based, on-demand web based, etc.).	Encourage Communities of Practice or Special Interest Groups within the firm to promote agile successes, share learning and offer support. Dikert (Dikert et al. 2016) notes that the formation and influence of agile communities is reported to have a significant impact on agile adoption.	Dedicated teams; teams are not disbanded after a project completes as is the norm for plan based projects in matrix organizations. Agile teams remain together from project to project (Thune et al. 2013). Dedicated resources breed domain knowledge, builds lasting relationships with customers and provides additional productivity through increased domain knowledge (Valade 2008). Rotate developers on teams moderately, to avoid domain weariness, attrition and burnout.	Product Owner commitment to devote a high percentage of their time to be available to the project. This role is the liaison between the agile team and the business sponsor and hence a high level of time commitment is needed. The Product Owner is fully integrated into the project team and development process (Thune et al. 2013).	Project stakeholders participate in daily stand-up team meetings. Daily stand-ups not exceeding 15 minutes with small team teams (Valade 2008). Valade also suggested a no-meeting day once a week. Project impediments are noted and team members are tasked to remove them.
Interview Feedback						
Participant A	No agile coaches on the project that PA was on. The expectation is that PA (as PM or Scrum Master) also act as an agile coach. At one bank there was a scrum master (this scrum master was also assigned across 5 other projects – acting as coach). Also, the scrum master was not co-located with the project. There were no coaches, coaching was expected to be provided by this person.	No evidence of agile training provided or even project on-boarding training for new team participants. Especially an issue for external contractors who are expected to know agile practices. A best practice would be to have an on-boarding boot camp for new team members. Also would benefit from agile training that was specific to new team members.	No evidence of communities of practice or SIGs at banks worked on. There were time constraints on attending communication sessions outside of projects.	Matrix type organizations. Teams are disbanded after the project concludes. The organizational structure is still plan based in most banks and there are insufficient resources to keep teams together for further projects. The organizations are divided into functional silos. This is still one constraint of large banks is the legacy organizational structures and lack of resources that allow resources to be permanently dedicated to teams.	Product owner commitment not an issue. The product owner was available for the projects he worked on. Project owner was constantly on the team.	These were conducted at banks he worked at. Every project held these meetings. However, one risk noted was that these meetings evolved into problem solving meetings and people liked to hear themselves speaking. A strong moderator is required to keep these focused - not everyone had this skill.
Participant B	Mix of staff, some experienced and some new. Some teams did not even have staff that were the right fit for an agile team; issue of staff that were used to being the heroes now having to work in a team where the hero approach is an anti-pattern for success. Lack of the right staff mix was detrimental to the project. If someone is not the right person for the team then you have to change that person right up front. Partioipant noted that if there was one thing he would change at bank1 would be to ensure that the agile projects started with the right people. Agile coaches – 3 available. Could manage 2 or 3 projects per coach. Also external coaches available. Roles of the coaches was to create the training materials and deliver the material. External training was too expensive ($1500 CA/p.p.) to have everyone trained so the training was developed internally. Coaches developed the training, provided training and were mentoring agile teams.	Three types of training or awareness presentations: 1 – 45 minute awareness session for senior level staff. 2 – half day training for senior managers. 3 – three day training course for agile team members. Training was always available year-round and delivered in class by coaches. None on-line. Training was deemed adequate.	The agile CoE started the communities of practice. They helped with the adoption of agile, it helped people with guidance when they did not know what to do. Stumbling blocks encountered were not the team members, nor IT, it was the business.	In the bank, teams were disbanded every time a project completed but stability of teams is very important for agile. At his current firm (non-banking) the product teams remain constant and dedicated to product suites. The matrix organization structure is an anti-pattern for dedicated teams. Dedicated teams is a challenge for banks. Smaller banking divisions can do this such as Capital Markets but for larger divisions this is not viable.	Business was not always on the project but was available every day to the project team. Business should have someone available to the agile team.	Stand-ups and retrospectives were held. Poor attendance by business members on meetings. One to two hour meetings were conducted. Daily stand-ups needed discipline stay on track for 15 minutes. Some members join by phone. At current firm, stand-ups are scheduled at 11:45 AM to motivate a 15 minute timely duration so people can leave for lunch thereafter.
Participant C	These were big material problems for the bank to solve and therefore the projects were big. The first projects were highly impactful and well chosen. The experienced staff were largely imported from outside into the project teams, some bank staff was added, but primarily external contractors. The project size was 40 to 50 people rather than a small team. Agile external coaches were added to the team, some truly great, some not so great. The coaches provided training, mentoring and process guidance. There was a fallacy that you could adopt agile and instantly speed up project delivery. In fact this will take a longer time to adopt these practices but this was not accounted for in the project. The project timelines did not take the learning curve into account.	Executive level education was available. Provided by external consultants. Socialization of the practices with senior leadership teams. Any team had a training budget and encouraged to spend it on agile training. Deeply discounted training from the outside was available. Training was initially delivered by externals, over time this has changed. For management, training was not so much on the rituals and practices but more so on the agile mindset. The importance was to get management and executives trained on this mindset as this could drive better decisions and outcomes downstream. Over 400 people at Director and above were socialized on agile. Training was differentiated to the audience. Scrum Master and Product Owner training was provided. Some training in terms of DevOps. Certified Scrum Alliance training. Business metrics were missing from outside training. Tailoring these to specifics of the bank as regards how business cases worked. A product owner curriculum as thus developed internally. Intranet based training also available – commercial good quality CBT.	CoEs were structurally in place. Tool Chain CoEs. Grass roots led CoEs. Budget was used to host internal Meetups to discuss projects and approaches. Regular coffee-houses were setup particularly for business to help people with the agile transition and answer questions on such things as how to size MVPs. These were hosted every four weeks, well attended and recorded. Started off with groups as large as 60 people. Was an opportunity for internal marketing/promotion of groups. Was also a way to get people in contact with coaches. Meet the coaches session were very effective because of the attendance of different teams and people would realize that they were having the same issues across different teams. This allowed people to contact each other and share likewise experiences. This had an effect after people left the room and then they would contact the agile coaches thereafter.	This is a major project problem. Projects are completed, the team is disbanded and moved to other projects, this is the nature of the organizations. When we disband agile teams we're setting the clock back on the learning curve. The next teams we do that over again. The issue is also that managers contribute their resources to projects, often their best resources. Once the project completes they want their best resources back so they can be assigned to other projects. No one wants to lose their best resources. The issue is therefore the siloed resource pillars are not conducive to dedicated product teams. The issue is also real estate, some teams are out of the center and therefore would have to commute and this causes all kinds of issues due to being relocated to agile project teams in different cities form where their normal operational base is. Geographic dispersion of key resources is an issue with centralized agile project teams. Difficult to cultivate best practices when teams are disbanded.	Yes, it happens, business is available on projects. Yes there is conflict. However this is an evolutionary approach, does not happen overnight and certainly not unique to banking.	Meetings were help, business participation was challenging and depending on the projects. Stand-up meetings were all over the map, some were very disciplined and others evolved into long meetings Part of the learning process. Need good facilitators. Scrum has been packaged in a way that is very easy to adopt but you need to intelligently adapt it to your circumstances.

Source: Author (2018)

Survey Results						
n = 6	Q19 - An agile coach is critical to have on any new agile project where the team is an early stage agile adopter.	Q22 - The bank provided a level of agile training that was appropriate for my role.	Q26 - Communities of Practice were used effectively by the bank to promote and sustain the agile adoption.	Q34 - Agile project teams in my bank are not disbanded after each project but stay together as one agile team to support past projects and undertake new projects.	Q32 - The business representative on agile projects were able to balance their day to day responsibilities while being available to the agile project team.	Q35 - In banking there is good time management of agile project team meetings (able to effectively time-box and manage the meetings).
Agreement, varS	**83.3%, 2.40**	**60%, 1.30**	**33.3%, 1.47**	**33.3%, 0.80**	**33.3%, 2.17**	**66.7%, 1.90**
Survey Feedback - What works well in adopting agile practices?	R1 - Use coaches who have real world agile experience. The market has been invaded by agile coaches with no hands-on development or IT background. They are one of the top reasons why the agile implementation failed in some banks.					R6 - Works well; sprints, tasks and stand-up meetings.
Survey Feedback - What were the personal challenges with agile projects?	R2 - Lack of buy-in from staff. People looking to be told what to do. Not how we do it here syndrome. Perception that agile works for technology teams but the business is not technology. R4 - issues working with non-agile teams in the bank. R5 - internal politics and value clashes.					
Survey Feedback - Impediments to agile adoption?	R5 - lack of transparency, lack of respect, lack of shared values. R3 - Human Resources: specifically performance and bonuses. Cannot state this strongly enough. Not Invented Here (NIH) syndrome. Resource efficiency issues; being busy versus being productive. No real impetus for change in Canadian banking. No executive in any Canadian bank has been able to tell me why they need to change from how they do business today.			R3 - Fractional resource allocation is an issue.		
Observations						
	One on one Meeting, November 2018 - Senior Agile Consultant; mentioned that subsequent approaches at this bank were to bring in external experienced agile teams and coaches to run agile projects. One example was to have staff from McKinsey & Co, start a project have them identify bank FTE resources that were a good fit for the agile approach and then gradually transition them into the project team.	Banking IT Team Leadership Meeting, February 2018 - the business does not understand that agile is not a license to avoid documenting requirements and constantly changing what they want and yet still meet a timeline target. Business needs to better understand how agile projects work - need to be educated.				

Data Interpretation						
Analysis	Although having the most experienced staff to participate on agile projects is the best practice approach, the evidence suggests those bank staff involved on agile projects are not the high performing staff that is needed. R2 notes a lack of buy-in from staff, not taking leadership and waiting to be told what to do. This goes against the agile principle of self-managed teams. Internal politics and value clashes are also an issues as well as lack of buy-in from business. The evidence suggests that coaches are an important part of an agile adoption (83% agreement). The feedback therefore portrays a culture in some banks that resists agile adoption. Those pilot "showcase" projects that must succeed using an agile approach were only successful by bringing in external experienced consultants and coaches to run the projects. In one bank, the project was seeded with McKinsey & Co consultants. The literature review points out, if the staff cannot be sourced from within the bank then bring in the skills from outside. This is observed with some of the participants interviewed. External consultants and experienced agile coaches are brought in from the outside to run agile projects when they must show positive outcomes.	PB and PC note that agile training is differentiated to the audience and available throughout the year in their bank; not only a one time endeavor. PA notes that for external consultants brought into an agile project there is no training provided. This could potentially be a gap whereby training is only provided to full time staff. Given that banks tailor their agile practices, an agile practices gap may develop between internal and external staff. The survey results indicate that 60% of respondents believe the training they received was adequate. In general the evidence points out that differentiated training is available in banking and is generally effective. It should be provided to all staff levels including external staff.	The evidence points out that communities of practice were encouraged and even established by the PMO at some banks. PB and PC comment that these communities did provide value in adopting agile practices. PA being an external consultant did not benefit from participation in the communities at some banks and this could be the nature of an external engagement; is that external managers brought in to run agile projects do not have the same access to training and communities as the internal staff do. The survey feedback shows that 33% agreement on the effectiveness of communities of practice in banking. The issue could be one of sustaining these communities over time. They may be established initially as a way to encourage knowledge sharing for easing agile adoptions but over time become less effective.	The evidence from the interviews and survey suggest that this is not a practice used by banking. 33% of respondents agree that the project teams stay together. The challenges with the typical matrix organizational structure does not lend itself to dedicated teams. People managers do not want to give up their best staff to a dedicated team. As a result project teams are disbanded once the project completes. This practice makes it difficult to establish the productivity (agile velocity) of agile teams as with every project a new mix of people comprise the team. Additionally, teams don't benefit from sustaining the close inter-personal staff dynamics developed throughout the project (norming, storming, performing, etc.). One challenge is that departments are not aligned as a product groups. Whereas in some software development firms (e.g. Adobe) a team is focused on one product, in banking, staff usually work on a multitude of applications without necessarily being allocated to a small collection of products. Teams are created to address the needs of new applications or required regulatory changes. For this best practice to apply to banking, dedicated product teams would have to be established. Banking would have to give up some efficiencies of scale that the matrix organization provides.	Overall the comments suggest that the product owner is available to the agile project teams. However, it remains a challenge to have the role dedicated 100% to the team. The best seems to be a compromise in having the product owner partially available to the team. Only 33% of survey respondents agree that the product owner can successfully balance their day to day activities with project participation. This constraint can be considered as a tailoring of the agile best practice to fit the banking environment where as a best practice the product owner must be partially available to the agile team but not fully dedicated. The compromise is achieving a balance between doing their day to day work and being available to the team. As a fundamental agile principle it is critical that a product owner be available to the team.	Evidence from the interviews and survey indicates that there were meetings held, particularly daily stand-ups and they worked well. PC noted that a good facilitator is needed to keep the meeting on track and not evolve into problem solving meetings. PB's approach to keep meetings within 15 minutes is to hold them before lunch. 67% of survey respondents agree that daily stand-ups are held at their banks. One participant noted that business attendance at the daily stand-up could be a challenge.
Conclusion	OP10 - Using experienced staff in the first agile pilots is critical to demonstrate success. As a best practice for banking, the evidence suggests that banks don't always have the internal skills to for an agile adoption. External consultants and coaches are needed to fill the skill the gap and seed the practices to enable successful agile adoptions.	OP13 - Comprehensive and differentiated training on agile is a best practice for agile adoption in banking.	OP18 - Communities of practice are a best practice for supporting agile adoptions in banking. Although their value could be highest during the agile adoption phase and less so when agile practices become well established.	TP14 - Is not a best practice that can be implemented in the current banking environment due to the organizational structure of teams in banks. Until banks evolve from functional to product based organizations, dedicated agile teams may not be possible.	TP15 - This is a best practice that applies to banking, however, with the caveat that product owners will likely not be fully allocated to the agile teams.	TP20 - Daily stand-ups are a best practice for banks. Business participation may be a challenge.

Source: Author (2018)

10.6 Appendix F – Research Information Document for Survey

Figure 10-8 - Participant Research Information Document for Surveys, Page 1

Survey Participant Information Document

EDINBURGH BUSINESS SCHOOL
HERIOT-WATT UNIVERSITY

Research Subject: ***Agile Project Management Adoption Best Practices in Canadian Banking***

Introduction

My name is Manuel Duarte. I am conducting a study as part of a thesis requirement for the Doctor of Business Administration Degree from Edinburgh Business School, Heriot-Watt University (Edinburgh, Scotland). The study will investigate the best practices for the adoption of agile methods in Canadian Banking for software development management. You may have also heard of this change as agile transformations or digital transformation of banking.

Research Description

Implementing agile software development methodologies into large Canadian banks which have relied on traditional plan-based project management methodologies is a culturally challenging change. The research will contrast practices that have worked for other software development industries through a comprehensive literature review and examine what practices were successfully adopted into the regulated Canadian Banking environment. This research will consider if the nature of the financial services industry and its culture imposes constraints on those agile practices that are successful in other industries. Banking is a regulated and difficult environment to implement change. It is a struggle between exogenous threats requiring innovation to adapt to a changing business environment and an entrenched culture of resisting change. The research will explore what agile adoption strategies are used by Canadian banks and if there are differences or commonalities across banks. Best practices are examined to shape an agile project management adoption framework. The result of this research will be a framework for adopting an agile project methodology suited to Canadian Banking.

Research Significance

Agile practices have been used by some Canadian banks for many years. Several academic studies on agile adoption and transformation have been carried out but none on Canadian banks. This study will be the first academic study on agile practices in Canadian Banking. Its significance is that it will provide a view into the best practices and challenges faced by Canadian banks in adopting agile practices for project management of software developed products.

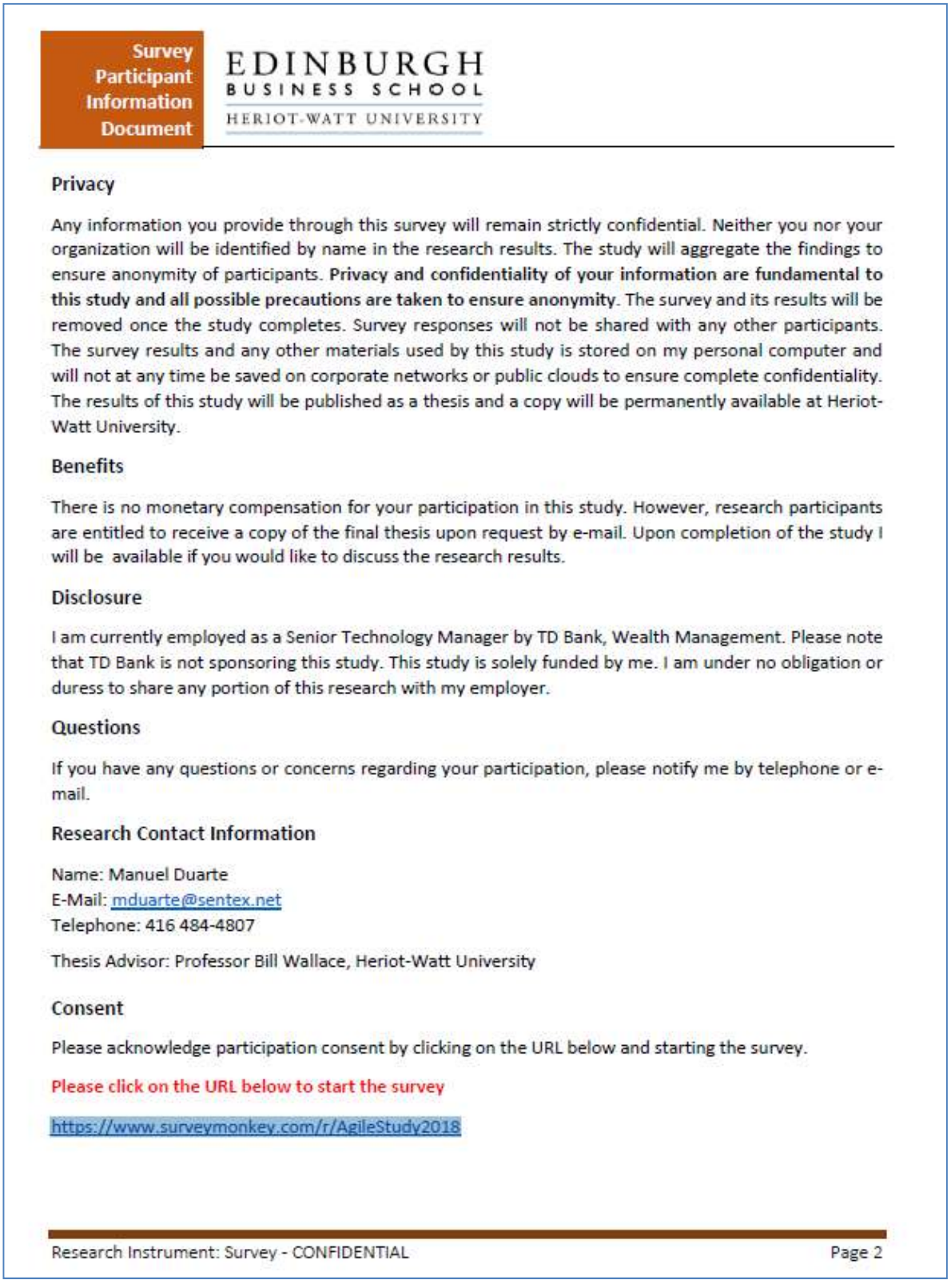
Voluntary Participation

As you are an industry insider with working experience in Canadian Banking and with exposure to agile practices your contribution to this research is important. However, **your participation is strictly voluntary and you may decline to participate at any time**. For this study, I am asking for your commitment to complete a web based survey that should take no more than 10 minutes of your time. I would encourage your participation as there is a lack of information on agile adoption strategies for large regulated Canadian banks; your participation will provide a significant contribution to the knowledge base.

Research Instrument: Survey - CONFIDENTIAL Page 1

Source: Author (2017)

Figure 10-9 - Participant Research Information Document for Surveys, Page 2



Survey Participant Information Document

EDINBURGH BUSINESS SCHOOL
HERIOT-WATT UNIVERSITY

Privacy

Any information you provide through this survey will remain strictly confidential. Neither you nor your organization will be identified by name in the research results. The study will aggregate the findings to ensure anonymity of participants. **Privacy and confidentiality of your information are fundamental to this study and all possible precautions are taken to ensure anonymity**. The survey and its results will be removed once the study completes. Survey responses will not be shared with any other participants. The survey results and any other materials used by this study is stored on my personal computer and will not at any time be saved on corporate networks or public clouds to ensure complete confidentiality. The results of this study will be published as a thesis and a copy will be permanently available at Heriot-Watt University.

Benefits

There is no monetary compensation for your participation in this study. However, research participants are entitled to receive a copy of the final thesis upon request by e-mail. Upon completion of the study I will be available if you would like to discuss the research results.

Disclosure

I am currently employed as a Senior Technology Manager by TD Bank, Wealth Management. Please note that TD Bank is not sponsoring this study. This study is solely funded by me. I am under no obligation or duress to share any portion of this research with my employer.

Questions

If you have any questions or concerns regarding your participation, please notify me by telephone or e-mail.

Research Contact Information

Name: Manuel Duarte
E-Mail: mduarte@sentex.net
Telephone: 416 484-4807

Thesis Advisor: Professor Bill Wallace, Heriot-Watt University

Consent

Please acknowledge participation consent by clicking on the URL below and starting the survey.

Please click on the URL below to start the survey

https://www.surveymonkey.com/r/AgileStudy2018

Research Instrument: Survey - CONFIDENTIAL Page 2

Source: Author (2017)

10.7 Appendix G – Interview Questionnaire

Figure 10-10 - Interview Questions, Page 1

Interview Question Development

Author: Manuel Duarte

Document Version: 01 FEB 2018

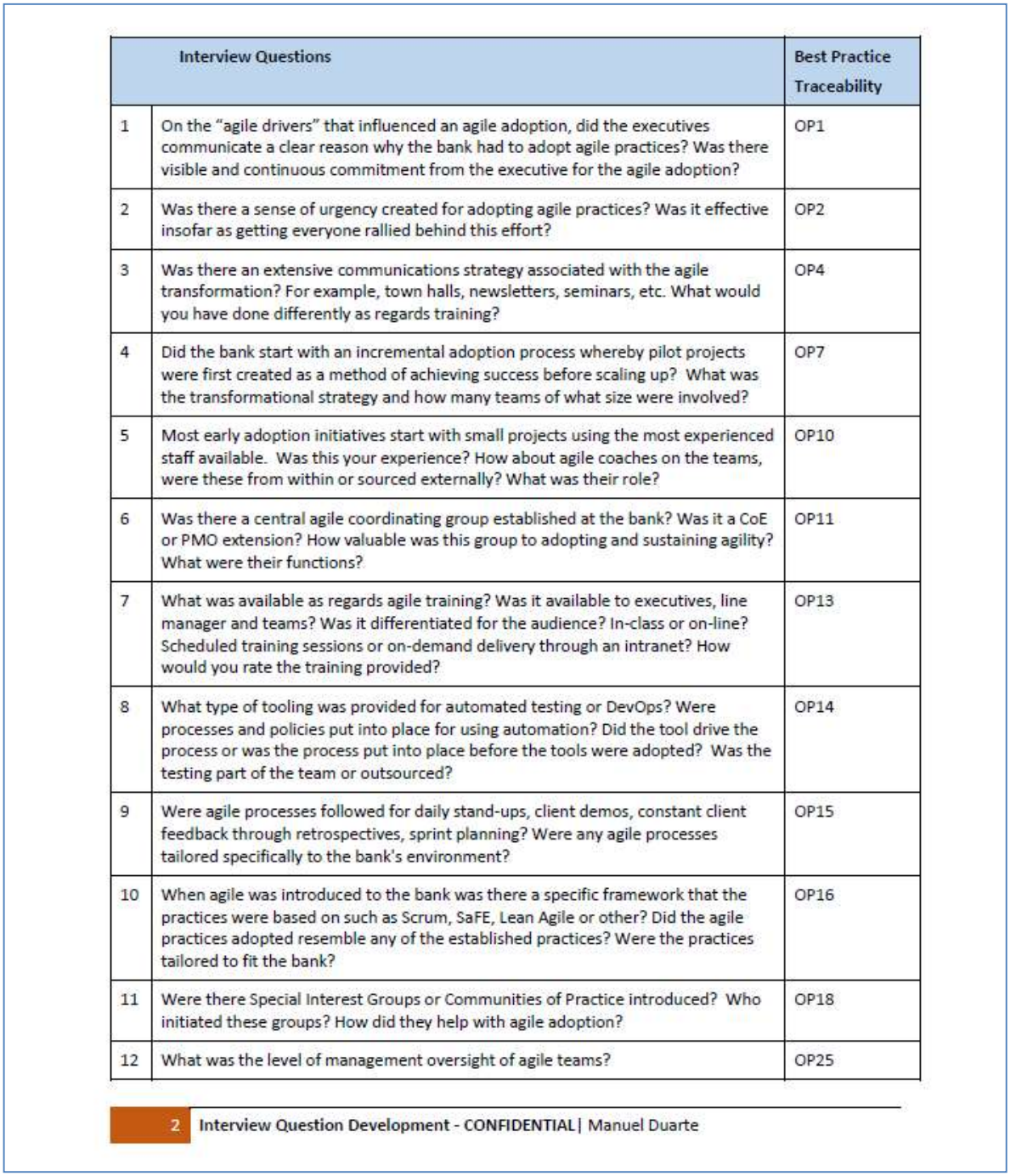
Notes:

- Assumption is that an agile like Scrum methodology is used by the bank.

Demographics	Responses
How many years of agile project participation do you have?	1. Less than one year 2. Less than 2 years 3. Less than 3 years 4. Less than 5 years 5. More than or equal to 5 years
Which certifications have you completed (click all that apply)?	• No certifications • Scrum Master • Product Owner • Project Management Professional • SAFe Certification • Disciplined Agile Certification • Other
How many years have you worked in Canadian Banking?	1. Less than one year 2. Less than 3 years 3. Less than 5 years 4. Less than 7 years 5. More than or equal to 8 years
What is your current job title?	
What is your job level within the organization (please select the closest fit)?	1. CIO or equivalent 2. VP or Managing Director 3. Associate Vice President or Director 4. Senior Manager 5. Project Manager, Scrum Master or Product Owner 6. Team Member 7. Other
What is your employment status?	1. Canadian bank - full time staff 2. Consulting firm - full time staff 3. Self-employed: Contractor / Sole Proprietor 4. Other

Source: Author (2017)

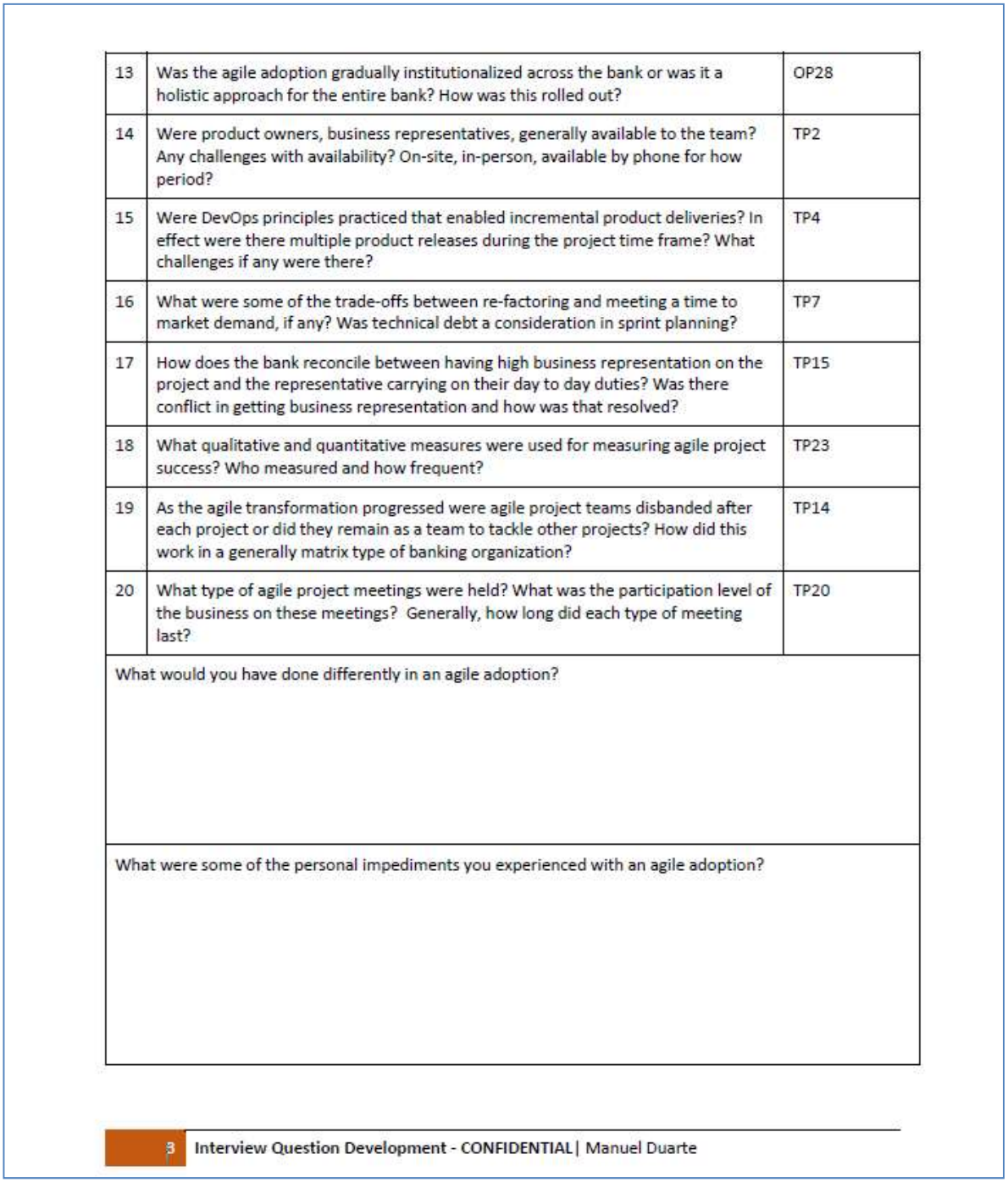
Figure 10-11 - Interview Questions, Page 2



	Interview Questions	Best Practice Traceability
1	On the "agile drivers" that influenced an agile adoption, did the executives communicate a clear reason why the bank had to adopt agile practices? Was there visible and continuous commitment from the executive for the agile adoption?	OP1
2	Was there a sense of urgency created for adopting agile practices? Was it effective insofar as getting everyone rallied behind this effort?	OP2
3	Was there an extensive communications strategy associated with the agile transformation? For example, town halls, newsletters, seminars, etc. What would you have done differently as regards training?	OP4
4	Did the bank start with an incremental adoption process whereby pilot projects were first created as a method of achieving success before scaling up? What was the transformational strategy and how many teams of what size were involved?	OP7
5	Most early adoption initiatives start with small projects using the most experienced staff available. Was this your experience? How about agile coaches on the teams, were these from within or sourced externally? What was their role?	OP10
6	Was there a central agile coordinating group established at the bank? Was it a CoE or PMO extension? How valuable was this group to adopting and sustaining agility? What were their functions?	OP11
7	What was available as regards agile training? Was it available to executives, line manager and teams? Was it differentiated for the audience? In-class or on-line? Scheduled training sessions or on-demand delivery through an intranet? How would you rate the training provided?	OP13
8	What type of tooling was provided for automated testing or DevOps? Were processes and policies put into place for using automation? Did the tool drive the process or was the process put into place before the tools were adopted? Was the testing part of the team or outsourced?	OP14
9	Were agile processes followed for daily stand-ups, client demos, constant client feedback through retrospectives, sprint planning? Were any agile processes tailored specifically to the bank's environment?	OP15
10	When agile was introduced to the bank was there a specific framework that the practices were based on such as Scrum, SaFE, Lean Agile or other? Did the agile practices adopted resemble any of the established practices? Were the practices tailored to fit the bank?	OP16
11	Were there Special Interest Groups or Communities of Practice introduced? Who initiated these groups? How did they help with agile adoption?	OP18
12	What was the level of management oversight of agile teams?	OP25

Source: Author (2017)

Figure 10-12 - Interview Questions, Page 3



13	Was the agile adoption gradually institutionalized across the bank or was it a holistic approach for the entire bank? How was this rolled out?	OP28
14	Were product owners, business representatives, generally available to the team? Any challenges with availability? On-site, in-person, available by phone for how period?	TP2
15	Were DevOps principles practiced that enabled incremental product deliveries? In effect were there multiple product releases during the project time frame? What challenges if any were there?	TP4
16	What were some of the trade-offs between re-factoring and meeting a time to market demand, if any? Was technical debt a consideration in sprint planning?	TP7
17	How does the bank reconcile between having high business representation on the project and the representative carrying on their day to day duties? Was there conflict in getting business representation and how was that resolved?	TP15
18	What qualitative and quantitative measures were used for measuring agile project success? Who measured and how frequent?	TP23
19	As the agile transformation progressed were agile project teams disbanded after each project or did they remain as a team to tackle other projects? How did this work in a generally matrix type of banking organization?	TP14
20	What type of agile project meetings were held? What was the participation level of the business on these meetings? Generally, how long did each type of meeting last?	TP20
What would you have done differently in an agile adoption?		
What were some of the personal impediments you experienced with an agile adoption?		

Source: Author (2017)

10.8 Appendix H – Main Study Analytical Framework Sample

Table 37 shows the framework analysis spreadsheet for one (OP10) of the 20 best practices studied in this research. The framework incorporates feedback from the interviews, any observations, survey comments and scores.

Table 37 – Framework Analysis for OP10

4. Agile People	
Best Practice	OP10
Description	Use experienced staff. Identify champions that are accepting of agile practices and can act as early stage agile evangelists and mentors. If available, develop evangelists from staff that are already trained on agile practices. Use experienced agile coaches to assist with agile practices adoption and to provide methodology leadership on projects from the onset. External coaches are best to spot where corrections in the agile approach are needed. Their advice is better received as they are considered impartial. Ensure that experienced developers are engaged on initial agile projects. If the level of experience is not available internally, consider bringing that skill from outside (CEB 2012).
Interview Feedback	
Participant A (PA)	No agile coaches on the project that PA was on. The expectation is that PA (as PM or Scrum Master) also act as an agile coach. At one bank there was a scrum master (this scrum master was also assigned across 5 other projects – acting as coach). Also, the scrum master was not co-located with the project. There were no coaches, coaching was expected to be provided by this person.

Participant B (PB)	Mix of staff, some experienced and some new. Some teams did not even have staff that were the right fit for an agile team; issue of staff that were used to being the heroes now having to work in a team where the hero approach is an anti-pattern for success. Lack of the right staff mix was detrimental to the project. If someone is not the right person for the team then you have to change that person right up front. Participant noted that if there was one thing he would change at bank1 would be to ensure that the agile projects started with the right people. Agile coaches – 3 available. Could manage 2 or 3 projects per coach. Also external coaches available. Roles of the coaches was to create the training materials and deliver the material. External training was too expensive ($1500 CA/p.p.) to have everyone trained so the training was developed internally. Coaches developed the training, provided training and were mentoring agile teams.
Participant C (PC)	These were big material problems for the bank to solve and therefore the projects were big. The first projects were highly impactful and well chosen. The experienced staff were largely imported from outside into the project teams, some bank staff was added, but primarily external contractors. The project size was 40 to 50 people rather than a small team. Agile external coaches were added to the team, some truly great, some not so great. The coaches provided training, mentoring and process guidance. There was a fallacy that you could adopt agile and instantly speed up project delivery. In fact this will take a longer time to adopt these practices but this was not accounted for in the project. The project timelines did not take the learning curve into account.
Participant D (PD)	No, this approach was big bang on a burning platform. Yes, the best staff available was used. Yes, agile coaches used. External coaches used and the primary role was coaching the teams.

Participant E (PE)	Not using experienced staff. This was a big bang approach project and much expertise was brought in from outside such as Deloitte and Cognizant as well as off-shore development. Coaches were from Deloitte. Coaching was their main responsibility. Provided lessons learned from their previous organizations. Helped with front-end planning and financials as well.
Participant F (PF)	The bank would use whatever people they would normally use. They were not trying to stack the deck to prove out the suitability of agile and learn lessons from that. They were using the same resources they would use on any other project. A mix of coaching and facilitation was available. Coaches were there strictly for the culture change and process change, they were not there to contribute as part of the work effort of the team.
Participant G (PG)	Started with small projects, as a new methodology could cause risk. In annual planning we asked what projects could be agile based without adding risk to market or delivery. We wanted to improve delivery but not increase risk to the bank. The people involved on these projects were the same people who would have been involved on any other project regardless if it was agile or waterfall. One challenge is people involved with agile projects are not the right fit for the project. Some people are highly skilled and are used to being the hero on projects. These are saviors who come in at the last minute to save the project and get the attention. In agile you have to work as a team and personality clashes do occur. These heroes can still shine but have to shine differently. Coaches were brought in to help with the agile training and coaching of teams. Deloitte was also brought in to help with the agile transformation.
Survey Results	

n = 27	Q19 - An agile coach is critical to have on any new agile project where the team is an early stage agile adopter.
Agreement, varS, A/D	**Q19 - 81.5%, 1.15, 11.0**
Survey Feedback	
Q41 - What works well in adopting agile practices?	R1 - Use coaches who have real world agile experience. The market has been invaded by agile coaches with no hands-on development or IT background. They are one of the top reasons why the agile implementation failed in some banks. R7 - Decentralized smaller teams embedded in each business unit. R1 - Remove people blocking agile adoption. Agile cannot thrive in a location where people actively fight against accepting change.
Q42 - What were the personal challenges with agile projects?	R2 - Lack of buy-in from staff. People looking to be told what to do. Not how we do it here syndrome. Perception that agile works for technology teams but the business is not technology. R4 - issues working with non-agile teams in the bank. R5 - internal politics and value clashes.
Q43 - Impediments to agile adoption?	R5 - lack of transparency, lack of respect, lack of shared values. R3 - Human Resources: specifically performance and bonuses. Cannot state this strongly enough. Not Invented Here syndrome. Resource efficiency issues; being busy versus being productive. No real impetus for change in Canadian banking. No executive in any Canadian bank has been able to tell me why they need to change from how they do business today. R13 - Majority of the control partners (Finance, Risk, Compliance, Legal, Technology Infrastructure etc.) have not adopted Agile practices.
Observations	

	One-on-one meeting, November 2016 - Senior Agile Consultant; mentioned that subsequent approaches at this bank were to bring in external experienced agile teams and coaches to run agile projects. One example was to have staff from McKinsey & Co, start a project have them identify bank FTE resources that were a good fit for the agile approach and then gradually transition them into the project team.
Data Interpretation	
Analysis	Although having the most experienced staff to participate on agile projects is a best practice, the evidence suggests those bank staff involved on agile projects are not the high performing individuals one would expect. The staff applied to agile projects are the same bank staff used in traditional projects as noted by PA, PB, PE, PF and PG. In most cases, agile coaches are brought in from the outside to supplement the skills that the internal bank resources lack. PA notes that in his experience, external consultants are expected to train staff on agile principles. Staff and middle management knowledge of agile project principles is not generally evident. PD and PE note that external consultants are brought in for highly critical projects that the bank must deliver successfully. More than one participant mentioned Deloitte providing coaching and transformational services. An observation from a meeting in 2016 with a senior agile coach notes that one major bank brought in a consulting firm (McKinsey & Company) to lead a critical agile project. The consulting firm bought in their staff to start the project, then gradually identified high performing bank employees to be brought into the project. PG and PB commented that the staff who are used to working on traditional projects are not ideal for agile projects. The biggest issue is dealing with "heroes"; those

	staff who come in at the last minute and save the day. They have difficulties adapting to working in a team where individual success is discouraged over team success. PG comments that heroes have to find a different way to shine on agile teams. R2 notes a lack of buy-in from staff, not taking leadership and waiting to be told what to do. This goes against the agile principle of self-managed teams and is indicative of staff not understanding the expectations of their roles on an agile project. The evidence suggests that regular bank staff are applied on agile projects and coaches become an important part of an agile adoption (82% agreement). There are 11 more times agreements than disagreements on this question, strongly suggesting that coaches are a must for agile adoptions especially in cases where organizational knowledge of agile is weak. One agile coach (PF) commented that banks need to be cautious about the level of agile knowledge of the large consulting firms as they promote a process based approach which could be counter to agile principles. Process based approaches fit with the way banks operate but go against agile principles. Large firms are setup for economies of scale. Economies of scale and agile thinking are not congruent. RS17 commented that the market has been invaded by agile coaches with no hands-on development or IT background expertise. They are one of the top reasons why the agile implementation failed in some banks. PF was skeptical about the contribution and value for money realized by engaging a large consulting firm, versus using experienced coaches. The feedback indicates that some banks want to adopt agile practices but are weak on knowledge of the practices. The

	literature review points out, if the staff cannot be sourced from within the bank then bring in the skills from outside. This is observed with some of the participants interviewed. External consultants and experienced agile coaches are brought in from the outside to run agile projects when they must show positive outcomes.
Conclusion	*OP10 - Using experienced staff in the first agile pilots is critical to demonstrate success. However, banks don't always have the high performing staff with agile skills necessary to guarantee the success of critical agile projects. As a best practice for banking, the evidence suggests that banks don't always have the internal skills to for an agile adoption. External consultants and coaches are needed to fill the gap and seed the practices to enable successful agile adoptions. A common theme has been to scale agile adoptions by using top tier consulting firms which carry over the expertise gained from agile transformations at other banks. The banks have the financial resources to engage the large consulting firms for help, something that smaller firms may not have. As well, the process structure and vast resources of a top tier consultancy may be better aligned with the banking culture and way of working. In most cases, banks have longstanding relationships with these same firms. This is a best practice in other industries and applies equally to banking due to the need to build qualified agile practitioners by seeding the knowledge from external qualified practitioners. One difference is that banks generally engage top tier consultancies versus smaller firms who may engage individual coaches.

Source: Author (2018)

10.9 Appendix I – Main Study Survey Data Graphs

Survey Analysis

This section is an in-depth analysis of the survey data. The survey also featured open ended questions and the responses were considered for the qualitative analysis data.

The survey results in the pilot were plotted into a radar graph and the same graph was planned for the main study. However, 31 questions and 27 responses yielded 837 data points that when plotted into a radar graph became overly cluttered and impossible to discern any patterns. Instead the main study used a bar graph (Figure 10-13).

To identify responses with strong agreement an average score of 3.25 or greater was assumed. This translates to 65% of the responses having selected *Agree* or *Strongly Agree*. Likewise low agreement were those responses with average scores of 2.6 or lower, meaning a 52% or lesser agreement rate. The highest potential average score is 5, indicating all responses were *Strongly Agrees* whereas a score of 1 indicates all responses were *Strongly Disagrees*. Using this selection criteria resulted in 17 questions rated as high and 3 questions rated as low from a total of 31 questions. The selection limits of 3.25 for high and 2.6 for low were subjectively chosen by the researcher.

The intent of this analysis was to highlight which questions have the highest and lowest levels of agreement as per the survey responses. Table 38 lists the high and low scores for the 20 questions meeting the high/low criteria. Responses from all 31 questions were taken into account for creating the analysis and conclusions.

Agreement Ratio

The Agree and disagree ratio is a measure of the response count for agree versus responses for disagree:

Equation 1 - Agreement Ratio

$$Agreement\ Ratio = (Strongly\ Agree + Agree) / (Disagree + Strongly\ Disagree)$$

A ratio of 1 indicates an even balance between agree and disagree votes. A ratio value of less than one indicates higher disagreement with the question. By contrast, a value of greater than 1 indicates a higher number of agree votes. The ratio excludes the neutral votes but serves to

demonstrate the magnitude of responses that agree and disagree. Q9 does not have a ratio value as it had no disagree votes.

Table 38 - Highest and Lowest Scoring Survey Questions

Number	Question	Average Score	Sample Variance	Agree / Disagree
	High scores are equal to or greater than 3.25 (65%)			
Q9	I sincerely believed there was a need for adopting agile practices in the bank.	4.70	0.29	NA
Q10	The level of executive commitment for agile adoption as a high priority was clearly evident to everyone.	3.67	1.38	4.30
Q11	Our executives set a credible sense of business urgency for adopting agile practices in my bank.	3.52	1.41	3.00
Q12	My business partners were convinced of the need for adopting agile practices in our bank.	3.44	0.95	2.50
Q13	Our executives communicated a compelling argument for the adoption of agile practices.	3.26	1.81	2.80
Q18	In your experience, was agile first tried on pilot projects before being rolled out to larger projects in the bank (incremental agile adoption versus a big bang approach)?	3.70	4.22	3.80
Q19	An agile coach is critical to have on any new agile project where the team is an early stage agile adopter.	4.33	1.15	11.00
Q20	Was there a central Agile CoE or PMO created to support the agile adoption?	4.19	3.08	7.30
Q21	A central coordinating body (Agile Centre of Excellence or Agile Project Office) is essential for an agile adoption.	3.63	1.70	3.20
Q24	Agile practices such as daily stand-ups, client demos, retrospectives and sprint planning were well conducted at the bank.	3.78	0.87	6.00
Q25	The agile practices used by the bank were adapted to fit the banking environment (they were not the textbook practices proposed by Scrum but were tailored to fit the bank's way of running agile projects).	3.96	0.58	21.00
Q28	The method of incremental agile adoption used by the bank (implementing agile one group or division at a time) is a good way to scale agility in the banking environment, versus a holistic bank-wide adoption.	3.74	1.20	4.50

Q29	Product owners (business representation) were accessible to the agile team whenever needed.	3.33	1.62	1.60
Q30	The agile project team deployed incremental product releases throughout the life of the project (Minimal Viable Product), as opposed to one large release at the project end.	3.37	1.17	2.10
Q35	In banking there is good time management of agile project team meetings (able to effectively time-box and manage the meetings).	3.33	1.00	3.00
Q38	When the bank adopted agile practices, my business partners supported using these practices on their projects.	3.48	0.95	4.30
Q39	Today, my business partners understand the benefits of using agile practices on their projects.	3.59	0.94	4.50
	Low scores are equal to or less than 2.6 (52%)			
Q33	At my bank when assessing client satisfaction on project completion, emphasis is placed on qualitative client satisfactory measures rather than quantitative factors (e.g. scope, budget and schedule).	2.56	1.49	0.50
Q34	Agile project teams in my bank are not disbanded after each project but stay together as one agile team to support past projects and undertake new projects (Product team concept).	2.59	1.10	0.50
Q37	The bank has not carried over any previous waterfall practices into their agile practices.	2.26	1.43	0.40

Source: Author (2018)

Highest and Lowest Survey Scores

Q25 has the highest ratio due to a 77.8% agreement score and only a 3.7% disagreement score resulting in a ratio value of 21. The low variance (0.58) for this question indicates a strong clustering of data points along the agreement scale. Table 39 also indicates a high value for Q25 due to the higher number of agreement scores. Q19 shows a similar pattern of high scores with 81.5% agrees versus 7.4% disagrees, resulting in an agreement ratio of 11, indicating strong agreement. The sample variance for Q19 is 1.15, indicating a wider dispersion of agree and disagree points. The high score on Q19 indicates that most respondents agree the role of an agile coach is necessary on early stage agile projects.

Q37 with an average score of 2.26 indicates the weakest agreement score. *Disagrees* and *strongly disagrees* account for 59% of the score. Q37 could indicate that although banks have adopted agile practices, the overall sentiment is that they have carried over artifacts from plan based management. This may be due to the regulatory agile environment or a requirement for homogeneous management reporting across both waterfall and agile projects.

Question Scores by AWRM Dimension

Taking the survey scores and mapping them into the AWRM survey dimension, by best practice and questions associated with each best practice, yields the scoring in Table 39. The table shows the average score for each question and if the score qualified as a high or low score. Additionally the averages for each AWRM dimension are computed and the result shown as an average and a percent. 39 shows an overall average for each dimension being above 62.5%, indicating positive agreement on responses received for each AWRM quadrant. Furthermore, the AWRM dimension's average percentage shows only a 7% difference between the highest and lowest percentages showing consistency across all four dimensions.

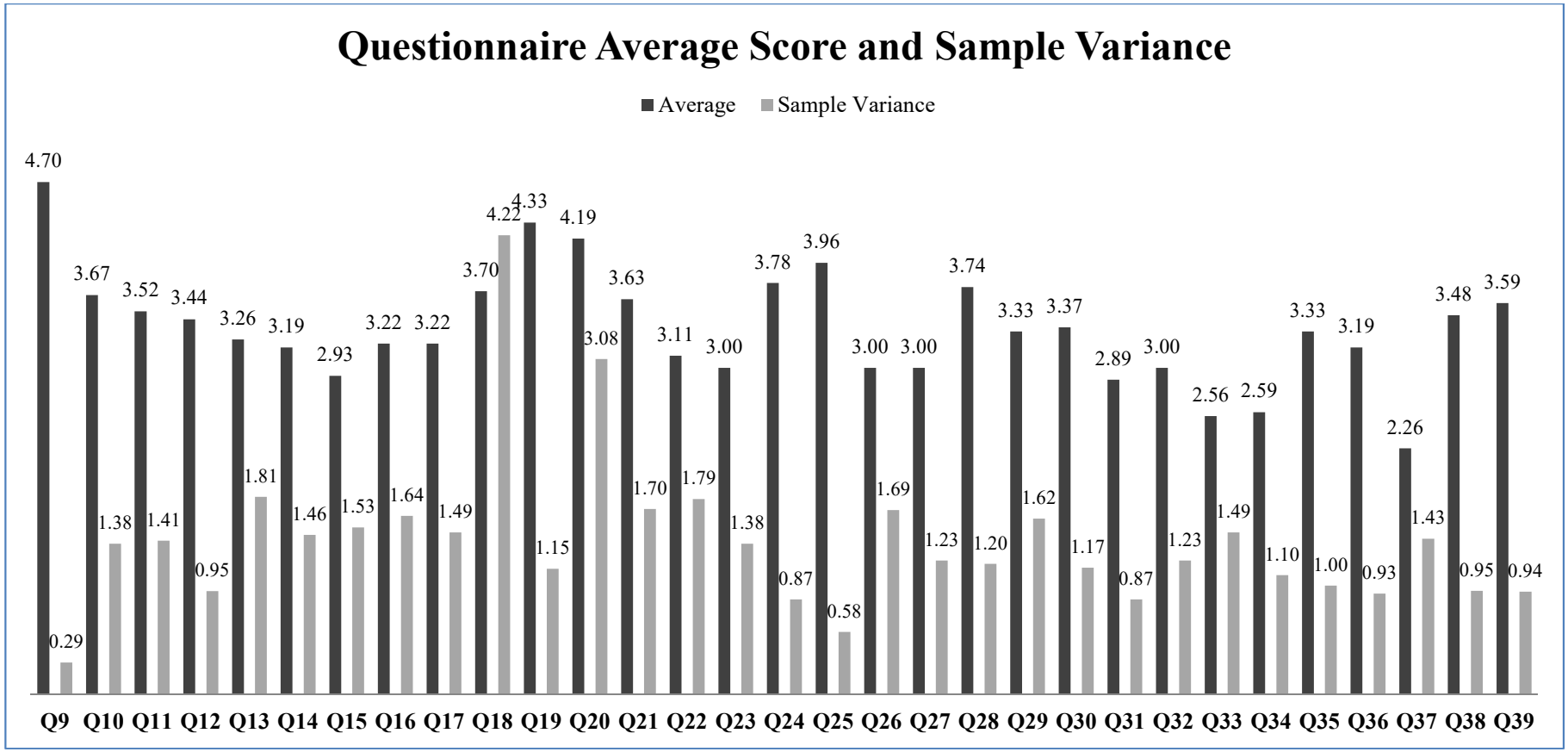
The Strategy dimension has the highest number of scores. The People and Process dimensions score lower but not disproportionally. What does this mean? The survey questions were based on general best practices and if such practices were used in Canadian banks. If so, were they effectively used? Positive agreement scores indicate that best practices are used and although there are some sub-optimal scores, the majority of scores are above 62.5%.

Table 39 – Scores by AWRM Dimension

AWRM Dimension	Best Practice ID	Question Number	Average Score	Average Score %	High/Low Scores	Agree %	Disagree %	AWRM %
Strategy	OP1	Q9	4.70	94.00%	H	96.30%	0.00%	
Strategy	OP1	Q10	3.67	73.40%	H	63.00%	14.80%	
Strategy	OP1	Q13	3.26	65.20%	H	53.80%	19.20%	
Strategy	OP2	Q11	3.52	70.40%	H	55.60%	18.50%	
Strategy	OP2	Q12	3.44	68.80%	H	55.60%	22.20%	

Strategy	OP4	Q14	3.19	63.80%		44.40%	33.30%	
Strategy	OP4	Q15	2.93	58.60%		30.80%	30.80%	
Strategy	OP4	Q16	3.22	64.40%		50.00%	26.90%	
Strategy	OP7	Q17	3.22	64.40%		46.20%	15.40%	
Strategy	OP7	Q18	3.70	74.00%	H	79.20%	20.80%	
Strategy	OP11	Q20	4.19	83.80%	H	88.00%	12.00%	
Strategy	OP11	Q21	3.63	72.60%	H	70.40%	22.20%	
Strategy	NA	Q38	3.48	69.60%	H	48.10%	11.10%	
Strategy	NA	Q39	3.59	71.80%	H	66.70%	14.80%	71.06%
Processes	OP14	Q23	3.00	60.00%		40.70%	37.00%	
Processes	OP15	Q24	3.78	75.60%	H	66.70%	11.10%	
Processes	OP16	Q25	3.96	79.20%	H	77.80%	3.70%	
Processes	TP4	Q30	3.37	67.40%	H	55.60%	25.90%	
Processes	TP7	Q31	2.89	57.80%		29.60%	33.30%	
Processes	NA	Q37	2.26	45.20%	L	22.20%	59.30%	64.20%
Linkages	TP2	Q29	3.33	66.60%	H	48.10%	29.60%	66.60%
People	OP10	Q19	4.33	86.60%	H	81.50%	7.40%	
People	OP13	Q22	3.11	62.20%		56.00%	24.00%	
People	OP18	Q26	3.00	60.00%		53.80%	34.60%	
People	TP15	Q32	3.00	60.00%		40.70%	44.40%	
People	TP14	Q34	2.59	51.80%	L	25.90%	51.90%	
People	TP20	Q35	3.33	66.60%	H	55.60%	18.50%	64.53%

Figure 10-13 - Questionnaire Average Score and Sample Variance



Source: Author (2018)

Survey Data Graphs

Figures 10-13 display the survey data as a graph to better visualize the survey's responses as average and variance. The variance represents the degree of dispersion between agree and disagree responses. Responses with a wider dispersion indicate a greater gap between agree and disagree scores, denoting that unanimous agreement on the question is weak. The variance for Q18 and Q20 is not representative as these are *yes/no* questions with a value of either 5 or 1 and therefore will have a disproportionate variance number. Excluding Q18 and Q20 shows that the responses with the higher variance generally have lower scores, indicating a lower level of agreement and a wider spread of scores between 5 and 1.

Graphs show the correlation, not the causation of behaviors. Survey data combined with the interview data can provide more insight into causation.

10.10 Appendix J – John Kotter's Eight Stages for Change

Ref.	Stage	Actions Needed	Pitfalls
K1	Establish a sense of urgency	• Examine market and competitive realities for potential crises and untapped opportunities. • Convince at least 75% of your managers that the status quo is more dangerous than the unknown.	• Underestimating the difficulty of driving people from their comfort zones. • Becoming paralyzed by risks.
K2	Form a powerful guiding coalition	• Assemble a group with shared commitment and enough power to lead the change effort. • Encourage them to work as a team outside the normal hierarchy.	• No prior experience in teamwork at the top. • Relegating team leadership to an HR, quality, or strategic-planning executive rather than a senior line manager.
K3	Create a Vision	• Create a vision to direct the change effort. • Develop strategies for realizing that vision.	Presenting a vision that's too complicated or vague to be communicated in five minutes.
K4	Communicate the Vision	• Use every vehicle possible to communicate the new vision and strategies for achieving it. • Teach new behaviors by the example of the guiding coalition.	• Under-communicating the vision. • Behaving in ways antithetical to the vision.
K5	Empower others to act on the vision	• Remove or alter systems or structures undermining the vision.	Failing to remove powerful individuals who resist the change effort.

		• Encourage risk taking and non-traditional ideas, activities, and actions.	
K6	Plan for and create short- term wins	• Define and engineer visible performance improvements. • Recognize and reward employees contributing to those improvements.	• Leaving short-term successes up to chance. • Failing to score successes early enough (12-24 months into the change effort.
K7	Consolidate improvements and produce more change	• Use increased credibility from early wins to change systems, structures, and policies undermining the vision. • Hire, promote, and develop employees who can implement the vision. • Reinvigorate the change process with new projects and change agents.	• Declaring victory too soon—with the first performance improvement. • Allowing resistors to convince "troops" that the war has been won.
K8	Institutionalize new approaches	• Articulate connections between new behaviors and corporate success. • Create leadership development and succession plans consistent with the new approach.	• Not creating new social norms and shared values consistent with changes. • Promoting people into leadership positions who don't personify the new approach.

Source: (Kotter, 2007)

10.11 Appendix K – Using Five Levels to Monitor Maturity in Agile Initiatives

L01 →	**L02 →**	**L03 →**	**L04 →**	**L05 →**
Initial / Ad-Hoc	Repeatable / Doing Agile	Defined / Being Agile	Managed / Thinking Agile	Optimized / Culturally Agile
• Agile planning and requirements practices are piloted • Customer involvement is ad-hoc	• Improved Agile requirements engineering • Orientation of customer and stakeholders' practices • Improved collaboration and planning practices	• Agile planning and requirements practices are mature and documented • Enterprise standard Agile process, roles and responsibilities are defined • Working software/product is delivered frequently with customer reviews • Customer and stakeholder	• Agile KPIs are defined and measured by project teams • Automated testing solutions are utilized • Teams are much more empowered and rewarded • Focus on Scalability	• Agile KPIs are reported and management decisions are derived • Agile tools utilized throughout project lifecycle • Scalability is addressed • Optimized agile processes

		collaboration practices are mature • Teams struggle with scaling issues, such as strategies for large or distributed teams		

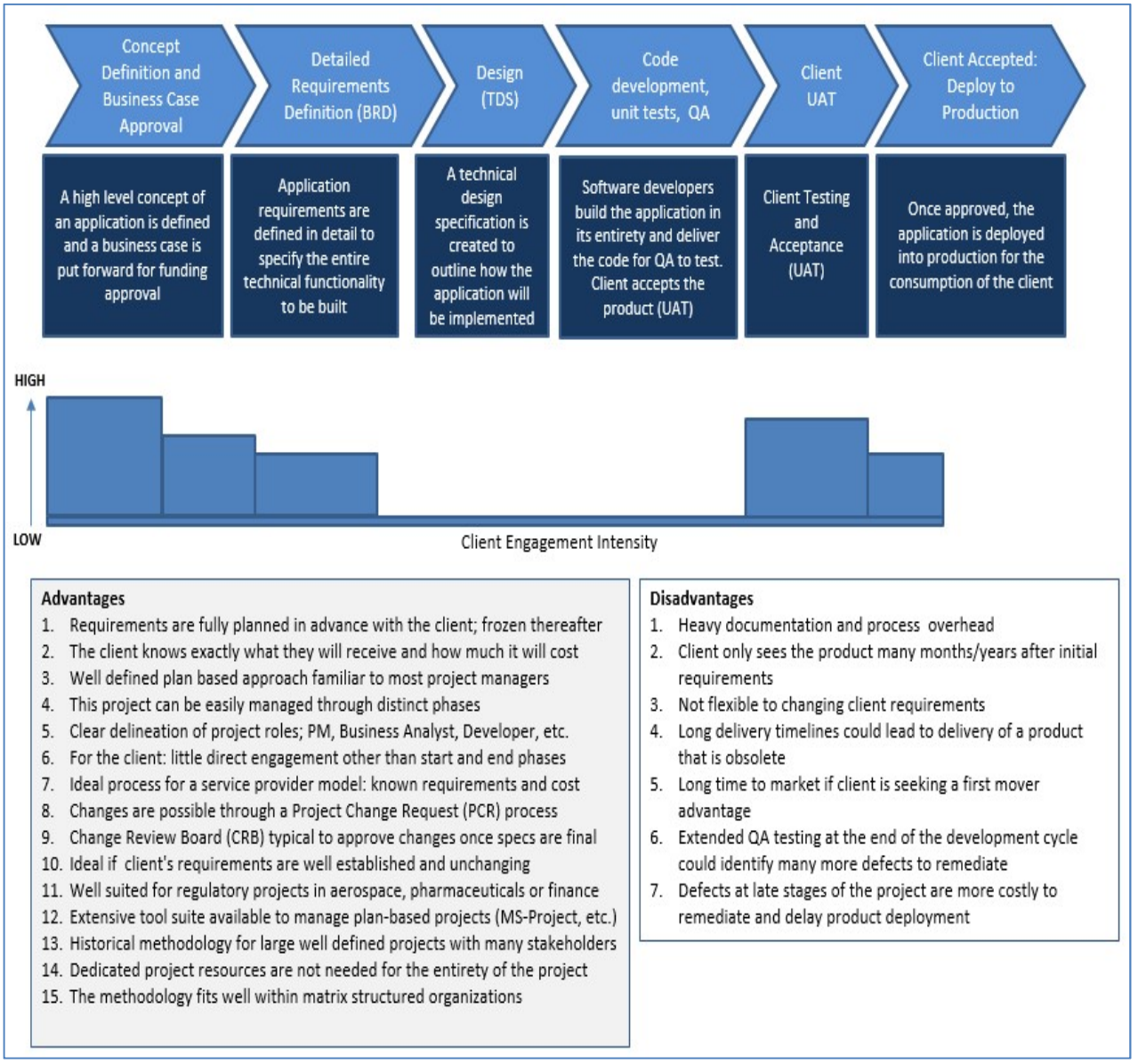
Source: (KPMG, 2015)

The five levels; Initial, Repeatable, Defined, Managed and Optimized definitions are from CMI's CMM maturity model (Paulk *et al.*, 1993).

10.12 Appendix L – Plan Based and Agile Product Development Methods

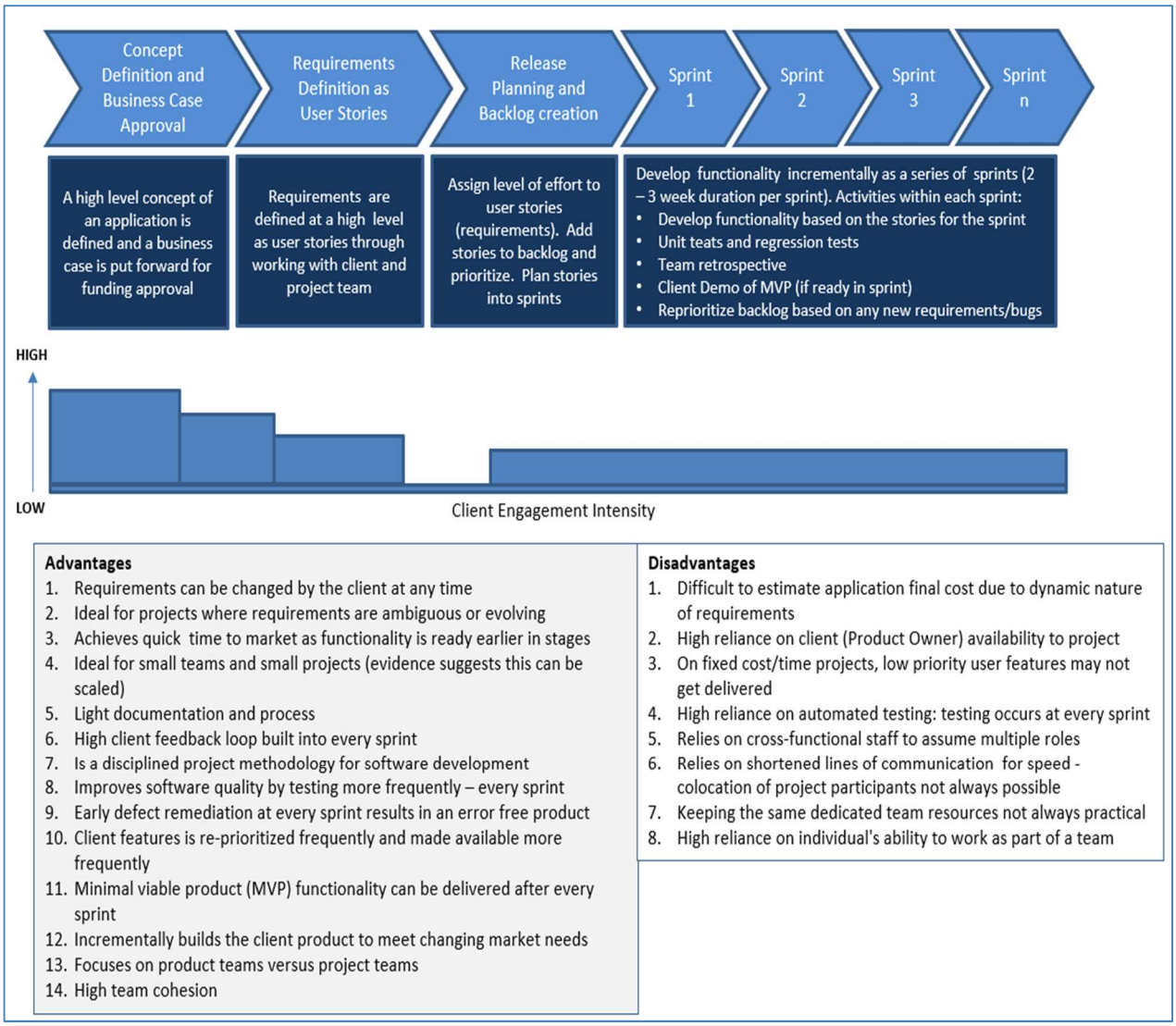
This sections explains the advantages and disadvantages of plan based and agile product development methodologies. This section supplements the information provided in Section 3.2.

Figure 10-14 - Plan Based Product Development



Source: Author (2019)

Figure 10-15 - Agile Based Product Development



Source: Author (2019)