A Multi Stakeholder Perspective on Audit and Automated Compliance: Bank of Ireland

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics.

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Abstract

Complex IT outsourcing arrangements promise numerous benefits such as increased cost predictability and reduced costs, higher flexibility and scalability upon demand. Organisations trying to realise these benefits, however face several audit and compliance challenges. The scope of this research was to collect stakeholder perceptions on audit, compliance and the automation challenges from multiple stakeholders in Bank of Ireland. These perceptions were collected by a series of semi-structured interviews and online survey questionnaires. The respondents of the semi-structured interviews and online survey questionnaires confirmed their current perceptions, challenges and future relevance under the five following predefined themes Strategy, Operations, Technical, Audit and Risk. Today organisations face several challenges combing audit, compliance and automation. The ever-increasing volumes of data created and stored by organisations presents its own challenges. This coupled with changes in technologies, increasing regulatory requirements and concerns regarding data integrity add to complexity.

There is a current trend within Bank of Ireland to automate front and back office services as much as possible. Service activities using ATM's, online banking and mobile banking are on the increase. These increases been driven by a pressure on the organisation to reduce its operational costs, overheads and the change in demand as more consumers move online. Technologies in banking will make digital payments simpler i.e. smartphone penetration, ubiquitous connectivity, biometrics, tokenisation, cloud computing, block chaining and the internet of things (IOT). These are a few trends that will shape the way consumers will transact with Bank of Ireland in the future.

With stronger financial regulatory compliance, auditing, risk and control practices being introduced by both the Irish Central Bank (ICB) and the European Central Bank (ECB) it is much more difficult for banks to compete with non-bank institutions. As a result, it can be more complex to implement the automation of services in banking using new technologies. Some suggestions have been made by several banks to relax the rules and regulations that both the ICB and ECB have implemented. And for both organisations could also adjust their controls to create a more favourable regulatory environment. They could work closer with banks in solutioning products with them.

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Abbreviations

AI	Artificial Intelligence
AML	Anti-Money Laundering
ATM	Auto Teller Machine
BOI	Bank of Ireland
BOTS	Robotics
CHAPS	Clearing House Automated Payment Processing
CPA	Cognitive Process Automation
ECB	European Central Bank
FTE	Full Time Employee
HCL	Hindustan Computers Limited
ICB	Irish Central Bank
IOT	Internet of Things
IRPA	Institute of Robotics Process Automation
IVR	Interactive Voice Recognition
KYC	Know Your Customer
NTT	Nippon Telegraph and Telephone Data Corporation
PUAM	Privileged User Access Monitoring
QUAL	Qualitative
QUAN	Quantitative
RPA	Robotic Process Automation
SME	Subject Matter Expert
SOX	Sarbanes Oxley

1: INTRODUCTION

1.1 Background and Context

Bank of Ireland was established in 1783 by Royal Charter and today has 16,000 employees in 8 countries worldwide. Bank of Ireland has adopted an onshore offshore IT outsourcing model. The bank has many IT service providers which include Accenture, HCL, IBM, NTT Data and Oracle Corporation. Gartner (2017) has described IT outsourcing as the use of external service providers to effectively deliver IT enabled business processes, application services and infrastructure solutions for business outcomes. Outsourcing, which also includes utility services, software as a service and cloud enabled outsourcing, helps organisations to develop the right sourcing strategies and vision. Outsourcing can enable enterprises to reduce costs, accelerate time to market, and take advantage of external expertise, assets and/or intellectual property (Gartner, 2017).

The research study will examine and evaluate stakeholder perceptions on audit, compliance and automation to include IT outsourced service providers within Bank of Ireland. Complex IT outsourcing arrangements which are typically dynamic and involve multiple service providers and service users often must respect different legislations (Parikh and Gokhale, 2006). As a result, challenges have arisen with respect to audit, compliance and automation. Internal perspectives are those issues the organisation faces regarding compliance and performance. External perspectives are those issues facing third parties engaging in external audit and consulting activities. Audits commonly validate the adequacy and effectiveness of internal controls (Carlin & Gallegos, 2007). Performing them, however, is more challenging in the context of complex IT outsourcing arrangements (Banker et al, 2010). As an IT payments expert who has worked in the financial IT services industry for over 20 years, and witnessing the increase use of IT automation to support audit and compliance, challenges from an operational and regulatory perspective are becoming evident

These challenges can be attributed to banking organisations having suboptimal IT strategies, lack of systems integration, suboptimal testing, substandard data strategies and inadequate automation.

Suboptimal Strategies

- Compliance IT implementation efforts focus solely on the initial compliance mandates and little or no attention is paid on the sustainability aspects. This leads to non-standard quick fixes that increase the future complexity and reduce scalability.
- Banks have taken a tactical workaround approach, rather than a holistic and strategic approach towards meeting audit and compliance requirements. This leads to in inherited technical debt, for the future and at that point in time, remediation becomes extremely costly.
- As new regulations were developed over the years, banks simply developed and purchased point solutions for managing specific regulatory mandates. This has led to the creation of duplication of systems, data stores, documentation and processes.

Lack of Integration

- Compliance and operational risk programs operate in silos and leverage separate systems for risk assessment, control, and testing. The integrated view of risk and compliance indicators are deficient within banks which leads to escalated compliance costs.
- Banks systems lack integration with other relevant systems e.g. Know Your Customer (KYC) with Anti Money Laundering (AML) applications.
- Reliance on legacy IT systems and complex operating structures makes systems integration challenging.

Suboptimal Testing

- Lack of standard compliance testing approaches as there is an over reliance on manual testing methods.

Substandard Data Strategies

- Immature and nonstandard data management processes prevent banks from developing an understanding of the risk and compliance status of customer's needs and activities.
- Lack of diverse data sources between structured and unstructured data leads to inaccurate and incomplete data. This leads to data quality and management issues.
- Reporting standardisation across banks. Reports are mainly prepared at the enterprise level which is focused on purely historical events.

Inadequate Automation

- The lack of an automated compliance management system. There is reliance on intensive human labour and slow error prone manual file processing e.g. excel spreadsheets are often stored across different departments of the bank.
- Banks compliance processes e.g. customer due diligence Know Your Customer (KYC) lack standardisation and automation, information handling and customer onboarding. This results in significant process slowdowns and poor customer satisfaction.
- With a myriad of digital channels e.g. websites, mobile applications, search engines banks lack the technology capabilities to track all channels to identify compliance policy violations and risk events.
- Lack of smart automation prevents banks from furnishing quality and timely reports to regulators.

Source: Infosys (2017), Regulatory compliance management in banks: Challenges and complexities.

Given the above audit and compliance challenges banking organisations will have to strategically think about how they are going to manage future demands from the Irish Central Bank (ICB) and the European Central Bank (ECB). Front and back end innovations within the financial services industry continue to gather pace. These developments are both on the retail and merchant fronts. The use of mobile and social platforms has increased and they have driven the demand for new services leading to a multichannel commerce. The innovation of new technologies through the Internet of Things (IOT) will make more devices connected which will result in an increase in volume and value of digital payments globally (Ernst & Young, 2011).

Over the last couple of years robotics in the form of IT automation has increased its use within the banking sector. Service banking and operational departments have implemented such technologies to counteract the rapid change in process development technologies. In turn eliminating repetitive tasks, minimising costs and manual intervention. This may come at a price e.g. what about the human factor?

The research will look at academic and professional papers from business, information technology, knowledge and accounting management journals. Six senior managers across Bank of Ireland which include IT senior managers form the IT outsourcing organisations will be interviewed in a semi-structured fashion. Business and audit users who support a range of application and infrastructure payment services deployed within Bank of Ireland (onshore and offshore) will then completed an online survey questionnaire. The pre-designed structured survey will focus on perceptions on audit, compliance and automation. The research will examine perceptions of all stakeholders and evaluate the benefits that automation offers the organisation in supporting processes that govern audit, compliance and automation.

1.2 Research Question

The semi-structured interviews and online survey questionnaires will address the following research questions:

What are the multi stakeholder perspective on audit and compliance automation within Bank of Ireland?

The research question presented by this research focuses on four key elements:

1. What are the multi stakeholder's perspectives on audit and compliance automation within Bank of Ireland?
2. What interpretations can be made regarding these multi stakeholder's perspectives?

1.3 Research Interest & Beneficiaries of the Study

Beneficiaries of the study may include:

- Industry Professionals, Information Technology and Business Students
- Banking Institutes
- Software Organisations understanding of the present workings and failings

1.4 Scope and Boundaries of this Study

The research will examine and evaluate if stakeholder perceptions on audit, compliance and automation are similar across the IT outsourced service providers within Bank of Ireland. With stronger regulatory, auditing, and risk control practices being forced upon organisations in the financial services sector, will compliance automation continue to advance with the increasing sophistication of artificial intelligence? The research is being presented using surveys and semi-structured interviews within the context of Bank of Ireland. The stakeholders participating in the study are senior managers, payments and business auditing experts from multiple organisations. These organisations include Accenture, Bank of Ireland, HCL, NTT Data and Oracle organisations.

1.5 Chapter Roadmap

- **Chapter 1**
  This introductory chapter provides a summary of the context and relevance of the research question.

- **Chapter 2**
  The literature review examines: Automation and its growth in the banking industry, current views on opportunities and automation value, legal and auditing future practices for service organisations

- **Chapter 3**
  An overview of the various methodological approaches available for this research are presented. The reasons behind the chosen methodology for this research will be explained. The limitations and strengths of the research will also be discussed.

- **Chapter 4**
  This chapter analyses, assesses and interprets the way the data collected in the research was analysed and interpreted in a rigorous manner. The resultant findings will determine if the stakeholder's perceptions are changing the future of the organisation.

- **Chapter 5**
  The concluding chapter puts forward the findings and conclusions derived from the research, thus demonstrating that the research question has been answered fully. The strengths and limitations of the research will also be highlighted, and areas of further investigation will be proposed.

2: LITERATURE REVIEW

2.1 Introduction

This chapter outlines the body of literature relating to IT audit and automated compliance in the financial services industry. It will address the current benefits and challenges of IT audit and compliance automation, its value, legal and future auditing practices for organisations.

2.2 IT Audit and Automated Compliance

Fundamental economic factors, such as macroeconomic uncertainty, credit conditions, market volatility, liquidity, big data, risk and security remain core concerns within the banking industry. IT has become a critical ingredient and strategic necessity. Failure to swiftly and successfully integrate new technologies may threaten these organisations very survival (Mahmood and Mann, 2005, Ray et al., 2005). Some of the areas within financial services where automation can play an important role include, account entry across systems, account reconciliation, support for accruals, mortgage approval processing and credit card order processing. From a compliance perspective, other areas include client onboarding checks, know your customer (KYC) and Anti Money Laundering (AML) authentication, credit checking, identification checks, data mapping across systems, activity tracking fraud detection, and the collection and distribution of payments.

The InfoSec Institute (2017) defines IT auditing as any audit that encompasses the review and evaluation of automated information processing systems, related non-automated processes and the interfaces among them. Planning the IT audit involves two major steps. The first step is to gather information and perform some planning the second step is to gain an understanding of the existing internal control structures.

Issa et al (2016) defines operationally, that audit processes are a direct consequence of available technologies. The advent of computers has changed the scope and the methods of examination. The advent of analytics will change the time scope of the audit (more proactive than reactive), the efficiencies, and the cost and benefit of the work. Audit processes include the acquisition, validation, analysis, and reporting of information from a broad range of sources with differing levels of granularity. Current processes have little standardisation of information, resulting in significant manual efforts required to acquire, validate, and analyse the information for the audit. Standardisation of financial information by organisations is therefore key. By standardising the data requested by auditors, both external and internal, organisations will be able to automate and replicate the information request process, thereby reducing the amount of time and effort required to provide the requested data.

In the aftermath of several recent accounting scandals, internal audit has received increasing attention regarding its ability to contribute towards corporate governance processes. These include promoting effective controls, risk management and mitigating fraud risk (Hermanson, 2008). According to Lin (2016), the financial services industry, as in many other industries, human labour and intelligence have gradually been displaced by computerised automation and artificial intelligence. Work in the financial services industry that previously took hours, days, or weeks of human labour is now completed in minutes or seconds by supercomputers using artificial intelligence and algorithmic models. JPMorgan Chase has been estimated in recent years to employ more software developers than Google and more technologists than Microsoft (CA Technologies, 2014). The increased adoption of the compliance function within the banking industry has dramatically changed the operations of many financial institutions. The ascents of smart machines in finance and financial compliance naturally raise existential questions about the role of humans in the future of the financial industry, just as similar questions are being raised by technological advancement in other industries throughout the economy (Barret, 2013).

The power, speed, accuracy, and efficiency of smart machines has led many in the financial services industry and beyond to extol smart machines and their data-driven algorithms as antidotes to human folly, but such extolment is sometimes misguided (Derman, 2011). While there is much to admire about artificially intelligent machines with their data-driven models, such admiration should also recognise the limitations of smart machines and their elegant models. The financial crisis of 2008 precipitated so dramatically because high powered computer models failed to properly account for the speed, consequences, and impact of a bursting housing market bubble (Lin, 2016). To their peril, too many institutions, regulators, and investors all placed too much faith and confidence in the elegant models of smart machines in the lead up to the financial crisis. The human factor will likely remain the critical factor in financial operations in the foreseeable future. According to Christian (2011) machines, no matter how artificially intelligent they become, they are still not as smart as humans yet. Replacing human functions with robots provides a new level of risk in terms of understanding what is right and wrong.

What compliance means, has been much debated by financial institutions and regulators. Compliance in general terms is the adherence to rules and regulations laid down by those in authority. Compliance is the certification or confirmation that the doer of an action meets the requirements of accepted practices, legislation, prescribed rules and regulations, specified standards, or the terms of a contract [Principles – Basel, 2010]. In literature Biegelman (2008) defines compliance as a state of being in accordance with established legislation, guidelines, standards or specifications. Compliance includes concepts of obedience, observance, deference, governable, amenable, passive, non-resistance and submission. The term regulation is derived from Latin. The word regula in Latin means a rule. Regulation is viewed as operating rules and is about stopping people doing bad things or maintaining order for society and for the economy (Lagzdins, 2011).

Compliance and regulation is a distinct responsibility with the banking organisation. However non-bank payment providers have an advantage in that they can circumvent banks' legacy systems and are not currently subject to the same regulatory standards or long-standing responsibilities as the banking community. This allows non-banks to adopt innovation techniques more experimental in nature, using new, technology driven solutions on a trial and error basis to see what works and what does not. This has resulted in non-banks gaining a reputation for being the quickest off the mark in exploring and implementing new channels, such as electronic and mobile payments (Broom, 2015).

According to Broom (2015), the spotlight on regulation for payments has intensified in recent years (as policy makers prioritise the restoration of confidence in the security of the banking industry), it is important to stress that banks have always been highly regulated entities. The banks' role as the haven of society's wealth inevitably requires that safety and security be an integral component of the banking culture, with a great deal of focus and energy dedicated towards regulatory compliance over the years. Banks therefore have a great deal of experience in achieving the balance of resources required for both regulation and innovation. Payment systems are a core group of strategic information systems in banking, which contribute towards economic development, especially in emerging economies. They form the foundation for the financial sector and national information infrastructure developments (Khiaonarong, 2000).

Payment systems are fundamental to economic and financial activity both at a national and international level. The payments system is the infrastructure (comprised of institutions, instruments, rules, procedures, standards, and technical means) established to enable the transfer of monetary value between parties discharging mutual obligations. Its technical efficiency helps to determine the efficiency with which transaction money is used in the economy, and assist with the management of the risk associated with its use. An efficient payments system reduces the cost of exchanging goods and services, and is indispensable to the functioning of the interbank, money, and capital markets (Saqib et al, 2016).

Regulatory developments are increasing the role of compliance. Through market research and interviews with industry executives, the IBM Institute for Business Value identified several significant industry trends that will impact the retail banking industry (2015). Regulatory burdens intensify heightened requirements around privacy, security, partnership risk and operational risk. This will require banks to take a more proactive, enterprise wide approach to managing compliance issues [Hedley, White, 2006].

Chan and Vasarhelyi (2011) who advocate innovation in the implementation of continuous automation say organisations should be moving toward automation if they want to both add value and meet compliance standards. However bridging innovation, automation and technology to close gaps to add value to an organisation's portfolio can be challenging. Security challenges for new payment methods like Apple Pay and Google Wallet are on the increase, hyper connectivity and the ability to connect technology devices is also making security more difficult. Platforms supported by third party organisations who provide software as a service find it difficult also. Rapid advancements in open source application programming interfaces (API's) and the introduction of new social organisational platforms pose real IT audit challenges for organisations around compliance and regulation.

2.3 Challenges and Gaps of IT Audit

Auditors face many challenges whether they are internal or external to the audited organisation. Many studies in the social sciences literature have found that humans perform poorly in the complex tasks that require the collection and aggregation of excessive information from multiple sources (Kleinmuntz,1990). It has been well documented in accounting and auditing literature that exposure to large amounts of information can potentially lead to increased ambiguity, information overload, difficulty identifying relevant information and patterns and, consequently, lead to suboptimal audit judgment (Alles, Kogan, and Vasarhelyi 2008; Brown-Liburd, Issa, and Lombardi 2015). **Figure 1: Evolution of IT and associated Audit Challenges**

Phase	Period	Evolution of IT	Examples	Audit Challenges
1	1945–1955	Input (I) Output (O) Processing (P)	Scientific and military applications	Data transcription Repetitive processing
2	1955–1965	I, O, P Storage (S)	Magnetic tapes Natural applications	Data not visually readable Data that may be changed without trace
3	1965–1975	I, O, P, S Communication (C)	Time-sharing systems Disk storage Expanded operations support	Access to data without physical access
4	1975–1985	I, O, P, S, C Databases (D)	Integrated databases Decision support systems (decision aides) Across-area applications	Different physical and logical data layouts New complexity layer Decisions impounded into software
5	1986–1991	I, O, P, S, C, D Workstations (W)	Networks Decision support systems (non-expert) Mass optical storage	Data distributed among sites Large quantities of data Distributed processing entities Paperless data sources Interconnected systems
6	1991–2000	I, O, P, S, C, D, W Decisions (De)	Decision support systems (expert)	Stochastic decisions impounded into IT systems
7	2000–2010	I, O, P, S, C, D, W, De, Distributed (Di),	Distributed systems Internet based Cloud	Data stored in the cloud and replicated Virtual IT software
8	2010–2020	I, O, P, S, C, D, W, De, Di, Big Data (BD)	Preponderance of data that is applicable in wide array of business, accounting, accounting, and auditing areas	Big data Multiple sources of automatic data capture
9	2020+	I, O, P, S, C, D, W, De, Di, BD, Artificial Intelligence	Self-improving systems Embedded intelligent modules	Audit activities and reporting are slow and occur too late

SOURCE: Adapted from Vasarhelyi & Harper (1991) The evolution of IT and associated Audit Challenges

Challenges that have emerged in recent years concentrate on the decentralisation and distribution of data with the advent of cloud computing. The emergence of big data (Vasarhelyi and Kogan, 2015; Moffitt and Vasarhelyi; 2013) creates a hybrid environment where systems must monitor the boundaries of the broad external data environment. Auditing in these areas is proving challenging for auditors, some organisations simply do not know how to audit big data. According to Issa, (2016) the problem is exacerbated by the unstructured nature of big data and the high level of complexity and poor structure involved in certain audit tasks, such as the evaluation of internal controls. The auditing profession is also a standard driven profession. In that it makes it impractical for the profession to adopt any new technology or methodology if not required or approved by a standard setting board. As a result, the auditing profession may face the challenges of adjusting its current auditing standards for the adoption of automated technologies in the future. Auditing is also a profession whose activities are widely based on judgments, as opposed to well-defined and repetitive tasks, which are more prone to automation. The auditing profession has historically organised its structures hierarchically with many lower-level employees performing repetitive low-level tasks. Examples of these tasks include the ticking, extending of verifying manual documents. And their hierarchical superiors examining and reviewing these tasks and drawing conclusions, which are typically judgmental.

Data presents both opportunities and challenges for IT audit. Specifically, how can IT audit leverage data analytics to reduce risks, meet compliance requirements, and increase the value of the information system? These concerns can be broken down into three areas: data analytics, data quality and access issues, and data risks (Dzuranin et al, 2016). According to Dzuranin (2016), auditors must be able to identify where data is stored and be able to retrieve the data and manipulate it so that it can be analysed. Controls over the data and the security of the data are also critical. Management must be able to identify what controls are in place to be sure that the data is complete and that access to the data is limited to those employees who should have access.

Data can be used to help identify and analyse business risks, but what if the data itself is a risk? Vasarhelyi et al. (2015) points out the risk of identifying false positives using big data during a financial statement audit i.e. to minimise the risk of incomplete or inaccurate data, additional controls must be implemented at the source of the data.

Compliance and regulation reforms are a key concern for banking organisations globally. To evaluate the value of compliance, it is necessary to look beyond meeting compliance minimum standards. Organisations need to begin with solid risk management and technology can help assess and maintain those risks. Controls should be designed around the risks identified. With the aid of IT audit, automation can reduce risk and improve operational efficiency (Dzuranin et al, 2016). The following Figure 2 lists some of the most challenging emerging technologies for an organisation to audit. These technologies can both provide organisations with certain opportunities and risk. As a result, the IT audit will be more involved within the organisation for these new technologies.

Figure 2: Increasing Risks from New Technology

Increasing Risks from New Technology

Technology Issue	Risk
Hyperconnectivity	The ability to connect technology devices is increasing making security more difficult.
New payment methods	Apple Pay and Google Wallet. Security issues related to new payment methods are increasing.
Open APIs	Application Programming Interface. Many companies use this interface with customers. Open platform increases security risks.
Big Data	Organizations do not know how to audit it.
BYOT (bring your own technology)	The lines are getting blurred between organization's technology and employees' personal technology. How do you control this? How do you audit these?
Internet of things	Ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Increased security risk.
XaaS (Everything as a Service)	Platforms supported by other companies and are very difficult to audit.
Social business	Uber, AirBnB, etc. are difficult to audit.

Source: Srinivas Saraswatula, JISC panel presentation, March 27, 2015, Raleigh, NC.

SOURCE: Srinivas Saraswatula, JISC panel presentation, March 27, 2015, Raleigh, NC.

Srinivasan (2016) recently published a high-level model of external audit process activities, and argued that automation of them could lead to the extinction of human auditors, although it was only speculative. In the past, automation has always brought in the destruction of certain occupations, only to give rise to even more new and different jobs that did not exist in the past (The Economist 2016). The same concerns are coming back now with fear of increased computerisation of company systems, namely in Artificial Intelligence (AI) and robotics aided by the internet? (The Economist 2014). Several organisations like Google are developing auto-piloted cars with increasing success. Technology has the potential to either assist or replace the human user. The question is: will it be workforce replacement or workforce enhancement?

However, from an opportunity perspective KPMG (2016) announced that it would work with IBM Watson to apply cognitive computing technology to its professional services offerings. The idea is that the auditor will use Watson to analyse massive volumes of financial data to detect anomalies. For example, ‘‘by scaling human skills and judgment through the application of cognitive technology across a bank’s commercial mortgage loan portfolio, auditors gained a more detailed and comprehensive understanding of the bank’s credit files and potential audit exceptions based on loan grading’’ (KPMG 2016).

2.4 Background to IT Automation and Innovation in Banking

IT innovation in retail banking began in the late 1950s. Banks introduced computers both to keep up with growth in business volume and, at the same time, to solve some very specific problems in bank operations. They also took the opportunity to automate existing standing practice in specific departments (Morris 1986).

Figure 3: Dimensions of IT Innovation in Commercial Banking, 1846 – 1995

Use of Technology in the Organisation

Impact on the Provision of Retail Finance	**Early Adoption (1864 – 1945)**	**Specific Application (1945 -65)**	**Emergence (1965 – 80)**	**Diffusion (1990-95)**
Innovation in Service Offering	Reduce inter-market price differentials	Conversion from branch to bank relationships	Growth of Cross Border Payments	Supply of non-payment products like insurance, mortgages and pensions
		Automated Bank Statements	ATM Introduced	
		Cheque Guarantee Cards	Automation of branch accounting	
Operation function innovation	Increased coordination between head office and branches	Reduce the cost of labour intensive activities (i.e. clearing system)	Real time controls begin	Growth of alternative distribution channels such as phone banking and EFTPOS

Source: Morris (1996), Authors Own Estimates

A process-directed automation thrust dominated the specific application period and aimed at undercutting the cost of administrative tasks such as the labour-intensive cheque clearing system. During this period, the typical financial sector computer installation consisted of a central mainframe dedicated to sequential batch processing of computer readable instructions dealing with separate processes such as providing a service for handling customer transactions, standing orders and other clerical procedures (Lazo, 2002).

According to Lazo (2015) the cash dispenser was born almost 50 years ago, in 1967. For many, this was the first tangible evidence that retail banking was changing; the introduction of the Automated Teller Machine (ATM) marked the dawn of contemporary digital banking. Several lay claim to the invention of the cashpoint, including John Shepherd-Barron and James Goodfellow in the U.K.; Don Wetzel and Luther Simjian in the U.S.; and even engineering organisations like De La Rue, Speytec-Burroughs, Asea-Metior, and Omron Tateisi. However, the ATM is a complex technology and there was no single eureka moment that marked its arrival (Lazo, 2015).

Lazo (2015), goes on to say the ATM finds its origins in the 1950s and 1960s, when self-service gas stations, supermarkets, automated public-transportation ticketing, and candy dispensers were popularised. The first cash machine seems to have been deployed in Japan in the mid-1960s, per a Pacific Stars and Stripes account at the time. The most successful early deployments took place in Europe, where bankers responded to increasing unionisation and rising labour costs by soliciting engineers to develop a solution for after-hours cash distribution. This resulted in three independent efforts, each of which entered use in 1967; the Bankomat in Sweden, and the Barclaycash and Chubb MD2 in the U.K. (Lazo, 2015). The technology that underlies today's payment card networks was first widely deployed in 1979, when Visa introduced the first electronic data capturing terminal (Evans, 2005). According to Evans (2005) mainframe computers did most of the processing and storage in central locations. Consumers had magnetic stripe cards and merchants had electronic terminals. At that time, the merchant swiped the customer's card through a reader to start the process of authenticating the consumer and authorising the transaction. The swipe initiated a signal that travelled through a series of intermediate computers that switched the transaction to a central processing unit. By exchanging signals with the cardholder's bank to assess the cardholder's account, this unit then determined whether to authorise the transaction. If the transaction was authorised, the unit then exchanged signals with other computers on the network to move the designated amount from the cardholder's bank to the merchant's bank. The various computers were connected over private networks that interconnected as necessary.

Today the digital revolution has brought changes to the financial services industry and advanced information systems have been adopted by payment processing organisations. Mobile and electronic banking is becoming more prominent than the bank's physical branches. Within the last couple of decades, the financial landscape has been completely altered. Not long ago, online banking and trading platforms were huge innovations. Now, it is all but common place for banking, trading, and account management to appear right at an individual's fingertips on mobile devices. Physical offices and branches are less necessary as well as costly; their growth has slowed as the need for them diminishes (Kaw, 2014). The human element is becoming less and less prevalent while the technological element grows. Individuals expect banks services to become quicker, easier and more streamlined. The purpose of technological innovation is to decrease inputs whilst simultaneously increasing outputs i.e. accounts should be opened immediately and payments should be instantaneous.

According to Jackson (2016) as computers continue to replace humans in positions involving data entry and financial transfers, the issue of too many bureaucratic layers should correct itself. As fewer individuals are needed to touch papers and view electronic documents, the time it takes to complete client requests and routine tasks will be dramatically reduced. As computers pick up more and more of the workload, there will be less explanation and clarity as to what is taking place. Unless there is adequate human oversight, there may be less transparency than before. The need for transparency all ties back to the great mistrust the general populace has for the financial industry (Jackson et al, 2016).

2.5 IT Automation and the Banking Service Industry

In general, the term “service industry” encompasses a broad range of services, including business trade, information service, finance and insurance, healthcare, accommodation, and government administration. Regardless of the type of service, one of the main goals of the service industry is to generate profit for service providers (Chiou et al, 2012). A key trend within banking over the last couple of years is that banks have started to focus on their core banking systems. With this strategy in mind the implementation of core banking systems across the bank, the usage level of IT for customer management has increased. Core banking systems have enabled banks to launch new products and services targeting specific customer segments after understanding their banking and investment requirements.

A core banking system is the software developed and installed in a bank to support its most common transactions like making and servicing loans, opening new accounts, processing cash deposits and withdrawals, processing payments and cheques (Mols, 2001). Over the last decade new regulatory requirements are in place to open payment accounts via application programming interfaces (API’s). These types of changes using innovative technologies have moved the banking industry to an “Open Banking” ecosystem. The banking ecosystem is changing in that it is at a critical turning point and it needs to decide whether to become a banking service utility, supporting other providers in their customer facing solutions or play a central role in the daily lives of consumers.

Open Banking is about how banks share their own products (i.e., services, functionality, and data) and how they enable their customers to share their data and account functionality with third-party (e.g., Fintech) applications in a secure and resilient fashion. As customers drive the actual uptake of such innovations, the concept of “customer ownership” or “product centric” is changing towards a concept of “customer centric” between banks and third-party developers (Egner, 2016).

Like many organisations banking organisations implement automation on a phased pilot approach, starting with a single department or with an organisational process level. The main driver behind this approach is that it makes deployment and testing easier and does not disrupt daily organisational activities. Automation services within the banking organisation has supported products and services like mortgage lending by eliminating manual forms and document reviews. As a result, reduced costs are experienced with increased staff productivity for other areas. The convenience of "anytime, anywhere" banking for customers has underpinned the need for self-service offerings. ATMs, IVRs (Interactive Voice Recognition), self-service kiosks, and online and mobile banking apps have played an important role in cultivating this self-service culture. As these technologies continue to mature, businesses will need to ensure they are continually assessing how robotics technology could be leveraged to enhance their offerings and improve customer experiences (Lewis, 2016).

Barclays bank uses RPA to automate a range of processes. These range from fraud detection and risk monitoring, to the automation of account opening. This enables Barclays bank to rapidly scale its ability to process customer requests and growing business needs while maintaining quality processes for its customers. Another example is U.K. based Co-operative Banking Group which has automated over 130 processes with robotic automation including complex Clearing House Automated Payment processing (CHAPS), VISA chargeback processing, and other back-office processes (Barnett, 2015).

The institute for robotic process of information and artificial intelligence define robotic process automation (RPA) as the application of technology that allows employees in an organisation to configure software or a "robot" to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems (2017). Automated solutions in the past typically required a high level of programming usually supported by a subject matter expert (SME). Today non-technical users and business users can use interfaces to generate code automatically with RPA tools. A key factor in enabling RPA implementation is the underlying data setup and management. Well defined data structures are needed for effective automation i.e. the easier the codification, the easier it is to create the underlying data flow, and automate it. While automated processes can be traced back centuries, the term automation did not come into popular use until 1947, when General Motors established an automation department (Hounshell, 1995). Automation refers to an operation or control system that uses the introduction of automated machinery or processes. According to Littler (2016) robotics and AI are subsets of automation. However, in many instances, product manufacturers and system designers have avoided the terms "robotics" and "AI" in favour of some form of the word automation. For example, contemporary jet aircrafts can take off and land by themselves with "automatic pilots." Similarly, the term "vehicular automation" encompasses the "self-driving car," "robot car" or "autonomous vehicle."

2.5.1 Benefits of Robotic Process Automation (RPA)

Potential core benefits of RPA include cost reduction, improved quality, faster outputs, and the ability to integrate with legacy systems. This helps create a more uniform approach to data management without having to start from scratch.

- Improved operational agility: robots can be "trained" quickly and hence can respond much faster to changing requirement and business needs.
- Improved scalability: quick and easy enterprise level scalability as robots can be scaled up, as well as down, quite quickly as the business needs vary.
- Increased speed: the processing speed of the robots is at least 2-3 times higher (may be more in some cases).
- Improved quality: more consistent and predictable output. Dramatic reduction in error rate which is another aspect that leads to cost reduction.
- Improved governance structure: collaboration between IT and business since IT supports/governs it and business controls it.
- Improved business planning and forecasting: "robomation" can make data gathering, organising, and analysing much faster and easier, thus helping the organisation to plan better for future business needs, trends, and opportunities.
- Improved compliance: every action is traceable and available for audit and reporting
- Enhanced customer experience: an automated solution model with 24/7/365 availability.
- Better labour management: makes manual workforce available for other non-repetitive or knowledge-based tasks that need judgment/interpretation.
- Geography independence: can provide a single, centrally located geography independent solution to businesses which have a global presence.
- Cost reduction: automation costs are significantly lower than the costs associated with full time employees (FTEs). Not only are there payroll and human resource (HR) savings, it is also possible to reduce infrastructure cost as "robots" do not need space, desks, machines, etc.

SOURCE: 2017 THE CAPCO INSTITUTE JOURNAL OF FINANCIAL TRANSFORMATION

The successful adoption of robotic automation still faces challenges, particularly during the implementation phase. Typically issues arise when organisations overlook the extent to which stakeholders have “bought into” the new system or have prepared for it. Executives that fail to take ownership of the concept, for example, will likely hinder cross-functional implementation. To avoid that problem, organisations can appoint an executive to secure the financial support to not only employ robotic automation, but also to provide the appropriate resources needed to drive change. Similarly, organisations need to establish a dedicated, cross-functional team, accountable to an executive sponsor, and task it to examine processes for automation, develop requirements and report progress. Another potential pitfall centres on the failure to apply finance controls as processes are automated (Seasongood, 2016).

2.6 Next Steps - Cognitive Process Automation

According to the Institute of Robotics and Automation (IRPA) Cognitive Process Automation (CPA) takes the concept of RPA a step further. If RPA is, at a high level, about automating repetitive high-volume tasks like entering data from one application to another, CPA is more knowledge-based work (2017). Artificial intelligence (also known as cognitive technology or cognitive computing, which may be viewed as synonymous terms with AI) is a broad category. CPA extracts information from unstructured sources, and enhances the decision-making process. The cognitive agents act and learn from experience, from human trainers, and even on their own, thereby developing the ability to effectively deal with their environment. While RPA can help with eliminating inefficiencies, CPAs (like machine learning, chat-bot technology, artificial intelligence, natural language processing, big data analytics, evidenced-based learning, computer vision technology, and speech recognition) can help with work requiring judgment and perception. This has the potential of taking RPA to a new level.

According to Vishnu (2016) at a leading global bank, cognitive RPA was used to automate its payments business in foreign trade finance. Highly unstructured datasets (comprising of invoices, bills, declarations, certificates, and letters), were one of the main challenges of automating a process end-to-end. High daily volumes of transactions requiring the same day processing, with complex business processes, and the need to interface with multiple core systems were some of the other challenges. Instead of employing only RPA and partially automating the process, the bank took the approach of a combined solution. By combining traditional RPA techniques with a host of cognitive technologies that could automate most steps in the process, the bank was able to reduce the number of FTE's required to perform the process by nearly 60% (Banking Fintech, 2016).

Davenport and Kirby (2016a) describe a set of tasks that cognitive technologies perform, and the level of intelligence they have reached so far. Most of the task categories are relevant to accounting and auditing. Performing physical tasks is the traditional domain of robots, but it may have relevance to certain auditing tasks like counting inventory.

Figure 4: Types of Cognitive Technology and Their Intelligence Level

Types of Cognitive Technology and Their Intelligence Level
Adapted from Davenport and Kirby (2016a)

Levels of Intelligence / Task Type	Human Support	Repetitive Task Automation	Context Awareness and Learning	Self-Aware Intelligence	
Analyze Numbers	BI, data visualization, hypothesis-driven analytics	Operational analytics, scoring, model mgmt	Machine learning, neural networks	Not yet	
Digest Words, Images	Character and speech recognition	Image recognition, machine vision	Natural language processing, generation, deep learning	Not yet	The Great Convergence
Perform Digital Tasks	Business process management	Rules engines, robotic process automation	Not yet	Not yet	
Perform Physical Tasks	Remote operation	Industrial robotics, collaborative robotics	Fully autonomous robots, vehicles	Not yet	

The first step in this process is the ‘‘human support’’ task of recognising characters and translating documents into digital information. If this is done on a large scale, then it qualifies as repetitive task automation. However, a higher level of intelligence is necessary to understand context within the document and extract relevant details from it. This natural language processing capability is available from external vendors and has been adopted by accounting and law firms. Natural language generation, or the automated creation of meaningful text, is being used for accounting-oriented tasks such as creating suspicious activity reports for anti-money-laundering processes in financial services (Davenport 2016).

Note that there are no cognitive technologies that are yet capable of self-aware intelligence, although that level of artificial general intelligence is widely predicted to arrive at some point in the future (Bostrom 2014). It is also very difficult at this point to automate cognitive non-routine tasks that would require fast adaptation. In such cases, automation can act as an assistant to the auditor by facilitating the performance of the task, while leaving the decision up to the auditor. A way to address this challenge is to implement a Continuous Auditing (CA) approach. The early stages of CA can be dated back to the beginning of electronic data processing during the 1970s (Vasarhelyi 2002) when the focus was on computer-assisted testing of internal controls (e.g., Cash et al. 1977; Vasarhelyi and Halper 1991).

2.7 Conclusion

There are varied discussions in incorporating automated reasoning and decision making into audit and compliance technologies. Artificial Intelligence (AI) and the implementing of automation into banking products and services is currently an interesting topic. The implementation of robotics, automation AI could mean jobs will become obsolete and banking becoming increasingly impersonal. However, automation is not just a matter of convenience today it is a matter of survival. Business functions such as compliance, which historically rely on rules based systems, are ripe for the use of AI. This has been a key driver of recent innovations in regulatory technologies. Rules-based systems produce large quantities of “noise” and vast amounts of unstructured and mostly irrelevant information which humans need to manually review, creating a considerable mundane burden for even the largest of compliance teams (Banking Fintech, 2016).

3. RESEARCH METHODOLOGY

3.1 Introduction

Before any perspectives, examination and evaluation of audit and automation can begin it is necessary to first define the chosen methodological model upon with the research is built. In this chapter, the methodology and fieldwork carried out for this research will be discussed. Different approaches were examined and considered and the reasons for the adoption of the methodology and philosophy will be discussed in more detail.

3.2 Purpose of the Research

The research examined and evaluated academic and professional papers from business, information technology, knowledge and accounting management journals. The purpose of research was to collect multiple stakeholder perceptions and challenges on audit, compliance and the automation from multiple stakeholders across Bank of Ireland. These perceptions were collected by a series of semi-structured interviews and online survey questionnaires. It is hoped that this research will provide some insight on the benefits and challenges that automation offers Bank of Ireland in supporting processes that govern audit and compliance.

3.2 Research Philosophy

A research philosophy forms the foundation to any research question. It can be defined as the development of knowledge and the nature of that knowledge (Saunders et al., 2009). There are many business research philosophies available for consideration when carrying out a research project and the philosophy chosen depends mainly on the researcher and other practical considerations and constraints. Researchers have diverse views on what is important and what is useful with respect to their research question. A survey is not just a technique for collecting information, questionnaires are widely used but other techniques, such as structured and in-depth interviews, observations, content analysis and so forth, can also be used in survey research (De Vaus, 2014). According to Crotty (1998) to conduct research, many factors need to be considered such as research philosophies, research approach, research strategy, research choices and timelines. This chapter reviews the research methodologies and strategies considered as part of this research.

Denscombe (2010) suggests that mixed methods research can improve the validity of the research by comparing similar data gathered using both methods. The overall strategy chosen for this research was to conduct surveys. The research embraced a two-tiered methodological approach using semi-structured interviews and online survey questionnaires in which qualitative and quantitative elements were intertwined.

The philosophical rationale that compels mixing of qualitative and quantitative models of research into a single study is pragmatism. Simply put, pragmatism is the belief in doing what works best to achieve the desired result. As an underlying philosophy for inquiry, pragmatism supports researchers in choosing between different models of inquiry as research questions being addressed intrinsically determine which methods are best suited (Morgan, 2007). That is, certain research questions are best addressed using qualitative analysis while others using quantitative methods. The pragmatic philosophy underpinning this research study allowed for a systematic application of appropriate qualitative and quantitative methods to address each specific aim.

The pragmatism research philosophy accepts concepts to be relevant only if they support action. Pragmatics recognise that there are many ways of interpreting the world and undertaking research and that no single point of view can ever give the entire picture and that there may be multiple realities (Saunders et al., 2012). In practice, social research frequently involves surveys with relatively small numbers between 30 and 250 (Denscombe, 2010) which suited this research study in the timelines provided. And when estimating the required sample size such survey tends to depend on non-probability sampling techniques. There are three pragmatic reasons for this:

1) Resources are one factor that always affects the researcher's decision on sample size i.e. it does not take place with infinite time and money.
2) The nature of research populations and the fact that many of the population s that social researchers might like to investigate are relatively small.
3) The pragmatic approach subscribes to the argument that, used properly, non- probability sampling techniques can produce data that is sufficiently accurate for the research.

Interpretivism approaches to research have the intention of understanding the world of human experience. It respects the differences between people as social actors and social objects and requires the researcher to understand the subjective meaning of social action (Bryman et al, 2015). The interpretivist researcher tends to rely upon the participants views of the situation being studied and recognises the impact on the research of their own background and experiences. For this research study, the researcher is relying on the participant's individual experience even though the researcher works in the same industry. In contrast interpretivism challenges the idea that social researchers can view things form an objective perspective. It sees social reality as something that is subjectively constructed by people's thoughts and actions.

This means that social researchers can never hope to be totally objective. They must always be insiders, part and parcel of the social reality they are studying. A consequence is that, from this perspective, the role of social research must be to interpret social phenomena, recognising that researchers thinking will be shaped to some extent or other by their own experience and identities as members of the social work within with their work takes place (Denscombe, 2010).

3.3 Methodology

Several methodologies were looked at for this research. To elucidate the challenges faced by stakeholders in the current audit and automated compliance management practice, a survey based approach was adopted. Surveys provide the means to extract the main problems perceived by stakeholders. Two survey questionnaires were designed using both qualitative and quantitative methodologies. The semi-structured interview formed the qualitative part of the research study. The online survey questionnaire formed the quantitative part of the research strategy. A combination of using both was the best strategy to elicit the most valuable data considering the opinions, feelings and views of all stakeholders within Bank of Ireland. It allowed feedback from a larger subset of the community than would be feasible with other research methods. The stakeholders were chosen based on their payments, business and auditing work experience.

The collected data was codified with the results of the six semi-structured interviews with senior management, business and auditing payment experts. To identify their perceptions of challenges in compliance management practices (Syed Abdullah et al. 2010).

The synthesis of the two sources of data allowed the researcher to determine the core challenges in current compliance management practice for payments, as perceived by both stakeholder groups and as ranked by the practitioners in terms of their criticality.

Creswell and Plano Clark (2007) define mixed methods as follows:

"*Mixed methods research is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis of data and the mixture of qualitative and quantitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone".*

3.3.1 Research Design

Within a mixed methods strategy contrasting methods can be used as a means of moving the analysis forward, with one method being used to inform the other (Denscombe, 2010). A parallel design was employed for this research i.e. methods, were carried out in parallel with the results feeding into each other. According to Mingers (2001), a parallel design is a deliberate attempt to compare analysis of the same information. As analysis is carried out separately on the same sets of data, the conclusions were then combined to generate a richer understanding of the research study. The purpose of the design chosen was to link both qualitative and quantitative components in that each component contributed to each other as a means of cross checking the results and the validity of the findings. Different methods were used also to investigate separate components of the overall question to see what new dimensions were known about the topic within Bank of Ireland.

3.3.2 Qualitative versus Quantitative Research

Saunders, Lewis et al., (2009) define 'research' as the systematic collection and interpretation of information with a clear purpose, to find things out. Research can be broadly divided into two categories: quantitative research, and qualitative research. Punch (2005) presents a simplified yet clear definition for both, i.e. quantitative research is empirical research where the data is in the form of numbers were qualitative research is empirical research where the data is not in the form of numbers. Creswell defines qualitative research in that it begins with assumptions and the use of interpretive/theoretical frameworks that inform the study of research problems addressing the meaning individuals or groups ascribe to a social or human problem. To study this problem, qualitative researchers use an emerging qualitative approach to inquiry, the collection of data in a natural setting sensitive to the people and places under study, and data analysis that is inductive and deductive and establishes patterns or themes. This dissertation embraces a mixed methods approach, in which quantitative and qualitative methodologies were combined.

3.4 Data Collection Methods and Research Instruments

Data collection methods are how data is gathered for a research project, e.g. observation, interviews, focus groups, questionnaires (Quinlan, 2011). This section provides further detail of the primary research instruments used in the study. The semi-structured interview was the dominant research instrument, while the online survey questionnaire added depth to the research and validated the data even though data was gathered in parallel. Islahuzzaman (2010) used a questionnaire survey to examine the perception and knowledge of auditors towards IT audit service. The design for the surveys evolved from the literature review presented in Chapter 2.

Themes or categories were predesigned for both the semi-structured interview and online survey questionnaire as an examination of the literature review. The predesigned themes used were Strategic, Operational, Technical, Audit and Risk categories to capture respective data on audit and automated compliance concerning payments across Bank of Ireland. These themes or categories were used during the data analysis stage to help with the coding or categorisation of data during the detailed analysis of each transcript. Duwaila and Mutairi (2017) used a similar approach in their research on the opinion of auditors towards the importance of information technology in Kuwait. Their categories included General Office Automation, Audit Automation, Accounting Firm Office Automation, E-Commerce Technologies and System Design and Implementation. The categories for this research study were modified and adapted to capture and collect all stakeholder perceptions on audit, compliance and the automation benefits and challenges across Bank of Ireland including IT Outsourced service providers.

3.4.1 Online Survey (Questionnaire)

From the 1940s to the 1970s, mail and face-to-face surveys were the main modes of data collection (Lyberg and Kasprzyk, 1991). The growth and use of the telephone during this period became popular in conducting surveys however the introduction of the internet in the 1990's threatened the dominance of the telephone survey. The current literature mainly focuses on analysing online and face-to-face or telephone surveys in terms of response rate, sensitive questions, social desirability, or 'don't know' responses. There is only a small amount of research that offers comparisons concerning the quality and representativeness of these different survey modes (Bracken et al., 2009).

The online survey is a questionnaire that a target audience can complete over the Internet. Online survey questionnaires are usually created as web forms with a backend database to store the answers and statistical software to provide analytics. The questionnaire is a self-report data collection instrument that each research participant fills out as part of a research study. It is simply a statistical study of a sample population by asking questions. Questionnaires can be used to collect quantitative, qualitative, and mixed data (Johnson and Christensen, 2014). The online survey questionnaire for this study was designed not only to provide quantitative data but some qualitative too. The online survey questionnaire was electronically administered to stakeholders to include business, auditing payment experts across Bank of Ireland including IT outsourced service providers. Internet surveys in whatever form they are very enticing for any researcher for many reasons:

According to Groves et al., (2004), surveys have the following characteristics:

- Information is gathered primarily by asking questions.
- Information is collected from only a subset of the population, described as a sample rather than all its members

This questionnaire method was chosen for this research study as it contains the following features:

- Faster, simpler and cheaper.
- Respondents have adequate time to think through their answers.
- Respondents, who are not easily approachable, can also be reached.
- Accurate and less bias.

Online survey questionnaire provides a more efficient and cost-effective way of generating many responses in a relatively short period of time, and have a substantial cost advantage over other methods of data collection (Wright, 2005). However, the data gathered in this fashion has many limitations. Answers may vary due to random mouse clicks or first options shown. This is of concern for longer surveys where the participant risks becoming bored. There is no option for follow-up questions based on the respondent's answer selection. It is possible that the survey link that was sent to the intended recipients is passed on to people not qualified to answer, which might skew results. These limitations were considered when analysing the survey results.

The online survey questionnaires took place over a four-week period during the month of July 2017. The online survey questionnaire contained thirty-one questions of similar design to the questions asked during the semi-structured interview. The questionnaire was originally sent and targeted to specific stakeholder groups within Bank of Ireland. It was sent to specific stakeholder groups based on their background and experience. However, using this approach participant responses were very slow. In follow-up, random participants were contacted by email. One hundred and twenty participants were contacted and followed up a second time by email. Ninety participants responded.

Questionnaire responses were analysed and are presented in the following Chapter 4, in the form of tables and figures.

3.4.2 Interview Methodology

Careful consideration was given to the interview process. This was to ensure that the maximum information was elicited from the interviewees, information was scribed accurately and findings were reported in an ethical manner. According to Kvale the quality of the interview is decisive for the quality of subsequent analysis, verification and reporting of the interview findings" (Kvale, 2007). Kvale (2007) further suggests that the quality of an interview is dependent on 3 key criteria:

- The interview is interpreted throughout the interview.
- The interviewer attempts to verify his / her interpretations of the subject's answers during the interview.
- The interview is "self-reported", it should be a self-reliant story that requires little additional explanation.

In designing the interview process, Kvale's 7 stages approach was used (Kvale 2007). This approach considers all aspects of the interview process starting with the consideration of the goals of the interview to the final reporting of findings.

1) Themazing – What is the theme of the interview? Kvale suggests that the researcher needs to understand the objectives of the interview and keep these objectives in mind throughout the interview process.
2) Designing – The researcher keeps a systematic record of the design procedure. Keep the final report in mind when designing the study, ensuring that ethical issues and informed consent are included.
3) Interviewing – The goal of the interview is to ensure that the interview can be reported to readers once the recorder is turned off. This suggests that the interview can be read as a narrative on its own with little additional explanation.
4) Transcribing – Kvale suggests that the researcher keeps in mind the readability of the finally published interviews and that the confidentially of the interviewee is always maintained.
5) Analysing – Based on the appropriate type of investigation.
6) Verifying – Check the validity, reliability and generalizability of the findings
7) Reporting – Communicate findings in a scientific and ethical manner, (Kvale 2007).

Knight and Ruddock (2008) define interviews in research which involve the collection from individuals, of detailed information, on thoughts, feelings and behaviours. During the interview process for this research study, the researcher observed the behaviour of the responses from the interviewee. These were captured by emoticons. The categories of the emotions consisted of Happy, Positive, Thinking, Confused and Annoyed. The purpose of using the emoticons was purely for the researcher. It allowed the researcher to provide examples to the interviewee if they felt confused by a question or required prompting for the interviewee to provide examples based on their experience.

Interviews of a conversational, face-to-face nature, with semi-structured unstructured questions, were conducted to establish senior managers perspectives on audit and automated compliance from a payments perspective across Bank of Ireland. The interviews took place at a time and location convenient to each of the interviewees. The semi-structured interview was structured into categories based on the five themes identified i.e. Strategic, Operational, Technical, Risk and Audit, like the online survey questionnaire. Moving from fully open-ended questions toward more theoretically driven questions as the interview progressed. This approach allowed the researcher and the interviewee to get a deeper and richer understanding of the subject being researched.

3.4.3 Semi-structured Interviews

The interview has today become one of the most widespread knowledge producing practice across the human and social sciences in general and in critical psychology more specifically. The interview exists in a variety of forms ranging from formal interviews, for example, conducted in surveys, through the Internet, over the telephone, or in face-to-face interaction, to more informal conversations conducted for research purposes, for example, as a part of ethnographic fieldwork. There are three fundamental types of research interviews: structured, semi-structured and unstructured. Structured interviews are, essentially, verbally administered questionnaires, in which a list of predetermined questions are asked, with little or no variation and with no scope for follow-up questions to responses that warrant further elaboration. Unstructured interviews do not reflect any preconceived theories or ideas and are performed with little or no organisation. Semi-structured interviews consist of several key questions that help to define the areas to be explored, but also allows the interviewer or interviewee to diverge to pursue an idea or response in more detail (Gill, 2008). This research took a semi-structured approach to facilitate further responses on questions asked.

The semi-structured interviews took place over a four-week period during the month of July 2017. Participants were selected for interview based on their seniority, background and experience with the research topic. The participants were contacted first by email, then followed up by phone conversation and finally by face to face requesting participation. Ten participants were contacted and provided with information about the research topic. Participants were asked to participate in a 90-minute face-to-face interview. Six participants accepted the request to participate in the semi-structured interview and four participants declined. Both the semi-structured survey and the survey questionnaire ran in parallel.

Each interview participant was asked thirty-one main questions like questions asked in the online survey. In addition, open ended questions had also been utilised, especially in any situation where it was deemed desirable to attain a more detailed and comprehensive explanation from the interviewees. The questions for both the online survey questionnaire and semi-structured interview are available in Appendices (6 and 7).

3.5 Survey Tool

The survey tool chosen for this research project is an online tool called *eSurveyCreator*. This was selected due to the in-depth level of functionality provided by this web-based tool. It afforded a wide range of choice including check boxes, multi select boxes, as well as the ability to add text boxes for open-ended questions, and an exit survey option, which presented an easy exit point at any stage of the survey to participants who did not wish to submit data. Unlike tools like Survey Monkey, *eSurveyCreator* also allows more than one hundred responses from participants and it is free of charge. This tool was also picked for its ability to provide clear and concise reporting tools on the collected data.

3.6 Participant Demographic and Sampling Method

As the research examines and evaluates stakeholder perceptions on audit, compliance and automation if they are similar across the IT outsourced service providers within Bank of Ireland, the participants chosen for the study worked in the payments arena for the organisation. The participants for both the semi-structured interviews and online survey questionnaires work across many functions in Bank of Ireland, Group IT, Group Operations, Group Change, Innovation and Group Risk and Assurance. The participants chosen for semi-structured interviews had 10+ years' work experience in the payments, accounting and auditing arena. Three of the participants that participated in the interviews worked directly for Bank of Ireland and the other three worked for the IT outsourcing service providers i.e. Accenture, HCL and Oracle organisations. Fifty percent of the participants chosen for the semi-structured interviews were women. Participants chosen randomly for the online survey were aged between twenty-five and fifty years old and had at least 2 years payments, accounting or auditing experience in IT, business, assurance across the organisation.

3.7 Ethical Considerations

Ethics in research refers to the application of fundamental ethical principles and is a matter of principled sensitivity to the rights of others (Bulmer, 2008). Ethical integrity is important to ensure the protection of the participants being researched, the researcher and the research itself. Research should be honest respectful, objective and confidential. Ethics were a primary consideration for both, the interviews and the online survey questionnaire. However, they were mainly associated with general issues in gaining access, collecting data, data processing and storage. Overall this was a low risk research study where ethical issues were concerned.

3.8 Lessons Learned

As there were only 6 interviewees, it was understood that the maximum benefit would have been gained from each interview. The initial interviews were not as valuable as later interviews conducted. The researcher gained confidence and interview experience throughout the process. Open ended questions became more detailed and more relevant to the research study as the study progressed. When sending out the online survey questionnaire the researcher should have contacted random individuals. Sending out the online survey questionnaire to random groups across Bank of Ireland was not a successful approach. As a result, time was lost in collecting the responses. Contacting individuals directly to complete the online survey questionnaire was very successful for the research study.

3.9 Conclusions

This chapter outlined a selection of methodological approaches available for this research, including their limitations and advantages. The desired target subjects for this study were drawn from business and IT professionals working in the banking and financial services industry. The chosen research method was that of pragmatism and mixed methods, with the use of semi-structured interviews and online survey questionnaires as a research strategy. The following chapter 4 presents the findings using this methodology.

4. FINDINGS AND ANALYSIS

4.1 Introduction

In the methodology chapter 3, the researcher used a mixed methods approach to collect data for this research study. This chapter details the way the quantitative and qualitative survey data was collected and analysed. Semi-structured interviews were conducted to gather qualitative data and an online questionnaire survey was used to collect quantitative data. The online survey was sent via email to random participants across Bank of Ireland to include the IT outsourced service providers. The intention of the online survey was to complement the responses of the semi-structured interviews. This section will demonstrate and present the data obtained through these methods. The online survey was focused on stakeholder user perspectives on audit, automation and compliance within Bank of Ireland. The semi-structured interviews focused on senior management stakeholder perspectives. Both methods highlighted the challenges of the IT audit and automation from both stakeholders.

The online survey user responses are displayed in a graphic format with a brief description of each. The management stakeholder interview results are combined in the description displayed in text with key findings highlighted. eSurveyCreator software was used to gather the data. Excel and Word were used to codify the interviewee responses and to analyse the data from the online survey.

4.2 Data Analysis

There are many mixed methods designs that can be used when analysing data. The data for this research study was analysed using a convergent parallel design (QUAL + QUAN). Two independent strands of qualitative and quantitative data were collected in a single phase roughly at the same time. The methods used were prioritised equally and the data analysis for each method was carried out independent of each other. The semi-structured interview formed the qualitative part of the research study and the online survey formed the quantitative part. The responses from the interview process were collated and codified. A list of priori codes was developed from the interviewee responses. The data was further refined and categorised into sub codes to organise the data. This approach ensured the sub codes fitted the data rather than the data fitting the sub codes.

Whilst analysing the transcripts from each interview the researcher also collated reactions and ideas that emerged during the interview process. The design of the interview questions using the emoticons helped and supported this part of the process. These ideas were important and vital to the analytic process when codifying the responses. The final codes determined the categories developed for each predefined theme i.e. Strategic, Operational, Technical, Audit and Risk. Despite the availability of alternative aid assistance to transcribe the interviews, such as computer voice recognition software, the researcher did not make use of these types of aid. All interviews were scribed and typed.

Each stakeholder's user response from the online survey was collated and analysed in Excel. The responses from each of the ninety stakeholder users was tabulated and populated by their frequency.

Figure 5: Interview Participants

The following interviewees participated in the research study. Names were anonymised for each of the interviewee's interviews.

Interview Participants	Title	Organisation	Payments Experience
Participant A	Head of Electronic Payments Centre of Excellence	Bank of Ireland	10+ Years
Participant B	Head of Programme Delivery Group Payments	Accenture	15+ Years
Participant C	Head of Delivery Payments Ireland and UK	Oracle	10+ Years
Participant D	European Director of Engagement for Payments	HCL	10+ Years
Participant E	Head of Delivery Change Group Payments	Bank of Ireland	15+ Years
Participant F	Head of Group Payments Services	Bank of Ireland	20+ Years

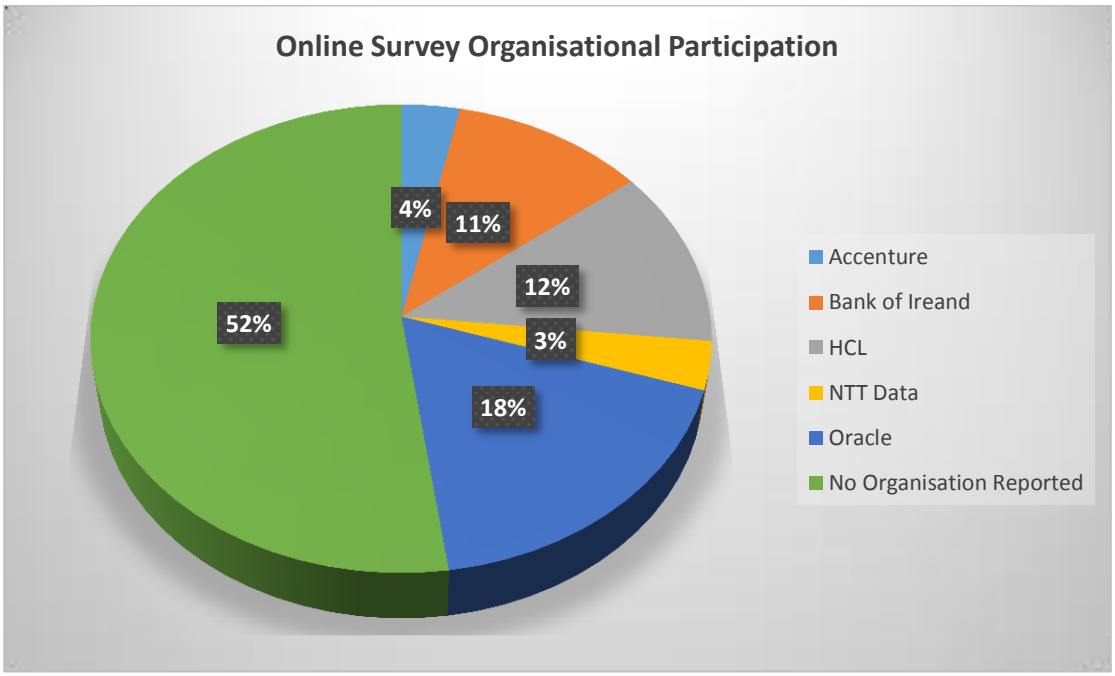
FIGURE 6: Interviewee Profiles

Interview Participants	**Summary Profile - Senior Management Stakeholders**
Participant A	Participant A in the last year was promoted to Head of Electronic Payments for Bank of Ireland. She has worked in payments for Bank of Ireland for many years. She has a deep understanding of payments globally and was a delivery lead across the implementation of many payment projects for Bank of Ireland. Participant A has had previous payment roles with Dun and Bradstreet and Sentinel solutions and is Bank of Irelands advocate with the European Central Bank.
Participant B	Participant B works for an IT outsourced service provider for Bank of Ireland. She has worked for over 15 years working directly for Bank of Ireland and with Accenture providing programme management for payments across Bank of Ireland. Participant B has had years of experience delivering and testing payment solutions for Bank of Ireland. She has delivered SWIFT payments and sanctions screening solutions for the organisation.
Participant C	Participant C works for an IT outsourced service provider for Bank of Ireland. He has held the role of head of payments delivery for Oracle corporation the last three years. Before this role he was the service delivery manager for SEPA payments for Bank of Ireland. He is currently based in Pune India. Before these roles he had worked for HCL on many global payment projects to include banks like Deutsche Bank and Barclays bank.

Interview Participants	**Summary Profile - Senior Management Stakeholders**
Participant D	Participant D works for an IT outsourced service provider for Bank of Ireland. He has held the role of European Director of Engagement for payments for HCL for the last couple of years. He has extensive payments knowledge however works on the commercial side with Bank of Ireland. He has held several global roles with HCL specifically for payments both in India and within Europe.
Participant E	Participant E works for Bank of Ireland. He has worked with Bank of Ireland for over seventeen years and heads up the change delivery function for group payments across the organisation. Before this role he worked in roles for Bank of Ireland in internal audit and operations modelling for payments. He has extensive auditing and automation experience within the organisation.
Participant F	Participant F works for Bank of Ireland. She has worked for Bank of Ireland for over thirteen years and is Head of Group Payment Services for Bank of Ireland. She has held this position for the last number of years. She has held previous roles held in Bank of Ireland to include Sarbanes Oxley Programme manager, Financial Controller, Head of Finance Business Partners and Head of Group Payments Fulfilment. Before Bank of Ireland she held numerous roles for PWC as their senior IT Audit Manager.

One hundred and twenty participants were contacted by email randomly across Bank of Ireland to participate in the research study. The survey users were randomly picked across both Bank of Ireland and the IT outsourced service providers. The random sample was primarily based on their roles within payments, business and auditing functions. Each of the users that was sent the online survey had to be followed up a second time by email. This was to push users to complete the online survey sent. Ninety participants responded to the online survey which provided an overall 75% response rate. All responses provided via the online survey were optional i.e. 52% of participants who responded to the survey did not want to provide their organisation or contact details. Out of the 48% who did provide this information the highest contribution was from the Oracle Corporation. There was a 18% response rate from Oracle, followed by 12% from HCL and then 11% from Bank of Ireland. Of the ninety participants who responded to the online survey 32% were male participants, while 21% were female respondents. 47% of users who responded did not provide their direct names or contact details to ascertain their sex.

FIGURE 7: Online Survey Organisational Participation



4.3 Survey Results

The semi-structured interview and the online survey were categorised into 5 predefined themes, Strategic, Operational, Technical, Audit & Risk. Each question in the online survey allowed for multiple-choice options, with question 11, question 14, question 26 and question 27 providing a text box to allow for the recording of respondent's personal opinions. Using the QUAL + QUAN parallel convergence data analysis approach both semi-structured responses and online survey responses were gathered at the same time. Qualitative responses from the semi-structured interview were codified for interpretation and compared against the quantitative responses for analysis. Each of 6 interviewees and the ninety online survey respondents provided full permission for the publication of their results, as outlined in the information sheet provided at the start of the survey in accordance with the ethical approval application submitted to, and granted by, Trinity College, Dublin.

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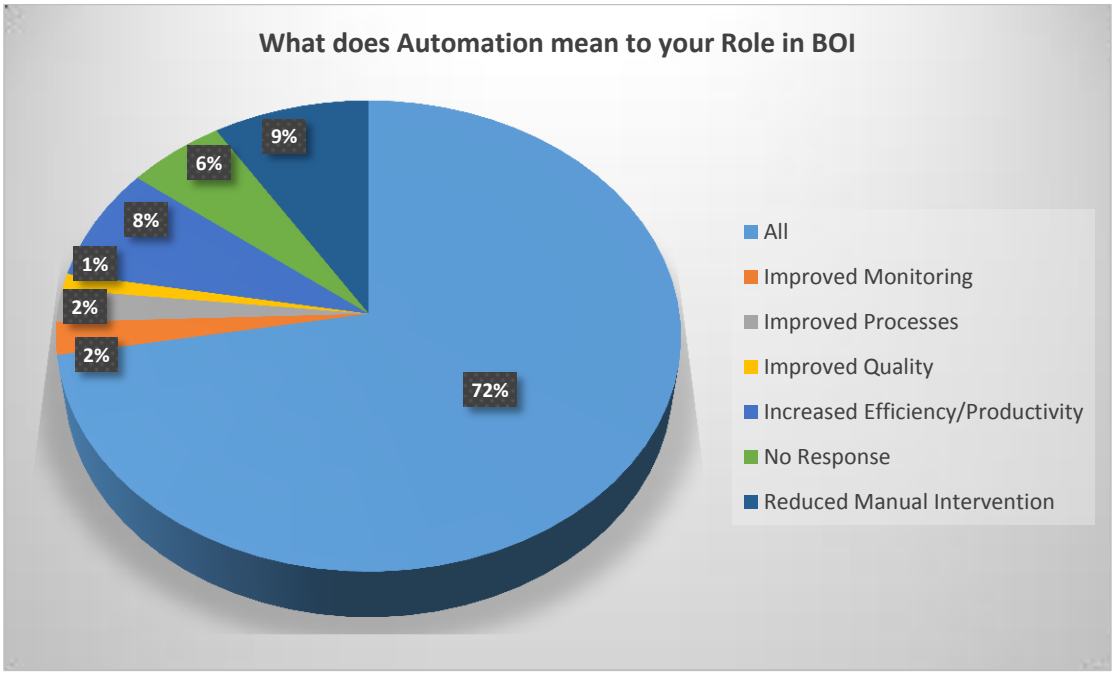
4.3.1 Strategic Theme

This section presents the data acquired from questions 1 to 6 for the interviews conducted with senior management and users who participated in the online survey.

Question 1 asks: What does automation mean to your role in Bank of Ireland?
During the interview process with each of the senior managers the same choices were verbally communicated to those provided for question one for the online survey. Responses to this question slightly differed in that senior management stakeholders agreed that automation for their role in Bank of Ireland included improved monitoring, improving processes and increases in efficiencies. However, the main driver for automation for their role as senior managers was primarily cost reduction, reducing manual interventions and automation scalability. 72% of users surveyed responded to say automation was a combination of things for their role in the organisation i.e. improved monitoring, processes, quality, increased efficiencies and reduced manual interventions.

FIGURE 8: Automation Role in BOI

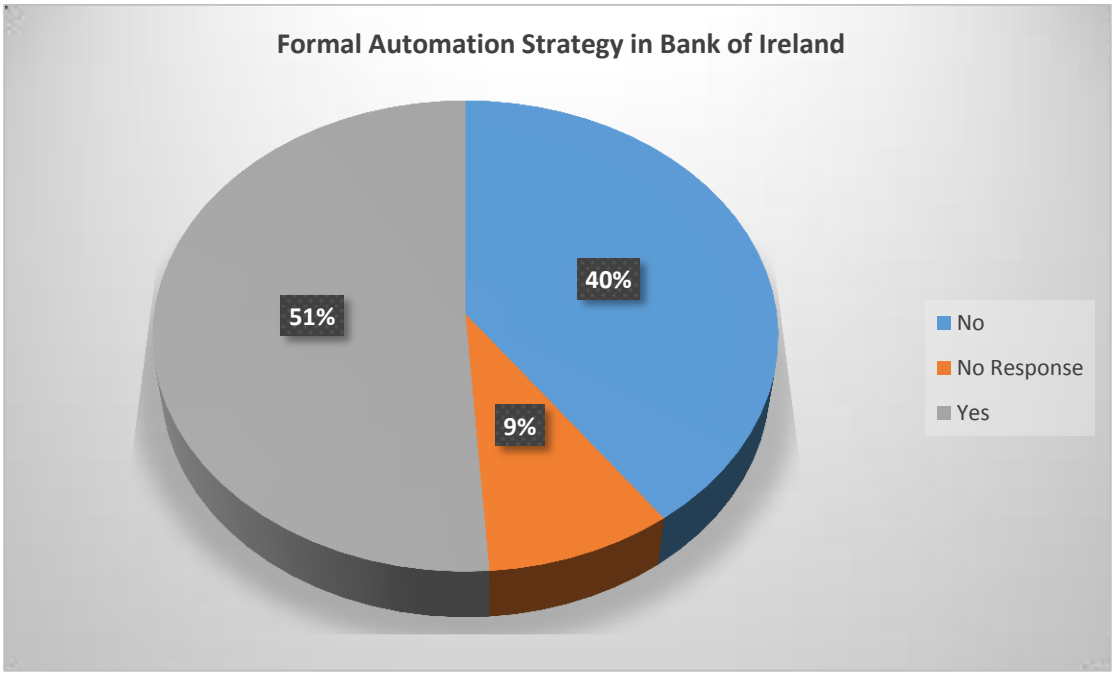


Interview participant F stated: "*For Bank of Ireland it means reduced manual intervention, improved processes, improved monitoring but mostly efficiency. It means lower cost and lower risk for the bank. I mean the cost to serve customers from an accuracy perspective removing human error from the equation"*

Question 2 asks: Is there any formal strategy in place to manage automation within the organisation?

Four of the six senior managers stakeholders interviewed agreed that a formal automation strategy exists within Bank of Ireland. Both senior managers interviewed from HCL and Oracle understood that there is an automation drive on within the organisation. Both managers were not aware that a formal automation strategy was in place for the organisation. From notes, there was a consensus between senior managers that the automation strategy maybe disjointed throughout the organisation. 51% of stakeholder users from the online survey agreed with senior management stakeholders there was a formal strategy in place. However, 40% of users disagreed and said that no formal strategy existed.

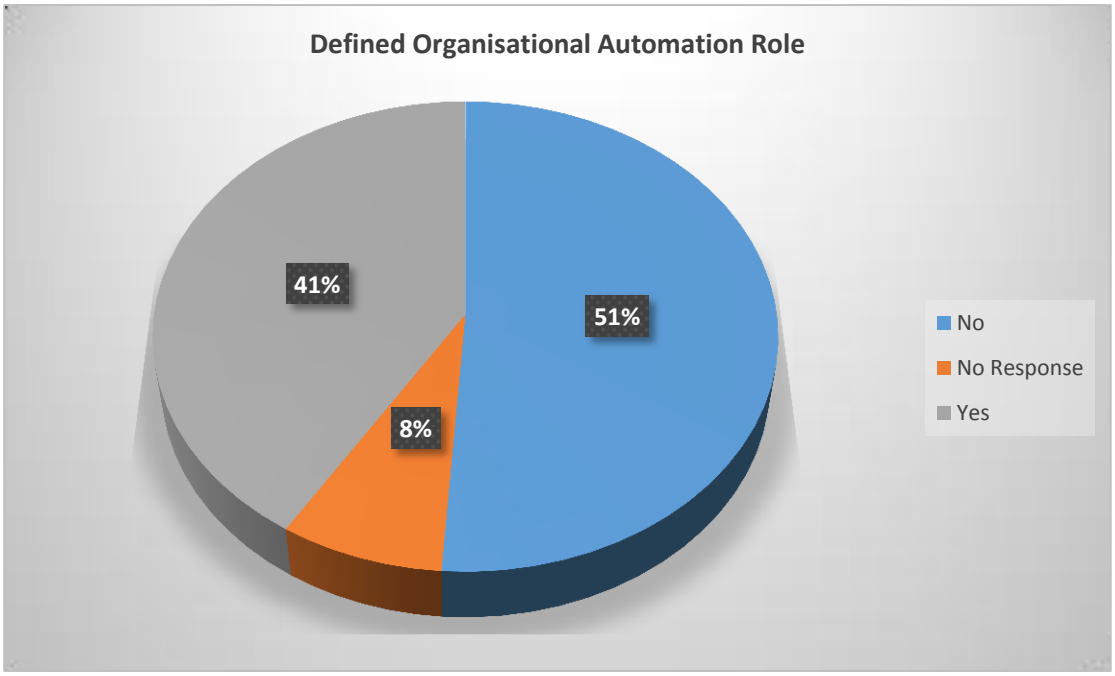
FIGURE 9: Formal Automation Strategy in BOI



Question 3 asks: Is there any defined role in your organisation who manages automation for Bank of Ireland?

All 6 senior managers interviewed responded to say that a defined role existed in their part of the organisation to manage automation. 41% of surveyed users responded to say that there was a defined role in the organisation to manage automation. 8% of users decided not to answer this question and 51% of users responded to say there was no defined automation role in place.

FIGURE 10: Defined Organisational Automation Role

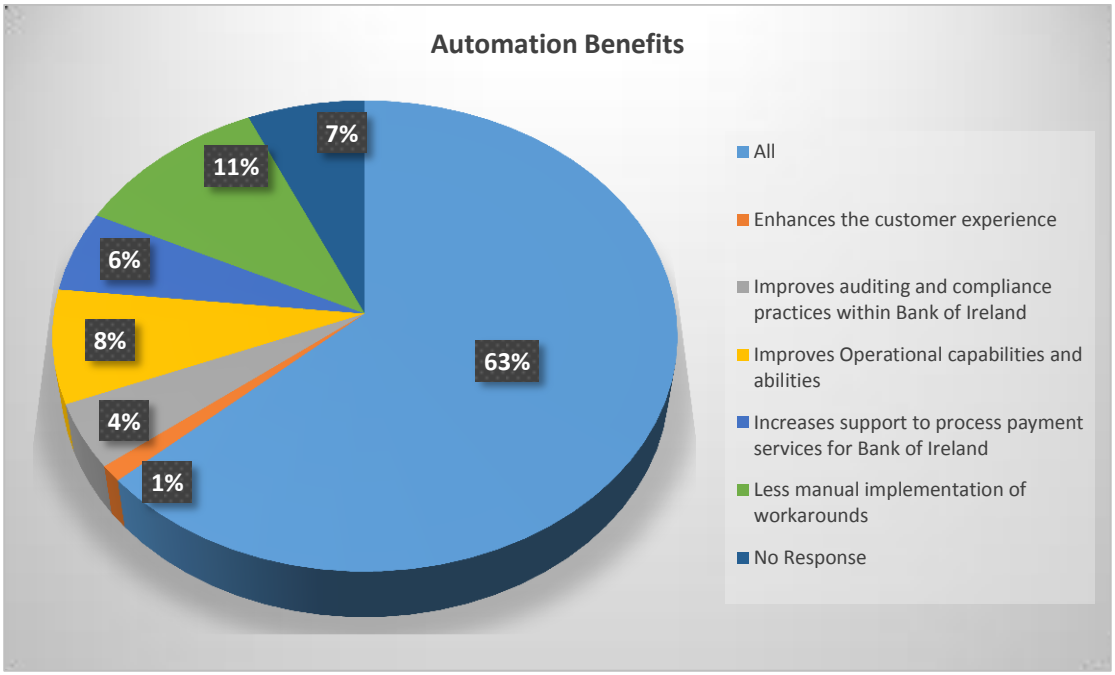


Interview participant B stated: *"Within Group Operations we have a whole team of robotics people, and in the context of the development team ChangeZone we have specific roles within testing and development operations".*

Question 4 asks: What benefits do you think automation offers Bank of Ireland?

63% of survey users responded to say the benefits of automation to Bank of Ireland included less manual implementation of workarounds, improved operational and auditing practices throughout the organisation. 7% of users surveyed did not answer this question. All senior managers interviewed included the same responses as surveyed users and added such benefits in their opinion as reduction in costs, reduction in staff, customer satisfaction and enhanced management of controls.

FIGURE 11: Benefits of Automation to BOI

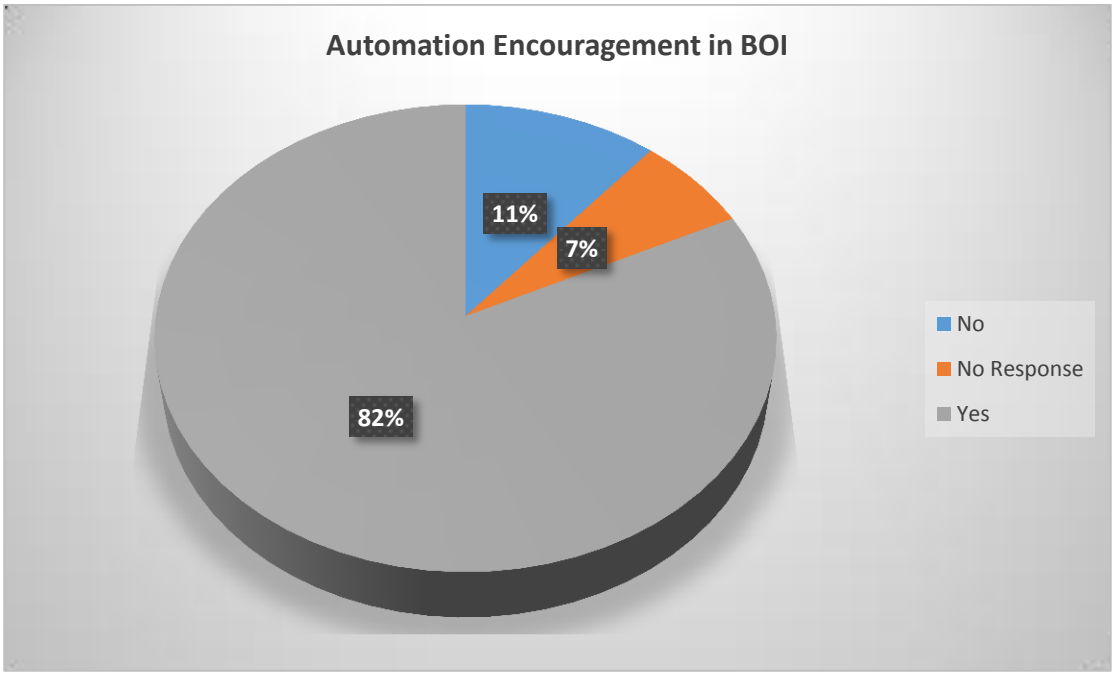


These benefits were confirmed by the CAPCO institute journal of financial transformation in a paper titled “Data Centre dependencies and Opportunities for Robotic Process Automation in Banking” in 2017.

Question 5 asks: Do you think senior management encourage the use of automation in Bank of Ireland?

82% of surveyed users responded to say that senior management encouraged the use of automation across many functions within Bank of Ireland. Only 11% responded to say senior management did not encourage automation. And in agreement senior management responded to say that they 100% drove and encouraged automation across their functional areas within the organisation.

FIGURE 12: Automation Encouragement in BOI

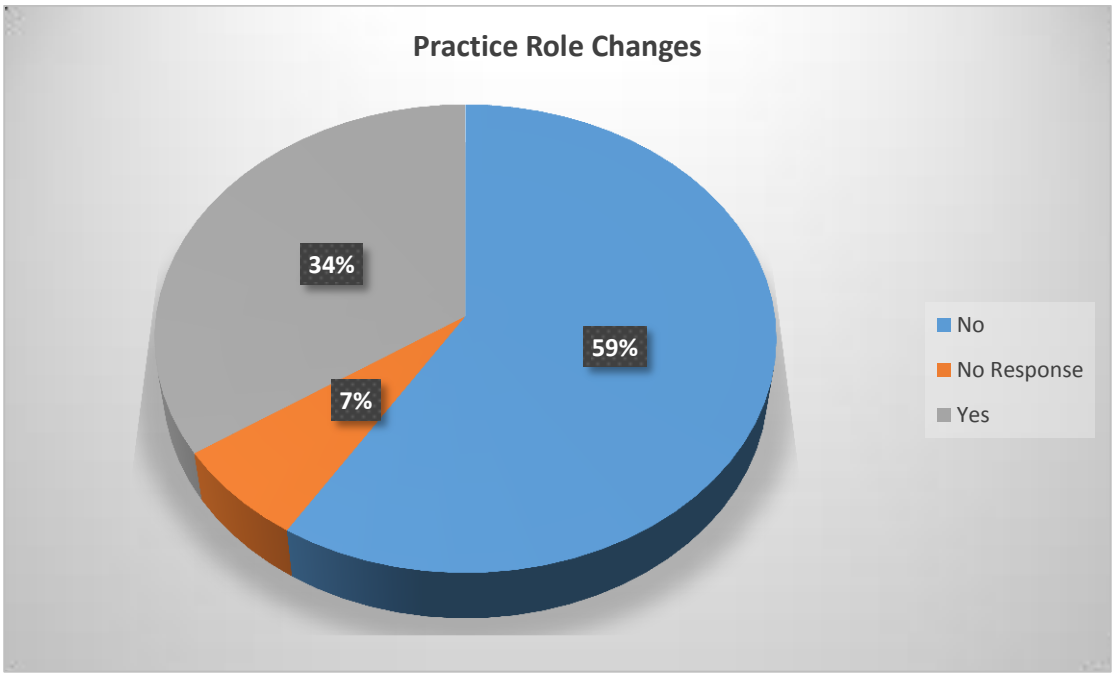


Interview participant D stated: *"Automation is on everyone's agenda in BOI irrespective of what department you work for within the organisation. However, there is always the cost agenda and the risk it can bring i.e. not all projects are successful".*

Question 6 asks: Has the practice of your role changed since implementing any automation within your functional area?

59% of surveyed users responded to say their work practices had changed since implementing automation for their functional areas within Bank of Ireland. Whereas 34% said their work practices had not changed with the implementation of automation. 7% of users did not respond to this question. Five of the senior managers interviewed agreed that their own work practices had changed since the implementation of automation.

FIGURE 13: Practice Role Changes



Interview participant C stated: *"Significantly automation has changed our work practices, we have been implementing automation into the delivery area for over 4 years now and we have classified all our alerts into automation that used to be manually checked. It has allowed my teams to concentrate on continuous delivery improvements for Bank of Ireland".*

A further question was asked by the researcher to senior management: How does senior management motivate the implementation of automation in Bank of Ireland?

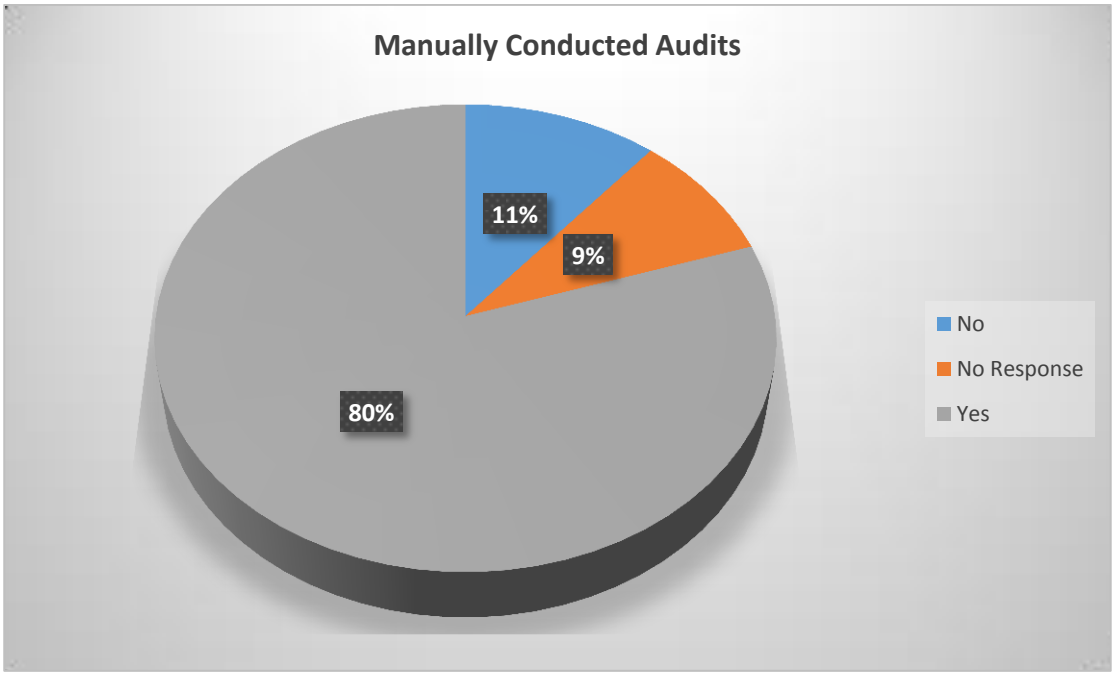
Interview participant F stated: *"We are indirectly motivated by the senior management team. As a senior manager, I motivate my teams by looking at the human effort and seeing what cost reductions can be made where and when. We worked on a project and named it AOMI (Automated Management Information). The project looked at specific timings on transactions to process. To see where users were spending their time on releasing payments for processing. We looked at those humans that released transactions in a low time to a high time and then we could gage an average time for releasing payments. We promoted the timings out to the teams and once done the average time for releasing payments increased across the teams. There was a fear that automation tools could replace humans. Automation can sometimes get the best out of people too. The long-term outcome was a reduction in staff resourcing".*

4.3.2 Audit Theme

This section presents the data acquired from questions 7 to 12 for the interviews conducted with senior management and users who participated in the online survey.

Question 7 asks: Are audits within your functional area currently conducted manually? 80% of users responded to say that audits were conducted manually for their areas. 9% of users did not answer the question and only 11% of users confirmed that audits were automated for their area. Four of senior managers interviewed responded to say audits were conducted manually however key controls were in place to monitor auditing on payment systems. Two senior managers stated audit automation was prevalent in their area for auditing and was primarily specific to functional testing for payments. The automation tools in place for auditing were to ensure correct controls were being met to reduce the risk of manual effort.

FIGURE 14: Manual Auditing

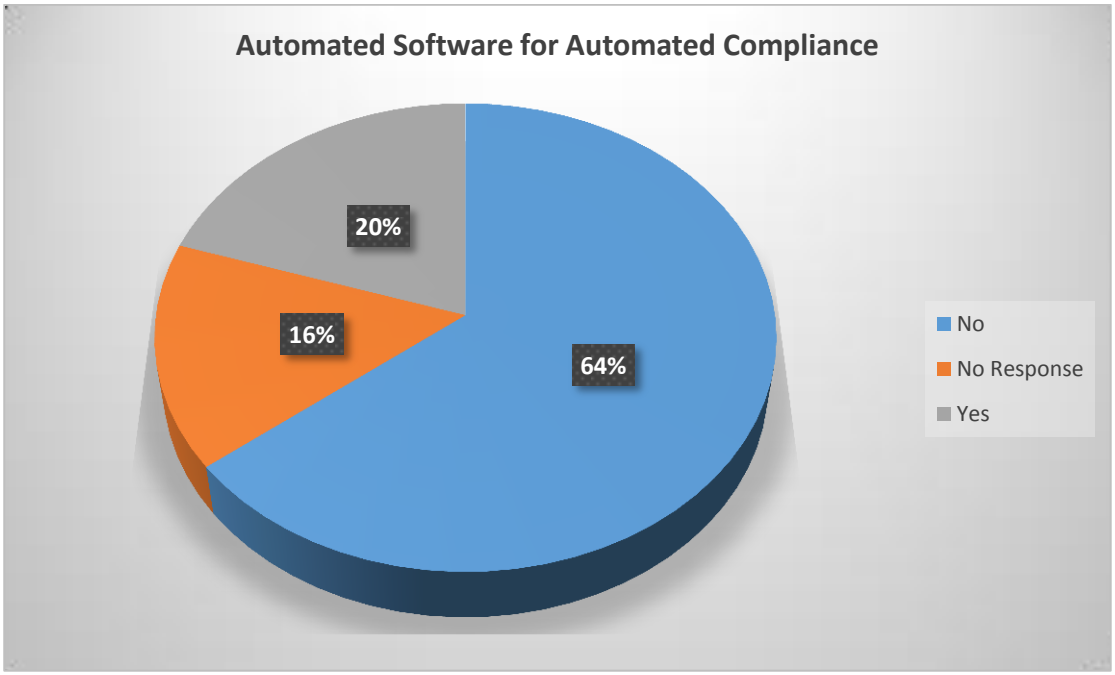


Interview participant F stated: *"Auditing tasks were carried out manually as many things require significant human judgement" and auditing is such a specialised area".* These perspectives correspond with what Issa & Vasarhelyi (2016) describe in their paper "Research Ideas for Artificial Intelligent in Auditing: The Formalization of Audit and Workforce Supplementation" in that *"Auditors aggregate information and use their judgment to identify risks factors and the understanding of internal controls to help determine scope, nature, and timing of substantive tests in a traditional audit process".*

Question 8 asks: Is automated software used for auditing compliance for your functional area within Bank of Ireland?

Four of the senior managers interviewed were aware that Bank of Ireland uses automated software for auditing and compliance purposes, compared to 20% of surveyed users. 64% of stakeholder users were not aware that Bank of Ireland uses automated auditing compliance software daily.

FIGURE 15: Automated Software for Automated Compliance



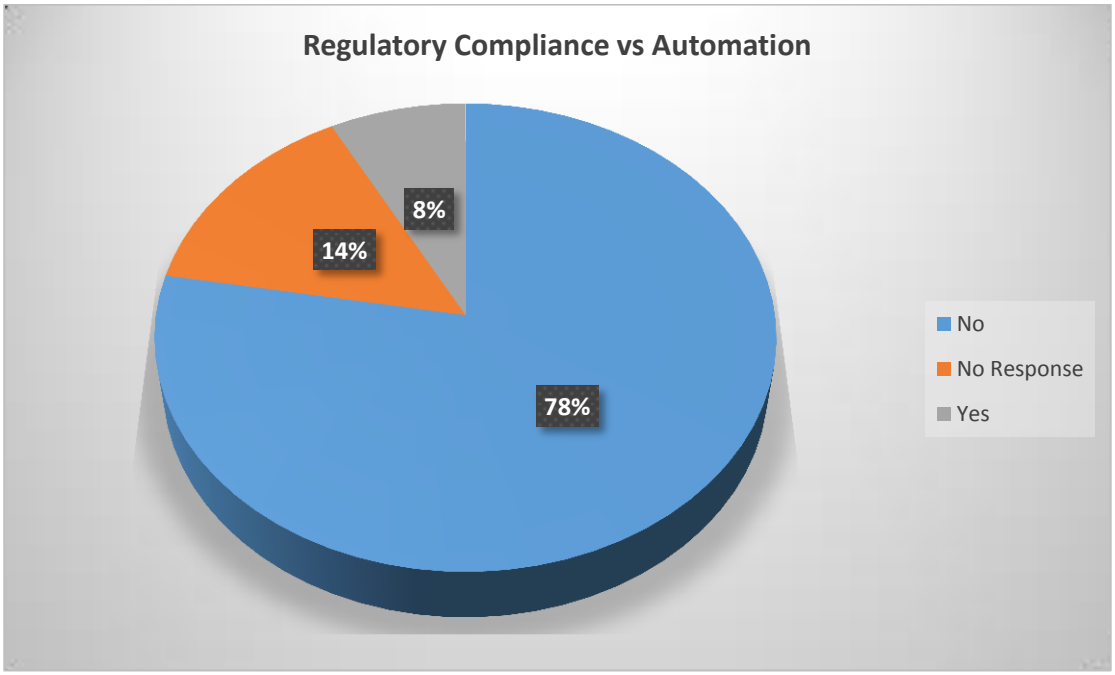
There may be a lack of communication or understanding of the tools, products and services within payments that perform automated compliance across the bank on a daily basis.

Interview participant D stated: *"We use an automated software tool called Blue Prism and the output from this is a technical reacquisition report. The report automatically identifies anomalies in the payment flow and sends automatic alerts to teams to notify them when issues are occurring within the robotics processing automation tool".*

Question 9 asks: Are you aware of any regulatory compliance around automation software for the organisation?

78% of surveyed users and 5 of senior managers interviewed were not aware of any specific regulatory compliance around automated software for Bank of Ireland. However, there was awareness by the senior managers on the implications of not having regulation in place throughout the organisation.

FIGURE 16: Regulatory Compliance

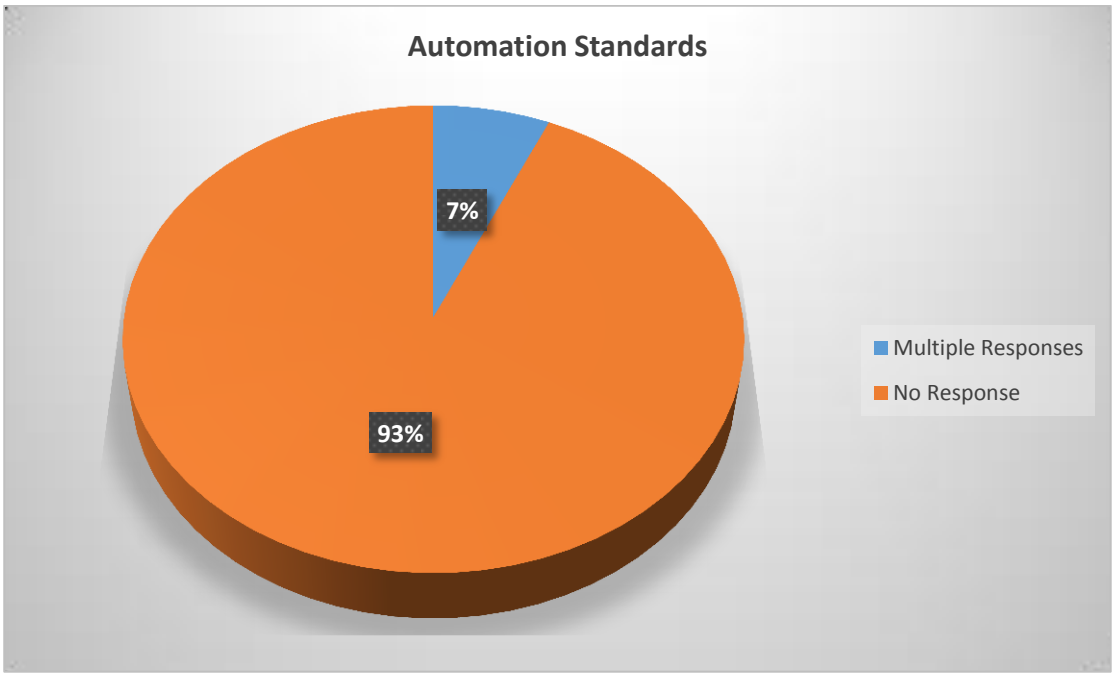


Interview participant C stated: *"I understand this could be a contention issue from a legal perspective. If you have robotic process automation tool or automated software in place and the software fails or it causes a major problem to the banks operations who is responsible for the problem, you can't blame a piece of software".*

Question 10 asks: If Yes, are there any standards you use in your role to support automated compliance for Bank of Ireland?

Bank of Ireland is a highly regulated organisation and has many internal financial controls e.g. SOX (Sarbanes Oxley), IT Sec Password Regulations, IT Risk Management (Radar) Systems and Controls, Business Continuity Management, MIFID II - Message Automation Regulations and PSS DCI Security Regulations. 93% of surveyed users were not aware of any specific standards for automated compliance within Bank of Ireland and all senior managers answered similarly to this question.

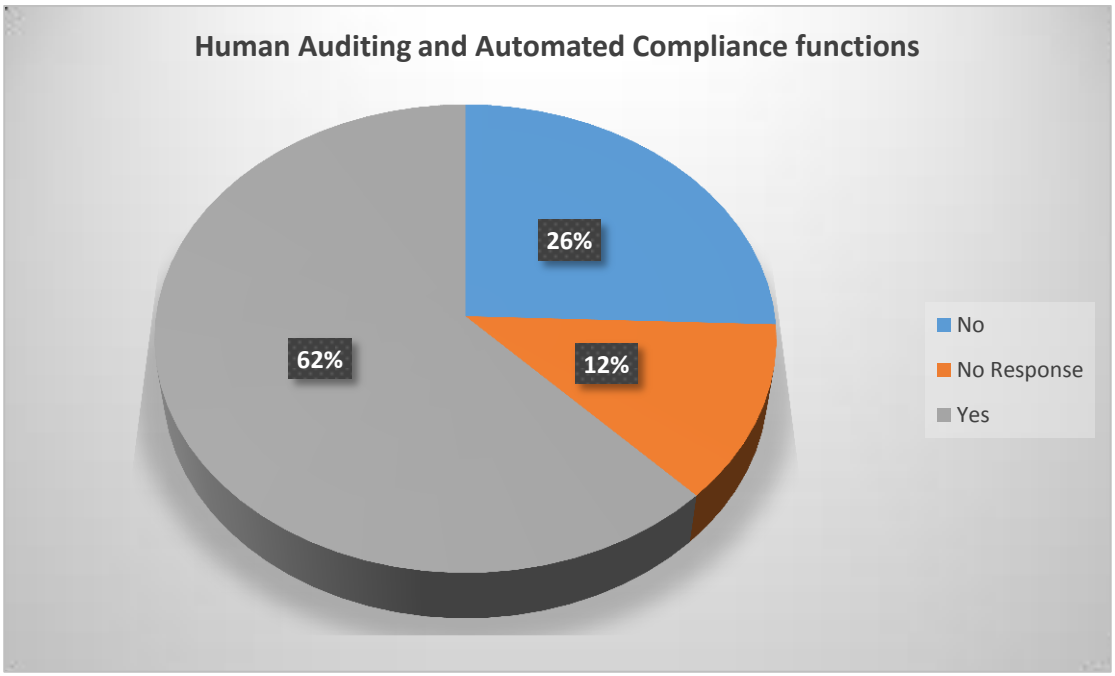
FIGURE 17: Automation Standards



Question 11 asks: In your opinion is human auditing and automated compliance separate functions within an organisation?

62% of surveyed users responded to say that human auditing and automated compliance are separate functions within Bank of Ireland. 12% of surveyed users did not answer this question and 26% of respondents agreed that auditing and automated compliance were combined functions. Five of the senior managers interviewed agreed that human audit and automated compliance are currently very separate functions within Bank of Ireland.

FIGURE 18: Human Auditing and Automated Compliance

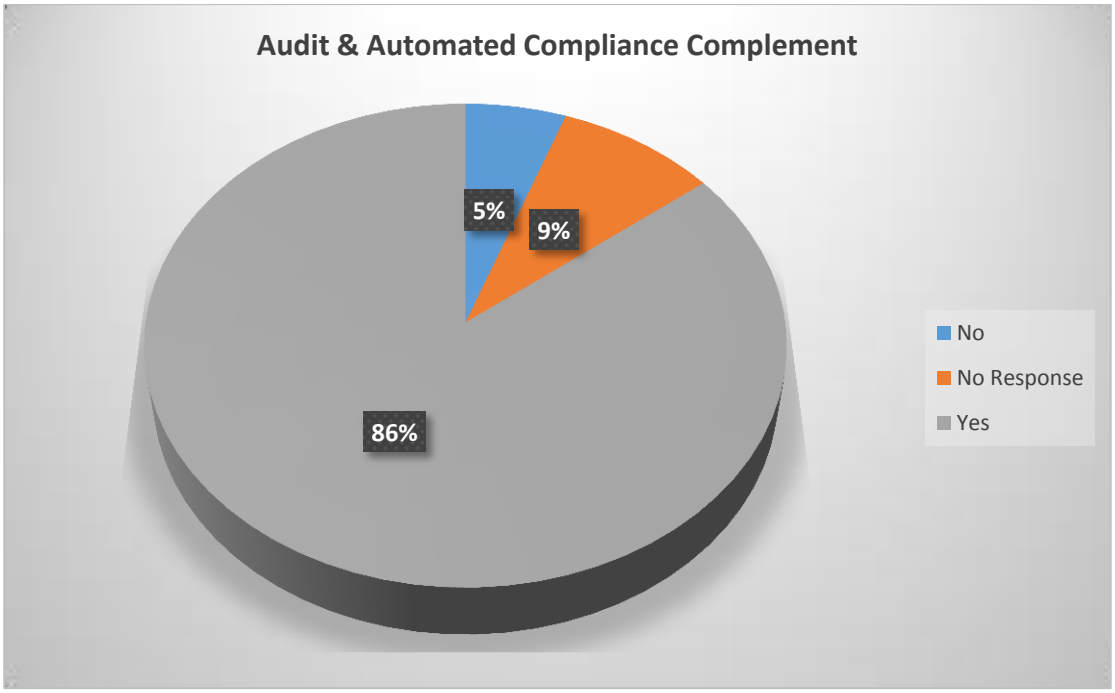


Interview participant D stated: *"The future is to have both audit and automated compliance working together".* Chan and Vasarhelyi (2011) advocate innovation in the implementation of continuous automation say organisations should be moving toward automation if they want to both add value and meet compliance standards.

Question 12 asks: Do you think human auditing and automated compliance could complement each other?

Both senior management and users agreed that human auditing and automated compliance can complement each other however with some reservations. Five of the senior managers interviewed agreed, and this was in line with 86% of surveyed users.

FIGURE 19: Auditing and Automated Compliance Complement



Interview participant E stated: *"As long as one is not blindfolded they can complement each other. Sometimes there are failings on both sides of the fence more so with the human side i.e. not understanding the context of what auditors are auditing. IT is extremely technical and complex. Can you provide an example? Yes. Well in a fraud example the automated tool we use "chat bots" can detect an issue with an address, pretty quickly however on the human side this could take time and experience to spot an anomaly".* According to Christian (2011) machines, no matter how artificially intelligent they become, they are still not as smart as humans yet. Replacing human functions with robots provides a new level of risk in terms of understanding what is right and wrong.

Interview participant F stated: *"I am sceptical about them complementing each other. When I worked in PWC auditing was a very manual and there were very good reasons for that like carrying out assurance on an audit or specific reconciliations. Robotic process automation currently cannot currently judge, it may in the future with artificial intelligence but now the bank has used robotics to repeat a sequence of steps to eliminate manual intervention and tasks".*

Senior management stakeholders were asked a further question under the auditing theme. In your opinion, what do you think are the gaps between human auditing and automated compliance?

Interview participant B stated: *"The looks and intuition that a human has compared to automated software to perform a task i.e. the human ability to smell something is not right compared to automated software to test and build are very different".*

Interview participant E stated: *"With automation, you can get past the drudgery and the correctness of the output is infallible. And on the human side there can be mistakes. When it comes to payments and let's be honest the bank is payments. We do not manually key in payments everything is done automatically now. Auditors understand logic but humans simply make mistakes".*

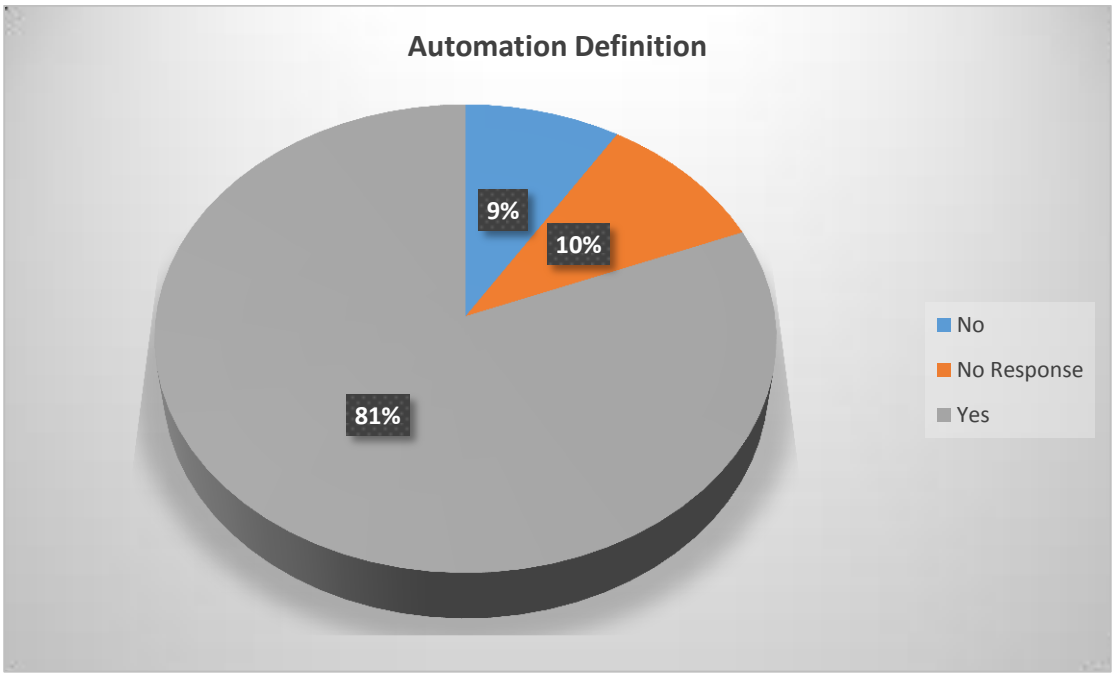
4.3.3 Operational Theme

This section presents the data acquired from questions 13 to 18 for the interviews conducted with senior management and users who participated in the online survey.

Question 13 asks: Automation is the application of technology that allows employees in a company to configure computer software or a “robot” to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems. Do you agree with this statement?

The definition is from the institute of robotic process automation. 81% of users surveyed agreed with the statement. 10% of users surveyed did not respond and only 9% disagreed with the statement. From a senior management perspective only three of the respondents interviewed agreed with the definition of automation from the institute. The managers interviewed felt there were challenges with the statement and its interpretation.

FIGURE 20: Automation Definition

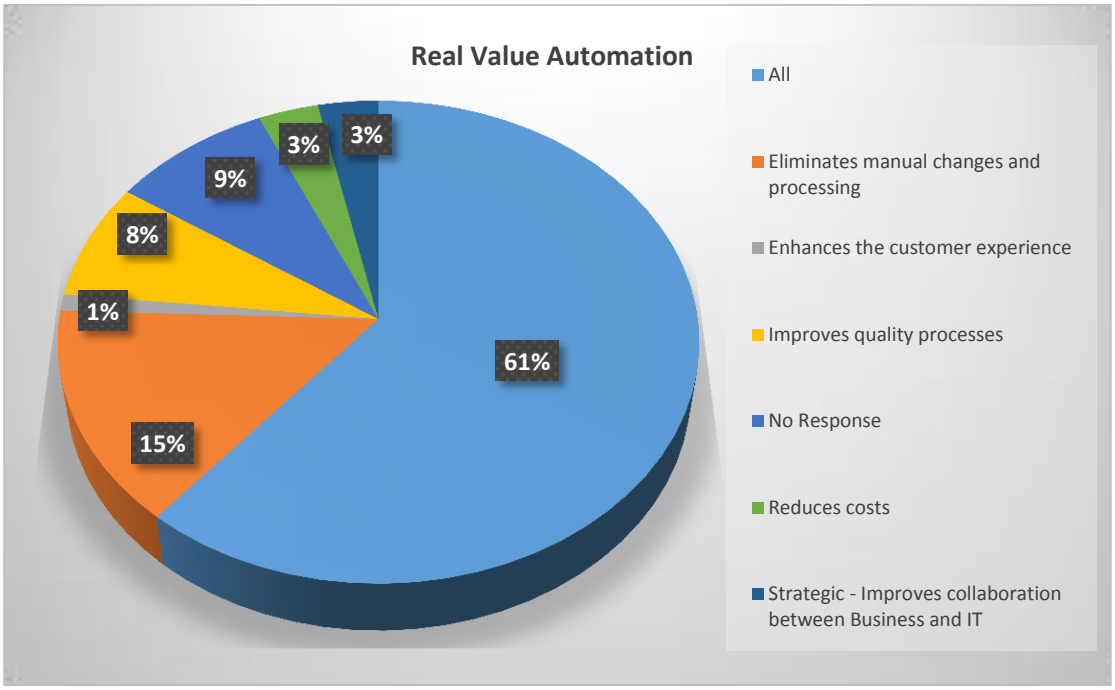


Interview participant F stated: *"I'm not sure about the word interpret existing applications? From a human perspective automation tools, even with the use of AI are not at that interpret stage for existing applications. On the other side, it really depends on the experience of the auditor to be able to interpret existing applications".*

Question 14 asks: Where do you believe automation adds real operational value within Bank of Ireland?

61% of users surveyed responded to say that the real benefits of automation to Bank of Ireland included enhancing the customer experience, improving quality processes and improving collaboration between business and IT departments. 15% of users surveyed responded to say it eliminated manual changes and processing. Only 3% of users surveyed did not respond. All senior management responded with the same responses however automation added real value from a cost base perspective for their departments within Bank of Ireland.

FIGURE 21: Automation Real Value

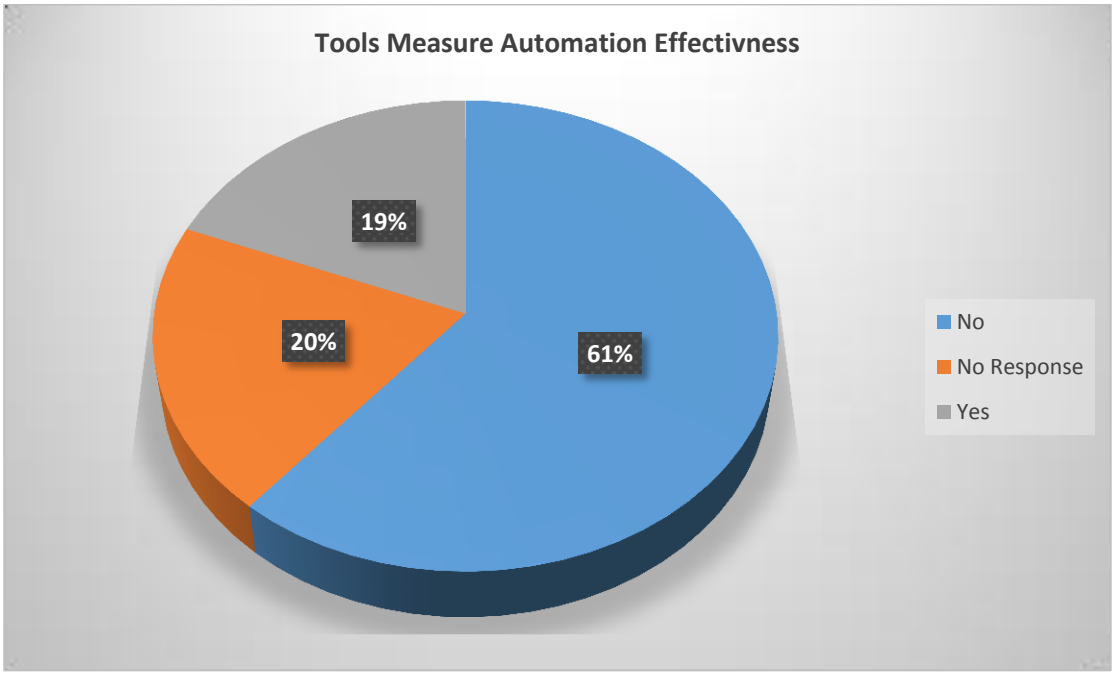


Interview participant F stated: *"Automation is always cost based from the bank's perspective. It blends heuristics from a software perspective. We put a robot in place for credit scoring and it has become a binary process for the bank. It adds real value in the sense that data can be collected quickly, seamlessly and the journey for the customer using automation is much quicker. For auditing data is gathered much quicker so decisions can be made much quicker".*

Question 15 asks: Is there a tool or mechanism to measure automation effectiveness throughout the organisation?

61% of users surveyed responded that there was not at tool to measure automation effectiveness throughout the bank. 19% agreed that there were metrics available for automaton effectiveness in the bank and 20% did not respond to the question. Senior management perspectives were divided equally and the perspectives communicated had different challenges.

FIGURE 22: Tools to Measure Automation Effectiveness



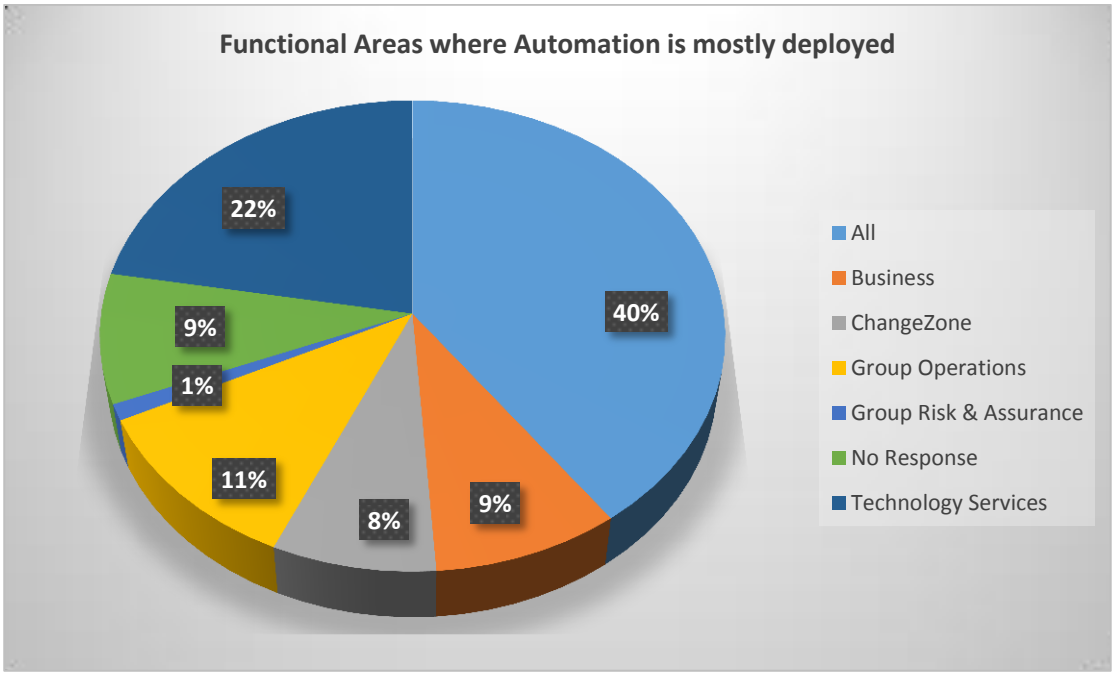
Interview participant E stated: *"We use Blue Prism. Blue Prism is an RPA tool deployed throughout the bank. We have measured the RPA tool to other tools in the market by completing sample workflow tests and how quickly and accurately it can perform tests. Blue Prism was far way the best tool. Due diligence was carried out from a request for proposal perspective and papers and case studies were examined both from Gartner and Forester".*

Interview participant F stated: *"To be honest the evaluation of specific automated software should be carried out by humans; self-regulating robots could be of concern for the bank. It can take months for projects to go live and human intervention is required during the life cycle of projects to ensure auditing is conducted correctly"*

Question 16 asks: Who would you say are the main drivers from the list below to implement automation within Bank of Ireland

40% of users surveyed responded to say that automation tools were driven by many departments throughout Bank of Ireland. However, Technology Services were driving a lot of the automation initiatives. The response to this question was disjointed in that senior managers responded to say most of the automation was deployed throughout Group Operations, ChangeZone and business areas.

FIGURE 23: Functional Drivers of Automation in BOI

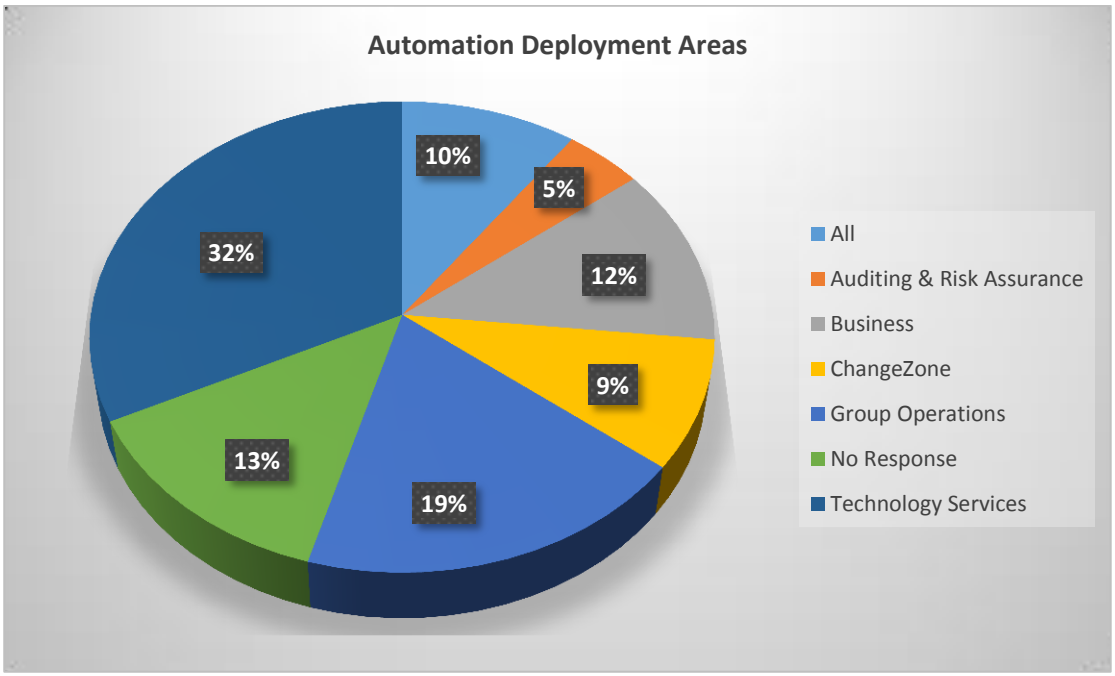


Each senior manager had a different perspective on where automation was being driven within Bank of Ireland. This may be attributed to each senior manager driving their own automation agenda.

Question 17 asks: Where do you think automation is mostly deployed within Bank of Ireland?

32% of users surveyed responded to say that automation was deployed amongst many departments throughout Bank of Ireland. Mostly deployed within Group Operations followed by the business department. Five of the senior managers interviewed responded to say that most automation was deployed throughout Group Operations. Each senior manager from notes transcribed had a different perspective on where automation was deployed, and some senior managers had more of an exact understanding of the specific areas where automation was deployed in the organisation.

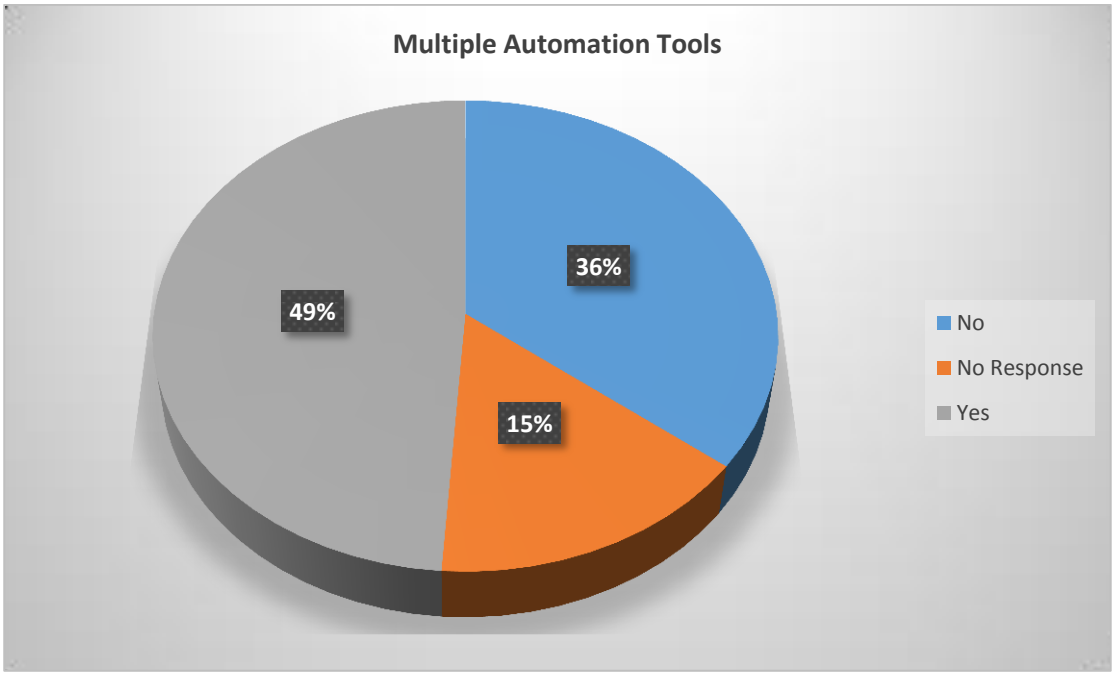
FIGURE 24: Automation Deployment Areas



Question 18 asks: Are multiple automation or robotics tools in place for payment services across Bank of Ireland?

Four of senior managers interviewed agreed that there are multiple automation tools in place across the organisation. Compared to only 49% of users surveyed who were aware that multiple tools existed. 36% of users were not aware of multiple automation tools across the bank and 15% of users did not respond to this question.

FIGURE 25: Multiple Automation Tools



Some questions in the next section for the technical theme were not appropriate to ask senior management. As when asked to respond, each participant communicated that they would have not had the technical knowledge or detail to answer these types of questions. Senior managers were asked further questions that related to technical themes within the organisation and these responses were codified and added into the qualitative analysis.

4.3.4 Technical Theme

This section presents the data acquired from questions 19 to 25 for the interviews conducted with senior management and users who participated in the online survey

Question 19 asks: Do you use automation or robotic tools in your current role?
38% of users surveyed responded to using automation tools in their current role compared to 49% who do not.

Question 20 asks: Is the automation tool you use a specific RPA Tool?
23% of users surveyed responded to using a RPA tool. 68% of users responded that they do not specifically use an RPA tool like Blue Prism.

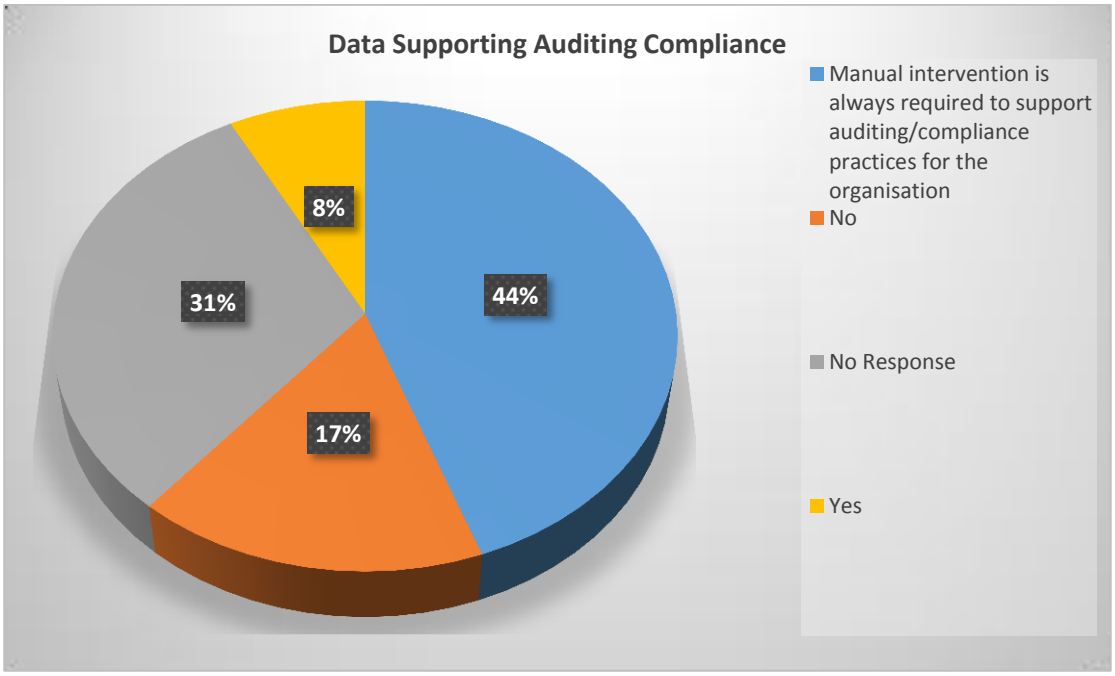
Question 21 asks: Is the automation tool used easily configurable?
31% of users surveyed responded to say that the tools they used for automation was easily configurable. 49% of users did not use an automation tool for their role.

Question 22 asks: Can the automation tool gather auditing logs for payment processing services/applications used?
38% of users surveyed responded to say that auditing logs were available for the automation tool there were using. 33% of users responded to say that no auditing payment logs were available. 29% of users surveyed did not respond to this question.

Question 23 asks: If the automation tool supports auditing log information, is the information provided to support auditing/compliance practices within Bank of Ireland?

Four of the senior managers interviewed responded to say data and log information for the automation tools that was used across their functions supported auditing and compliance practices for the organisation. 44% of users surveyed responded to say that manual intervention was always required to support auditing and compliance practices. 31% of users surveyed did not provide a response to this question and only 17% of users surveyed responded to say automation tools supported data for compliance practices for their areas.

FIGURE 26: Data Supporting Auditing Compliance



Four out of the six interviewed participants all responded with a specific tool called PUAM (Privileged User Access Monitoring) that supports automated auditing and compliance practices within Bank of Ireland.

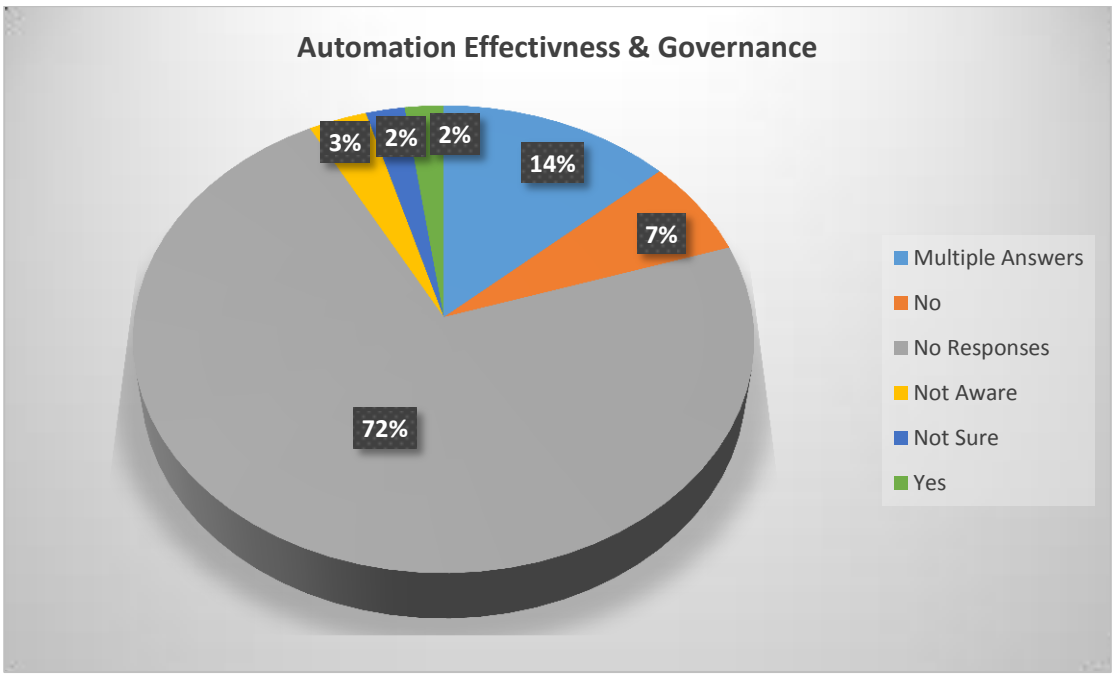
Question 24 asks: What automation tools do you use within your functional area to support payment services?

68% of users surveyed who responded were not aware of any specific automation tools used throughout the organisation. 27% of respondents provided specific tools that were used to support payment services throughout the organisation e.g. Blue Prism, Jenkins, Selenium and Side Safewatch applications.

Question 25 asks: Is there a mechanism to evaluate automation effectiveness throughout the organisation? (Governance Forums, MI/Reporting, Surveys).

72% of users surveyed were not aware of any mechanisms to evaluate automation effectiveness throughout the organisation. 14% of users provided multiple answers to this question. All senior managers responded to say that there was no mechanism in place to evaluate automation effectiveness.

FIGURE 27: Automation Effectiveness & Governance



Interview participant E stated: *"Security is such an important factor around any data and especially for Bank of Ireland. It's back to the compliance piece if it was automated it would help and support so many processes and functions within BOI".*

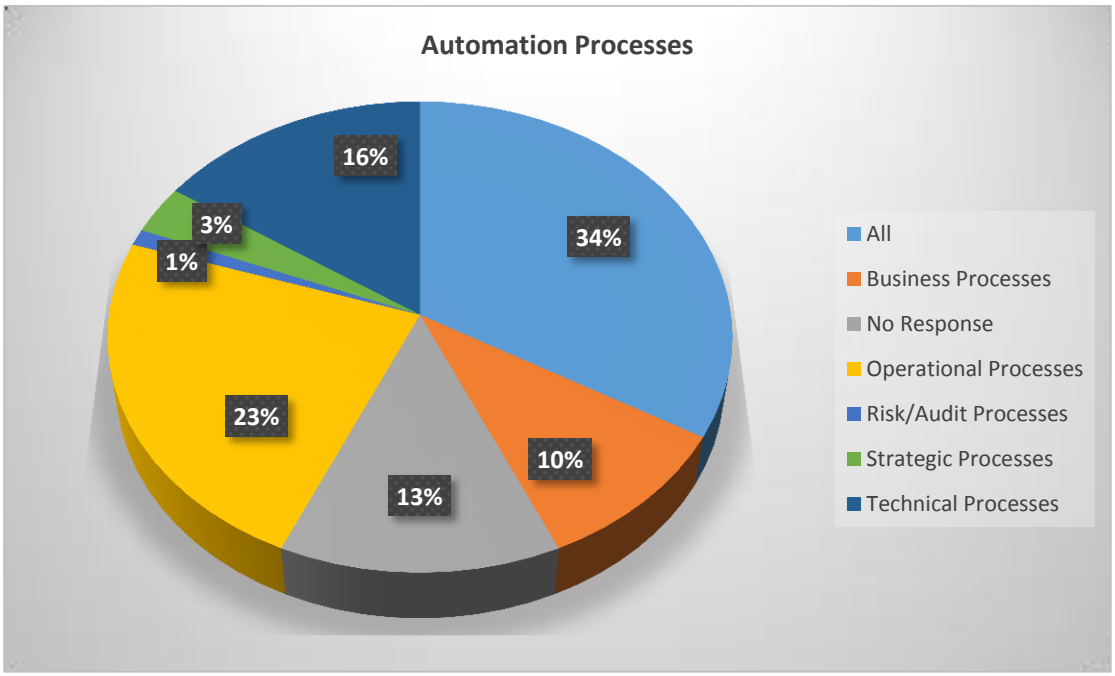
4.3.5 Risk Theme

This section presents the data acquired from questions 26 to 31 for the interviews conducted with senior management and the users who participated in the online survey

Question 26 asks: What main processes does automation support for Bank of Ireland?

34% of users surveyed responded to say that automation supports Strategic, Operational, Technical, Audit and Risk processes across the bank. 13% of users surveyed provided no response to this question, 23% of the respondents overall replied to say automation supported operational processes. All senior managers had different views on what processes automation supported throughout the bank. In a general capacity, automation supported all operational activities for bank branch processes i.e. payment processing for mandates, automated testing, automated routine changes and the opening of accounts.

FIGURE 28: Automation Processes

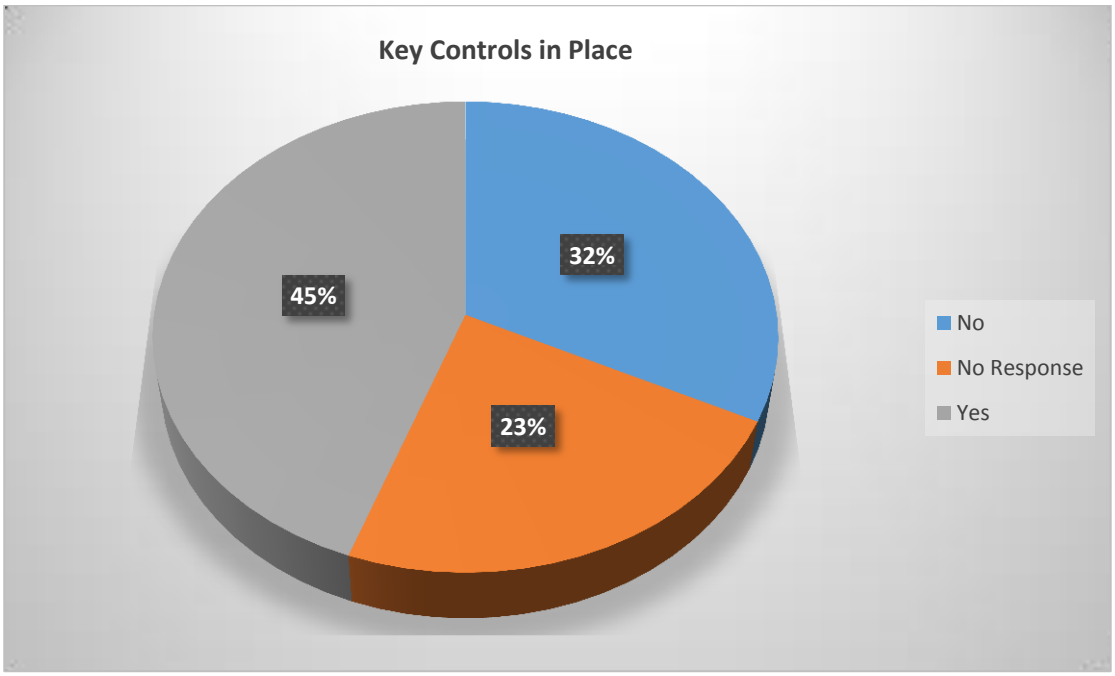


Interview participant E stated: *"The processes around automation estimation tools for BOI. It automates testing suites to be used for new releases for project delivery. The buzz word in the bank is automation but it really is only deployed amongst testing areas across different functions in the bank doing the same thing".*

Question 27 asks: Are key controls in place to govern the use of automation tools for Bank of Ireland?

Three of the senior managers interviewed responded to say that yes key controls were in place for automation across the bank. 45% of users also reported key controls were in place which is very similar response to senior management.

FIGURE 29: Key Controls in Place



Interview participant F stated: *"We have SOX controls from the business side of the house and we have governance in place to manage the assurance and risks around these controls. This is important to protect Bank of Irelands financial reputation*.

Some questions in the next section for the risk theme were not appropriate to ask senior management. As when asked to respond, each participant communicated that they would have not had the risk knowledge or detail to answer these types of questions.

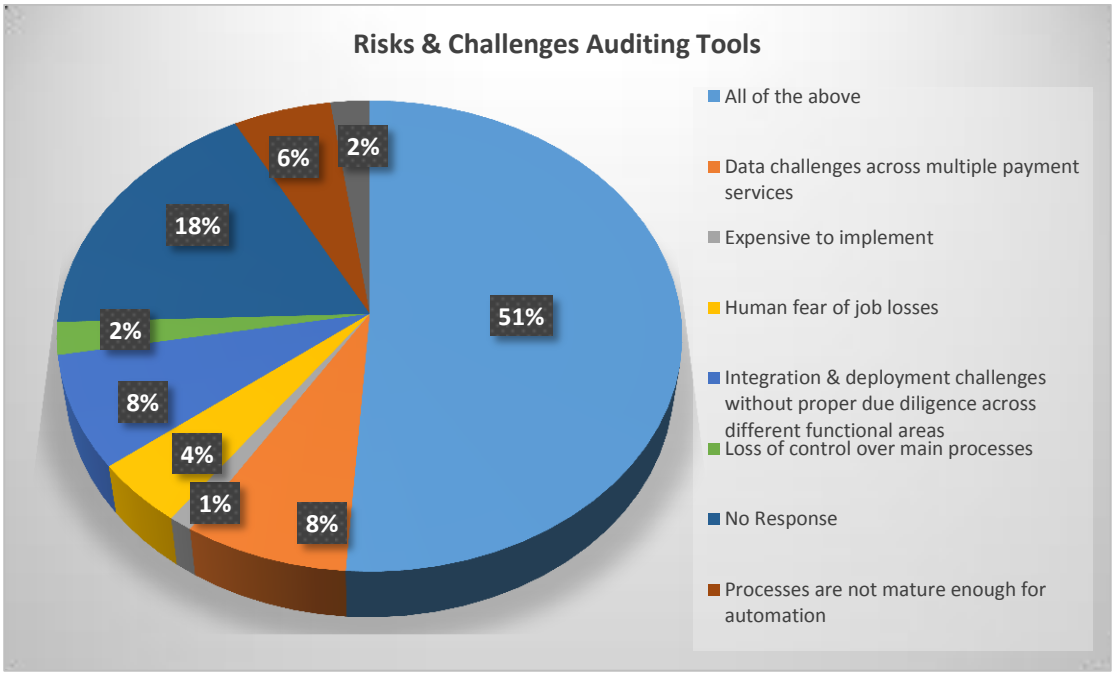
Question 28 asks: How many manual audits would you support for risk and assurance for your functional area on an annual basis?
39% of users surveyed responded to say that 1 to 5 manual audits were conducted on an annual basis. 16% responded to say that 15+ manual audits were conducted on an annual basis. 29% users did not respond to the question.

Question 29 asks: If there was an automated tool or product you could use to collect auditing data to support audit asks would you use one?
67% of users surveyed responded to say that if they could use an automated tool or product to collect audit data they would use one. 22% of stakeholder users surveyed did not respond and 11% of users responding to say they would not use an automated tool if one was available.

Question 30 asks: What risks or challenges do you think the organisation could face using an automated auditing/compliance tool?

51% of users surveyed responded to say the challenges and risks that they faced using automated auditing and compliance tools included data challenges across multiple payment services. These include integration and deployment challenges, processes are not mature enough for automation, security and access challenges and human fear of job losses. Senior managers addressed the same challenges and raised concerns over big data, the future of smart automation and human role changes within Bank of Ireland. Further challenges included the joining of front end and legacy systems and a myriad of digital channels with robots becoming artificial intelligent experts.

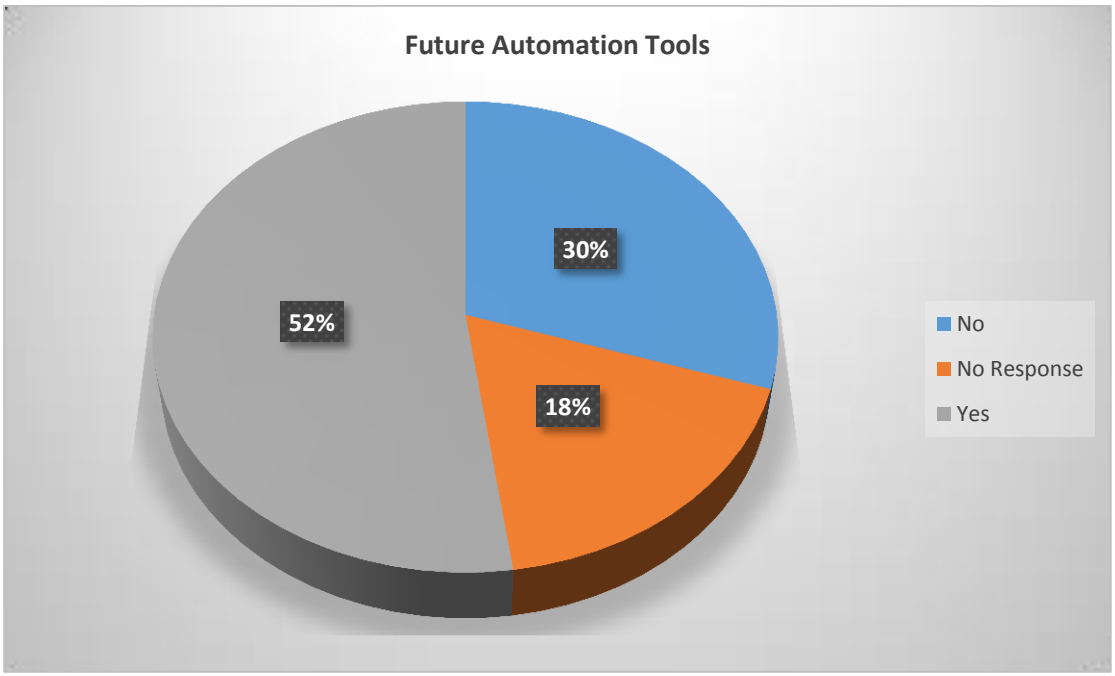
FIGURE 30: Risks & Challenges Auditing



Question 31 asks: Do you think the adoption of automation tools for auditing and compliance purposes will have an impact on your future role for the organisation?

52% of users surveyed responded to say that automation tools will have an impact on their future roles within Bank of Ireland. The senior managers were asked a similar type of question with more detail and their responses were very similar.

FIGURE 31: Future Automation Tools



Interview participant A stated: *"Automation is progressing rapidly in many different areas across Bank of Ireland. The bank is becoming more cost focused. On the flip side you can see from a HR perspective that staff are being poached into specific automation roles within the bank. Introducing machine learning into specific BOI functions like BOTs for automated lending decisions is the future".*

Interview participant B stated: *"Processes will mature as adverse capabilities are within the bank, however I do not think you will ever replace man. i.e. There is an impact on me as opposed to the greater good way to go. We certainly don't want everyone on the dole queue. We need to have people working to contribute to a society where we pay tax to keep the country operating. There is a value add, however within banking it should be used wisely and sensibly but it should not be the silver bullet. The human elements make life less boring".*

Interview participant C stated: *"Short term Bank of Ireland should be more cautious from a technology perspective. Implementing automation will allow the bank to quicker respond to crisis not from a market perspective but more from an operational perspective i.e. running the bank. The bank should less follow market trends and not so much concentrate on digital trends but more what automation and what it can drive for its customer base".*

Interview participant D stated: *"To be honest a fully automated bank with fully automated processes. The human element will be required in some way however with minimised human interactions. Role descriptions will change and the content of people's work day will change. The bank will move to a DevOps environment and testing will become more audit continuous and more automated. As technology enhances culture and roles will become more blended. You cannot slow down progress in technological advancements everyone's an expert".*

Interview participant E stated: *"Automation will become interactive even on the risk management front. New opportunities and new products will span from these opportunities. Automation will join the dots between front-end applications and legacy systems. Things will change from a universal income perspective and humans will move up the knowledge ladder and will have multiple jobs".*

Interview participant F stated: *"Operations will largely disappear and robotics will take over the end to end processes for payments throughout the bank. From front end processing, right through to bank end processing. I have a job to do with respect to eliminating manual processing from the bank and reduce costs and the only way this is achievable is by implementing automation and providing voluntary redundancy. Robotics are filling jobs that is the way forward. Other challenges include big data, when you look at Anglo Irish that was simply down to people not understanding the data and this was a big data problem. Issues on security and the right to privacy may pose concerns i.e. all control will be with machines at the end of the day. There are other issues with respect to roles i.e. What is the next banking industry going to look like? We may have multiple roles we may need to look at stress factors when using technology, the psychology effect they will have on us in the future. Life styles will change and will we have the freedom to do what we want, these are all questions that need to be resolved in the future".*

4.4 Survey Interpretation

FIGURE 31: Qualitative Codified Categories – Keywords by Theme

Questions	Categories - Keywords	Theme	No of Codes Referenced	No of Codes Ranked
Question 31	Future Automation	Strategic	118	1
Question 1	Automation/Reduction	Strategic	104	2
Question 4	Automation Benefits	Strategic	103	3
Question 6	Work Practice Change	Strategic	31	4
Question 3	Defined Role	Strategic	26	5
Question 5	Management Encouragement	Strategic	15	6
Question 2	Formal Strategy	Strategic	11	7
Questions	**Categories - Keywords**	**Theme Identified**	**No of Codes Referenced**	**No of Codes Ranked**
Question 8	Automated Software	Audit	89	1
Question 7	Manual Audits	Audit	35	2
Question 9	Regulatory Compliance	Audit	26	3
Question 11	Separate Functions	Audit	11	4
Question 12	Complement	Audit	5	5
Question 10	Automation Standards	Audit	1	6
Questions	**Categories - Keywords**	**Theme Identified**	**No of Codes Referenced**	**No of Codes Ranked**
Question 18	Multiple Automation	Operational	107	1
Question 14	Real Value	Operational	33	2
Question 15	Effectiveness	Operational	2	3
Question 13	Definition	Operational	1	4
Question 17	Deployment	Operational	1	4
Question 16	Drivers	Operational	0	0
Questions	**Categories - Keywords**	**Theme Identified**	**No of Codes Referenced**	**No of Codes Ranked**
Question 24	Functional Use	Technical	75	1
Question 22	Audit Logs	Technical	50	2
Question 19	Tools	Technical	32	3
Question 23	Compliance Practices	Technical	22	4
Question 21	Configurable	Technical	3	5
Question 25	Evaluation	Technical	3	5
Question 20	RPA	Technical	0	0
Questions	**Categories - Keywords**	**Theme Identified**	**No of Codes Referenced**	**No of Codes Ranked**
Question 28	Manual Audits	Risk	35	1
Question 26	Processes	Risk	19	2
Question 27	Key Controls	Risk	15	3
Question 29	Collect Audits	Risk	7	4
Question 30	Risks Challenges	Risk	3	5

The first step in the survey interpretation process was to collate and codify the qualitative responses from the semi-structured interviews conducted. Figure 31 displays the codes that were analysed and refined from the responses from senior management. This was achieved first by developing priori codes from sentences from the research study that each interviewee provided to each specific question asked. This process included the analysis of all sub responses provided by the participant. This data was refined and broken into sub codes to organise the data. The codes were then assigned to each of the predefined themes and then they were ranked based on the number of codes referenced in each transcript. Syed (2010) used a similar approach in information systems research when aligning industry challenges in the management of regulatory compliance. The research revealed the consolidated views of challenges in managing regulatory compliance as experienced by compliance practitioners and as perceived by experts in the Australian compliance industry.

The second step in the process was to quantify the online survey responses for all surveyed users. Responses were collated and ordered in their highest frequency for each of the category keywords identified for each of the predefined themes. The category keywords were averaged and then ranked in a table for each of the predefined themes i.e. Strategic, Audit, Operational, Technical and Risk. By consolidating the viewpoints of both users and senior management it facilitated a deeper insight and understanding of the challenges faced by auditing and payment experts across the organisation. It led to better focused research that will more readily addresses industry needs. The final step in the process was to merge the response results of the two independent strands of qualitative and quantitative research. This allowed interpretation or explanation if perspectives between senior managers, payment and business auditing experts on audit and automated compliance either converged or diverged within the organisation The quantitative analysis was conducted on a sample of ninety participant respondents, n = 90. For each of predefined themes averages were calculated and based on the highest scores user responses were ranked. Figures 32 to 36 display each of predefined themes with associated rankings for all surveyed questions asked.

FIGURE 32: Quantitative Codified Categories – Keywords by Theme – Strategic

Questions	Categories - Keywords	Theme	Stakeholder Users Averages %	Stakeholder Users Ranking
Question 1	Automation Reduction	Theme		
	All	Strategic	72	1
	Reduced Manual Intervention	Strategic	9	2
	Increased Efficiency/Productivity	Strategic	8	3
	No Response	Strategic	6	4
	Improved Monitoring	Strategic	2	5
	Improved Processes	Strategic	2	5
	Improved Quality	Strategic	1	6
Question 2	Formal Strategy	Theme		
	Yes	Strategic	51	1
	No	Strategic	40	2
	No Response	Strategic	9	3
Question 3	Defined Role	Theme		
	No	Strategic	51	1
	Yes	Strategic	41	2
	No Response	Strategic	8	3
Question 4	Automation Benefits	Theme		
	All	Strategic	63	1
	Increased Efficiency/Productivity	Strategic	11	2
	Improved Processes	Strategic	8	3
	Reduced Manual Intervention	Strategic	7	4
	Improved Quality	Strategic	6	5
	No Response	Strategic	4	6
	Improved Monitoring	Strategic	1	7
Question 5	Automation Encouragement	Theme		
	Yes	Strategic	74	1
	No	Strategic	10	2
	No Response	Strategic	6	3
Question 6	Work Practice Change	Theme		
	No	Strategic	59	1
	Yes	Strategic	34	2
	No Response	Strategic	7	3
Question 31	Future Automation	Theme		
	Yes	Strategic	52	1
	No	Strategic	30	2
	No Response	Strategic	18	3

FIGURE 33: Quantitative Codified Categories – Keywords by Theme - Audit

Questions	Categories - Keywords	Theme	Stakeholder Users Averages %	Stakeholder Users Ranking
Question 7	Manual Audits	Theme		
	Yes	Audit	80	1
	No	Audit	11	2
	No Response	Audit	9	3
Question 8	Automated Software	Theme		
	No	Audit	64	1
	Yes	Audit	20	2
	No Response	Audit	16	3
Question 9	Regluatory Compliance	Theme		
	No	Audit	78	1
	No Response	Audit	14	2
	Yes	Audit	8	3
Question 10	Automation Standards	Theme		
	No Response	Audit	93	1
	Yes	Audit	7	2
	No	Audit	0	3
Question 11	Separate Functions	Theme		
	Yes	Audit	62	1
	No	Audit	26	2
	No Response	Audit	12	3
Question 12	Complement	Theme		
	Yes	Audit	86	1
	No Response	Audit	9	2
	No	Audit	6	3

FIGURE 34: Quantitative Codified Categories – Keywords by Theme - Operational

Questions	Categories - Keywords	Theme	Stakeholder Users Averages %	Stakeholder Users Ranking
Question 13	Definition	Theme		
	Yes	Operational	81	1
	No Response	Operational	10	2
	No	Operational	9	3
Question 14	Real Value	Theme		
	All	Operational	61	1
	Increased Efficiency/Productivity	Operational	14	2
	Reduced Manual Intervention	Operational	9	3
	Improved Processes	Operational	8	4
	Improved Quality	Operational	3	5
	No Response	Operational	3	5
	Improved Monitoring	Operational	1	6
Question 15	Measure Effectivness	Theme		
	No	Operational	61	1
	No Response	Operational	20	2
	Yes	Operational	19	3
Question 16	Drivers	Theme		
	All	Operational	40	1
	Technology Services	Operational	22	2
	Group Operations	Operational	11	3
	Business	Operational	9	4
	No Response	Operational	9	4
	Changezone	Operational	8	5
	Group Risk & Assurance	Operational	1	6
Question 17	Deployment	Theme		
	Technology Services	Operational	32	1
	Group Risk & Assurance	Operational	19	2
	No Response	Operational	13	3
	Changezone	Operational	12	4
	All	Operational	10	5
	Group Operations	Operational	9	6
	Business	Operational	4	7
Question 18	Multiple Automation	Theme		
	Yes	Operational	49	1
	No	Operational	36	2
	No Response	Operational	16	3

FIGURE 35: Quantitative Codified Categories – Keywords by Theme – Technical

Questions	Categories - Keywords	Theme	Stakeholder Users Averages %	Stakeholder Users Ranking
Question 19	Tools	Theme		
	No	Technical	49	1
	No Response	Technical	13	2
	Yes	Technical	38	3
Question 20	RPA	Theme		
	No	Technical	68	1
	No Response	Technical	23	2
	Yes	Technical	9	3
Question 21	Configurable	Theme		
	No	Technical	49	1
	No Response	Technical	20	2
	Yes	Technical	31	3
Question 22	Audit Logs	Theme		
	Yes	Technical	38	1
	No	Technical	33	2
	No Response	Technical	29	3
Question 23	Compliance Practices	Theme		
	No	Technical	61	1
	No Response	Technical	31	2
	Yes	Technical	8	3
Question 24	Functional Use	Theme		
	No Response	Technical	68	1
	Yes	Technical	27	2
	No	Technical	6	3
Question 25	Evaluation	Theme		
	No Response	Technical	72	1
	Yes	Technical	16	2
	No	Technical	12	3

FIGURE 36: Quantitative Codified Categories – Keywords by Theme – Risk

Questions	Categories - Keywords	Theme	Stakeholder Users Averages %	Stakeholder Users Ranking
Question 26	Processes	Theme		
	All	Risk	33	1
	Operational Processes	Risk	23	2
	Technical Processes	Risk	16	3
	No Response	Risk	13	4
	Business Process	Risk	10	5
	Strategic Processes	Risk	3	6
	Risk Audit Processes	Risk	1	7
Question 27	Key Controls	Theme		
	Yes	Risk	44	1
	No	Risk	32	2
	No Response	Risk	23	3
Question 28	Manual Audits	Theme		
	1 to 5 Audits	Risk	39	1
	No Response	Risk	29	2
	15+	Risk	16	3
	None	Risk	8	4
	6 to 10 Audits	Risk	4	5
	11 to 15 Audits	Risk	4	5
Question 29	Collect Audits	Theme		
	Yes	Risk	67	1
	No Response	Risk	22	2
	No	Risk	11	3
Question 30	Risks Challenges	Theme		
	All	Risk	51	1
	No Response	Risk	18	2
	Data Challenges	Risk	8	3
	Integration Deployment	Risk	8	3
	Process not Mature	Risk	6	4
	Human Job Losses	Risk	4	5
	Loss of Control	Risk	2	6
	Security	Risk	2	6
	Expensive to Implement	Risk	1	7

4.5 QUAL + QUAN

Both qualitative and quantitative surveys were compared based on the predesigned themes developed and further analysed with the narrative responses provided by senior managers during the semi-interviews conducted.

FIGURE 37: QUAL + QUAN – Strategic Interpretation

Questions	Categories - Keywords	Theme	No of Codes Referenced Management Stakeholders	No of Codes Ranked Management Stakeholders
Question 31	Future Automation	Strategic	118	1
Question 1	Automation/Reduction	Strategic	104	2
Question 4	Automation Benefits	Strategic	103	3
Question 6	Work Practice Change	Strategic	31	4
Question 3	Defined Role	Strategic	26	5
Question 5	Management Encouragement	Strategic	15	6
Question 2	Formal Strategy	Strategic	11	7
Questions	**Categories - Keywords**	**Theme**	**Stakeholder Users Averages %**	**Stakeholder Users Ranking**
Question 5	Management Encouragement	Strategic	74	1
Question 1	Automation/ Reduction	Strategic	72	2
Question 4	Automation Benefits	Strategic	63	3
Question 6	Work Practice Change	Strategic	59	4
Question 31	Future Automation	Strategic	52	5
Question 3	Defined Role	Strategic	51	6
Question 2	Formal Strategy	Strategic	51	6

The purpose of carrying out this part of the research was to map the highest ranking qualitative and quantitative results against each other, to see if the use of both approaches in tandem contributed and validated the overall strength of the study. Using pragmatic and interpretative analysis, senior managers from a strategic perspective where more concentrated on what automation could achieve within Bank of Ireland. While users were aware that managers were encouraging automation through the integration of new technologies.

As discussed and identified by Mahmood (2015) in the literature review in Chapter 2, failure to swiftly and successfully integrate new technologies may threaten an organisations very survival.

Both senior managers and users ranked that automation for them reduced manual tasks, improved processes and improved overall quality of payment services for the organisation. As highlighted in the literature review by Saqib (2016) an efficient payment system is indispensable to the function of the interbank, money, and capital markets. The relationships and patterns for the remaining categories under the strategic theme were ranked very close to each other. This signified that senior managers and user's perspectives strategically understood that automation was the future for Bank of Ireland.

FIGURE 38: QUAL + QUAN – Audit Interpretation

Questions	Categories - Keywords	Theme Identified	No of Codes Referenced Management Stakeholders	No of Codes Ranked
Question 8	Automated Software	Audit	89	1
Question 7	Manual Audits	Audit	35	2
Question 9	Regulatory Compliance	Audit	26	3
Question 11	Separate Functions	Audit	11	4
Question 12	Complement	Audit	5	5
Question 10	Automation Standards	Audit	1	6
Questions	**Categories - Keywords**	**Theme**	**Stakeholder Users Averages %**	**Stakeholder Users Ranking**
Question 10	Automation Standards	Audit	93	1
Question 12	Complement	Audit	86	2
Question 7	Manual Audits	Audit	80	3
Question 9	Regluatory Compliance	Audit	78	4
Question 8	Automated Software	Audit	64	5
Question 11	Separate Functions	Audit	62	6

There was strong difference of opinion on the audit theme between senior management and users i.e. users using automated software were not aware that the software used was being used for compliance and auditing practices by the organisation. However, both parties perceived human auditing and automated compliance as separate functions within Bank of Ireland and contradictory both agreed they could complement each other. According to Jackson (2016) in Chapter 2 as computers pick up more of the workload, there will be less explanation and clarity as to what is taking place. Unless there is adequate human oversight, there may be less transparency.

Interview participant B stated: *"We still rely very heavily on 'signatures on pages' and the manual review of same via the audit process. There must be substantial scope to apply automation both control operation and review. I believe that manual assessment of control design effectiveness would still be required and most of the testing could be automated. However, a person would still (at present) need to review and sense check the results"*

FIGURE 39: QUAL + QUAN – Operational Interpretation

Questions	Categories - Keywords	Theme Identified	No of Codes Referenced Management Stakeholders	No of Codes Ranked
Question 18	Multiple Automation	Operational	107	1
Question 14	Real Value	Operational	33	2
Question 15	Effectivness	Operational	2	3
Question 13	Definition	Operational	1	4
Question 17	Deployment	Operational	1	4
Question 16	Drivers	Operational	0	0
Questions	**Categories - Keywords**	**Theme**	**Stakeholder Users Averages %**	**Stakeholder Users Ranking**
Question 13	Definition	Operational	81	1
Question 14	Real Value	Operational	61	2
Question 15	Effectivness	Operational	61	3
Question 18	Multiple Automation	Operational	49	4
Question 16	Drivers	Operational	40	5
Question 17	Deployment	Operational	32	6

There were similar perspectives on the operational theme between senior management and users especially around the real value automation and compliance brings to Bank of Ireland i.e. elimination of manual changes, improving collaboration between business and IT and enhancing the customer experience. As Lewis (2016) defines in the literature review the convenience of “anytime, anywhere” banking for customers has underpinned the need for self-service offerings. As these technologies continue to mature, businesses will need to ensure they are continually assessing how robotics technology could be leveraged to enhance their offerings and improve customer experiences.

FIGURE 40: QUAL + QUAN – Technical Interpretation

Questions	Categories - Keywords	Theme Identified	No of Codes Referenced Management Stakeholders	No of Codes Ranked
Question 24	Functional Use	Technical	75	1
Question 22	Audit Logs	Technical	50	2
Question 19	Tools	Technical	32	3
Question 23	Compliance Practices	Technical	22	4
Question 21	Configurable	Technical	3	5
Question 25	Evaluation	Technical	3	5
Question 20	RPA	Technical	0	0
Questions	**Categories - Keywords**	**Theme**	**Stakeholder Users Averages %**	**Stakeholder Users Ranking**
Question 25	Evaluation	Technical	72	1
Question 20	RPA	Technical	68	2
Question 24	Functional Use	Technical	68	2
Question 23	Compliance Practices	Technical	61	3
Question 19	Tools	Technical	49	4
Question 21	Configurable	Technical	49	4
Question 22	Audit Logs	Technical	38	5

There was strong difference of opinion on the technical theme between senior management and users. During the interview process, senior management could not answer all the technical questions due to not having deep technical knowledge on all auditing and compliance practices throughout the organisation. Users lacked knowledge around compliance practices and responded to say manual intervention was always required to support these practices. According to the Capco Institute (2017) Chapter 2, better labour management makes the manual workforce available for other non-repetitive or knowledge-based tasks that need judgment and interpretation.

FIGURE 41: QUAL + QUAN – Risk Interpretation

Questions	Categories - Keywords	Theme Identified	No of Codes Referenced Management Stakeholders	No of Codes Ranked
Question 28	Manual Audits	Risk	35	1
Question 26	Processes	Risk	19	2
Question 27	Key Controls	Risk	15	3
Question 29	Collect Audits	Risk	7	4
Question 30	Risks Challenges	Risk	3	5
Questions	**Categories - Keywords**	**Theme**	**Stakeholder Users Averages %**	**Stakeholder Users Ranking**
Question 29	Collect Audits	Risk	67	1
Question 30	Risks Challenges	Risk	51	2
Question 27	Key Controls	Risk	44	3
Question 28	Manual Audits	Risk	39	4
Question 26	Processes	Risk	33	5

Different perspectives existed between users and senior managers when it came to the risk theme. Across the categories surveyed there was commonality with challenges and risks. These included data challenges across multiple payment services, integration and deployment challenges, processes not being mature enough for automation, security and access challenges and human fear of job losses. According to Chan and Vasarhelyi (2011) the implementation of continuous automation for organisations is that they should be moving towards automation if they want to both add value and meet compliance standards. In Chapter 2 Alles, Kogan and Vasarhelyi (2008) in auditing literature say that exposure to large amounts of information can potentially lead to increased ambiguity, information overload, difficulty identifying relevant information and patterns and, consequently, lead to suboptimal audit judgment.

4.6 Summary of Findings

This chapter presented a detailed analysis of the results of the data gathered by the research. The research question and findings were used as a guide in the data analysis.

Chapter 5 will review the findings that have arisen from this chapter, and the way they correlate with the material reviewed in Chapter 2. This concluding section will also investigate if the literature review corresponds with the research findings of this research study. Subsequently, it will set out the necessary action steps required in response to these findings, thus providing future direction for research in this field.

5. CONCLUSIONS

5.1 Introduction

This chapter discusses how the findings of the study answer the main and sub research questions. Also discussed in this chapter is the contribution of this research to the existing body of knowledge, the limitations of the research and possible recommendations for future research in the area. The researcher's interest for such an undertaking has come from the increased coverage on automation within financial services, both in the media and academic circles. Of interest are the following: the paper by Dzuranin and Malaescu (2016), *"The Current State and Future direction of IT Audit: Challenges and Opportunities";* and the paper by Issa and Vasarhelyi *"Research Ideas for Artificial Intelligence in Auditing: The Formalization of Audit and Workforce Supplementation".* Each paper highlights the challenges and opportunities that organisations face with emerging technologies surrounding IT automation and auditing compliance for the future.

5.2 Research questions and objectives

The primary research question examines multi stakeholder's perspectives on audit and compliance automation within Bank of Ireland. The sub question is important to the research study as it examines what interpretations can be made regarding these multi stakeholder's perspectives. To answer the primary research question and the sub question the literature explored the challenges and gaps of IT audit, automated compliance within Bank of Ireland. The literature put in context in the following; within the financial services industry human labour and intelligence are gradually being displaced by computerised automation and artificial intelligence for auditing and compliance.

The result of the research study is not conclusive, in that perspectives for some of the predefined themes were similar whilst others were not. Findings delivered many comments and suggestions under more than one heading. The findings as well as areas for future research are presented further below.

5.3 Research Findings

It is clear from the literature review conducted in Chapter 2 that there are many perspectives concerning automation for audit and compliance technologies within banking. Automation and artificial intelligence could mean jobs within financial services become obsolete and the banking industry becomes impersonal. As highlighted by Kaw (2014), the human element is becoming less and less prevalent while technological element grows. On the other hand IT audit can leverage data analytics to reduce risks, meet compliance requirements, and increase the value of the information systems. However as presented in Chapter 2 this brings its own challenges and possible opportunities.

Compliance and regulation are distinct responsibilities within banking, and regulatory developments are increasing in the role of compliance. Banks need to be moving towards automation if they want to add value and meet compliance standards. The IT audit will become more involved within the organisation for new technologies; new payment methods, open API's, big data, internet of things, everything as a service and security. Clearly within Bank of Ireland both senior management and users had similar perspectives when it came to the benefits that automation can bring to the organisation for auditing and compliance practices. However, having suboptimal strategies in place can lead to the creation of duplication of systems, data stores, documentation and processes. It is evident from the analysis and findings that senior management understand that automation is high on Bank of Ireland's agenda for success in the future.

However, both parties agreed that no formal automation strategy existed across the organisation. Senior management agreed that strategies concerning automation for IT auditing and compliance were certainly disjointed across the bank. The results presented by the researcher for the auditing theme clearly highlight some of these gaps. Even though both parties agreed there were no standards for automation and compliance across the organisation, users reported that having standards in place was a high-ranking priority for them.

One could ascertain that this maybe down to the manual intervention work required for asks that all users must support for auditing and compliance purposes. 55% of users responded to say that they supported 1 to 15 manual audits on an annual basis. From the literature review Issa (2016) has communicated by standardising data requested by auditors, organisations will be able to automate reducing the amount of time and effort required to provide the requested data. It also allows auditors to aggregate information to use their judgement to identify risk factors and the understanding of internal controls to help testing in the traditional audit process. Operational perspectives between senior management and users were very similar under this theme. Both agreed that automation was adding real value to enhancing the customer experience, improving quality processes and improving collaboration between the business and IT departments within Bank of Ireland. However, no tool existed to measure this automation effectiveness especially concerning automated compliance across the bank. Infosys reported (2017) the lack of smart automation prevents banks from furnishing quality and timely information to regulators.

For both predefined themes, technical and risk perspectives ranked almost oppositely between senior management and users. Agreement existed that key controls were in place to govern the management of automated compliance throughout the organisation. Vasarhelyi (2015) from the literature review implies that management must be able to identify what controls are in place to be sure that the data is complete and that access to the data is limited to those employees who should have access. This is evident in senior management responses. Participant B states: *"PUAM is used to govern monitoring access in and out of the payment systems but to say that we still perform human watching as automation can go awry e.g. Bank of Bangladesh scenario could happen e.g. smalls amounts of cash being ciphered and processed; given automated software is rule and pattern based attackers could cipher very small amounts of cash that may never be tracked".* As previously communicated by Carlin & Gallegos (2007) audits commonly only validate the adequacy and effectiveness of internal controls. Performing them according to Banker (2010) is more challenging in the context of complex IT outsourcing arrangements.

5.4 The Future of Automation Auditing & Compliance in Banking

From the literature review, surveys and the research study that was carried out the future for banks is to implement continuous auditing frameworks which will allow for cognitive process automation using artificial intelligence. CPAs (like machine learning, chat-bot technology, artificial intelligence, natural language processing, big data analytics, evidenced-based learning, computer vision technology, and speech recognition) can help with work requiring judgment and perception. Vishnu (2016) implies combining traditional RPA techniques with a host of cognitive technologies could reduce the number of FTE's required to perform processes by nearly 60% (Banking Fintech, 2016). A common theme across senior managers when interviewed communicated that automation for them was about reducing costs and the number of FTE's for each of their functional areas.

Participant B stated: *"Processes will mature as adverse capabilities within Bank of Ireland, however I do not think you will ever replace man. i.e. There is an impact on me as opposed to the greater good way to go. We certainly don't want everyone on the dole queue. We have people working to contribute to a society where we pay tax to keep a country operating". Participant E stated: "Automated compliance from a Bank of Ireland perspective will be that the robotics will become the artificial intelligence and you will have robots programming the robots".*

5.5 Limitations of the Study

The findings of this research have been limited to responses of senior managers and business and auditing payment experts that work within Bank of Ireland to include IT service providers and Bank of Ireland staff. Due to financial and time constraints 6 semi-structured interviews were completed. Some of the interviews had to be rescheduled based on the interviewees own work schedule. The overall population surveyed for the online survey was 90 participants, with an 80% response rate all questions asked. A greater sample size may have provided a greater level of precision and confidence for the research study; this was not possible given the timeframe. The data gathered from the semi-structured interviews and online surveys were insightful. However, the researcher believes that interviews and surveys from a variety of banks may have provided better insight on different viewpoints. Given the topic of the research study other banks may have not provided this information.

5.6 Future Research Opportunities

It is hoped that this research can be used as a springboard for future expansion on the data needed from a larger subset of individuals within senior management roles across all other financial services industries. Innovation, along with regulatory compliance requirements, is changing the face of banking. The increased volume and availability of data on both internal and external audit functions has already begun in areas of ‘‘Big Data,’’ but more is needed to address the current IT audit practice environment.

5.7 Summary

In conclusion, it appears that the data has successfully supported the research objectives for each of the stakeholder’s perspectives; audit and automated compliance within Bank of Ireland. There were unexpected results across the research study in that management and users were strategically and operationally aligned on automation, audit and automated compliance. However, perspectives on Audit, Technical and Risk were opposing. Regulation concerning automated compliance will be a challenge for Bank of Ireland in the future. Automation is not new to Bank of Ireland, the bank launched its first ATM in 1980 and is continuing its digital transformation journey globally. As branches become more automated and move more to Open Banking, according to Lewis (2016) in Chapter 2, technologies will continue to mature. Businesses will need to ensure they are continually assessing how automation and robotics technology could be leveraged to enhance offerings and improve customer experiences.

According to Banking Fintech (2016) regulators will play an important role in the uptake of AI in banking, as they could either pose a barrier or help facilitate the widespread adoption of this technology. Regulators can quite rightly be wary of new technology due to concerns over inflated hype and low-quality products. It is, however, in the interest of the regulators to embrace AI as advanced computing power will be necessary to cope with the demands of the banks of tomorrow. Increasingly tech-savvy and sophisticated criminals combined with fast-paced and multi-jurisdictional commercial environments will only increase the risks that outdated technology solutions struggle to manage today.

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APPENDICES

Appendix 1: Ethics Application

School of Computer Science & Statistics
Research Ethics Application

Part A

Project Title: Why is there a gap between human audit and automated compliance?

Name of Lead Researcher (student in case of project work): Sean Michael Cahill

Name of Supervisor: Diana Wilson

TCD E-mail: cahills5@tcd.ie Contact Tel No.: 0872642082

Course Name and Code: MSc in Information Management System/DPTCS-MISY-1P09

Estimated start date of survey/research: 14/06/2017

I confirm that I will (where relevant):

- Familiarize myself with the Data Protection Act and the College Good Research Practice guidelines http://www.tcd.ie/info_compliance/dp/legislation.php;
- Tell participants that any recordings, e.g. audio/video/photographs, will not be identifiable unless prior written permission has been given. I will obtain permission for specific reuse (in papers, talks, etc.)
- Provide participants with an information sheet (or web-page for web-based experiments) that describes the main procedures (a copy of the information sheet must be included with this application)
- Obtain informed consent for participation (a copy of the informed consent form must be included with this application)
- Should the research be observational, ask participants for their consent to be observed
- Tell participants that their participation is voluntary – this is info that should be in the info sheet
- Tell participants that they may withdraw at any time and for any reason without penalty
- Give participants the option of omitting questions they do not wish to answer if a questionnaire is used
- Tell participants that their data will be treated with full confidentiality and that, if published, it will not be identified as theirs
- On request, debrief participants at the end of their participation (i.e. give them a brief explanation of the study)
- Verify that participants are 18 years or older and competent to supply consent.
- If the study involves participants viewing video displays then I will verify that they understand that if they or anyone in their family has a history of epilepsy then the participant is proceeding at their own risk
- Declare any potential conflict of interest to participants.
- Inform participants that in the extremely unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities.
- Act in accordance with the information provided (i.e. if I tell participants I will not do something, then I will not do it).

Signed: Sean M Cahill Date: 14/06/2017

Lead Researcher/student in case of project work

Part B

Please answer the following questions.		***Yes/No***
Has this research application or any application of a similar nature connected to this research project been refused ethical approval by another review committee of the College (or at the institutions of any collaborators)?		No
Will your project involve photographing participants or electronic audio or video recordings?		No
Will your project deliberately involve misleading participants in any way?		No
Does this study contain commercially sensitive material?		No
Is there a risk of participants experiencing either physical or psychological distress or discomfort? If yes, give details on a separate sheet and state what you will tell them to do if they should experience any such problems (e.g. who they can contact for help).		No
Does your study involve any of the following?	Children (under 18 years of age)	No
	People with intellectual or communication difficulties	No
	Patients	No

Appendix 2: Information Sheet for Semi-Structured Interview Participants

PROJECT TITLE: Why is there a gap between human audit and automated compliance?

BACKGROUND OF RESEARCH: There is a current trend within the payment services industry to automate activities and tasks as much as possible. Automated self-services are on the increase which is been driven by an increasing pressure on service organisations to reduce its operational costs and overheads. Worldwide there has been an increase in regulatory reforms and organisations are struggling to keep pace with the changes. With the increase in stronger regulatory compliance and auditing on payment processing, new risk and control practices are being introduced, it is much more difficult for organisations to compete with non-bank institutions when implementing new technologies in automating payment services. The study will examine and evaluate why there is a gap between human audit and automated compliance. The scope of this research will examine and evaluate if managers and payment experts within similar supporting service organisations under the umbrella of Bank of Ireland share the same attitudes, opinions, and views on why is there a gap between human audit and automated compliance?

METHODS AND MEASUREMENTS: The semi-structured interview will be conducted with each participant and a narrative analysis will be employed for data analysis. Two questionnaires will be designed. Questionnaire 1, the interview questionnaire will compose of thirty plus questions with five themes identified with a maximum of ninety minutes to complete each interview process (Sean Michael Cahill Manager Interview Questions - Appendix A).

PARTICIPANTS: You were chosen based on your experience and understanding of the Bank of Ireland business. The participants for the interviews will be made up of five to ten senior managers across Bank of Ireland to include senior managers from each of the service organisations identified (Oracle, NTT Data, HCL and Accenture). The sample will include both male and female senior managers within an age range of 35 to 60 years. Careful consideration has been given to the choice of interview candidates to include those senior managers that understand the payments business and those that understand the auditing part of the Bank of Ireland business. The five to ten senior managers are selected based on a mixture of their professional experience across several different functions within Bank of Ireland. You were selected as you fall into this criterion within Bank of Ireland.

DEBRIEFING ARRANGEMENTS: Interviews will be conducted face to face within Bank of Ireland offices and the interviewers input will be anonymised. Interview participants will be thanked for their contribution and more information on the study will be provided if required. The researcher's contact information will be provided to each interview participant after each interview. Participants will also be given the option to withdraw their data at any point (once they have been fully informed on the intent and purpose of the study) without penalty. In the extreme unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities. There is no potential for conflict of interest at any stage during the interview process. After the interviews, have completed notes and data will be anonymised, encrypted and held onto storage space on a private cloud. I will send any quotes for signoff to the interviewee before publishing. The data and notes which will include verification and context will be destroyed after 180 days. I will also request a stay for the dissertation so that it does not enter the TCD library for 5 years.

Appendix 3: Information Page for Online Participants

PROJECT TITLE: Why is there a gap between human audit and automated compliance?

BACKGROUND OF RESEARCH: There is a current trend within the payment services industry to automate activities and tasks as much as possible. Automated self-services are on the increase which is been driven by an increasing pressure on service organisations to reduce its operational costs and overheads. Worldwide there has been an increase in regulatory reforms and organisations are struggling to keep pace with the changes. With the increase in stronger regulatory compliance and auditing on payment processing, new risk and control practices are being introduced it is much more difficult for organisations to compete with non-bank institutions when implementing new technologies in automating payment services. The study will examine and evaluate why there is a gap between human audit and automated compliance. The scope of this research will examine and evaluate if managers and payment experts within similar supporting service organisations under the umbrella of Bank of Ireland share the same attitudes, opinions, and views on why is there a gap between human audit and automated compliance?

METHODS AND MEASUREMENTS: Two methods will be used (i) A semi-structured interview and (ii) an online survey. Questionnaire 2, the online survey is composed of thirty plus questions targeted at payment and business auditing experts across each of the service organisations identified under the umbrella of Bank of Ireland. The online survey will be a structured questionnaire it will link back to 5 themes identified. It will take a maximum of 20 minutes to complete the survey.

PARTICIPANTS: The participant (you) will either be a payment or business auditing expert within the umbrella of organisations within Bank of Ireland. You were selected as you fall into this criterion within Bank of Ireland. Thirty candidates from each of the 5 service organisations will be selected. The sample will include both male and female experts within an age range from 25 to 50 years. A mixture of participants has been selected from those starting out in their careers to those who are much more experienced.

DEBRIEFING ARRANGEMENTS: The online survey will be conducted online and the input will be anonymised. The debriefing page will immediately follow the last question on the online survey. Participants will be thanked for their contribution and more information on the study will be provided. The researcher's contact information will be listed and each participant will be reminded to print a copy of the debriefing from for their records. Participants will also be given the option to withdraw their data at any point (once they have been fully informed on the intent and purpose of the study) without penalty. In the extreme unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities. There is no potential for conflict of interest at any stage during the process. Anonymised data will be encrypted and held onto storage space on a private cloud. After the online survey is completed, the anonymised data will be destroyed after 180 days. I will also request a stay for the dissertation so that it does not enter the TCD library for 5 years.

Appendix 4: Informed Consent Form for Semi Structure Interview

LEAD RESEARCHER: Sean Michael Cahill

PROJECT TITLE: Why is there a gap between human audit and automated compliance?

BACKGROUND OF RESEARCH: The semi-structured interviews are part of a research project designed to examine and evaluate why there is a gap between human audit and automated compliance. The scope of this research will examine and evaluate if managers and payment experts within similar supporting service organisations under the umbrella of Bank of Ireland share the same attitudes, opinions, and views on why is there a gap between human audit and automated compliance? The research study will contribute to the Masters Programme M.Sc. in Management of Information Systems in the School of Computer Science and Statistics, Trinity College Dublin, Ireland.

PROCEDURES OF THIS STUDY: The interview questionnaire will compose of thirty plus questions with five themes identified with a maximum of ninety minutes to complete each interview.

PUBLICATION: Only general findings will be reported, without reference to identifiable individual results. Results of the research will form part of the dissertation in the Taught Masters Programme M.Sc. in Management of Information Systems in the School of Computer Science and Statistics, Trinity College Dublin, Ireland. The dissertation will be submitted to the School of Computer Science and Statistics on the 1st of September 2017.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

PARTICIPANT'S NAME:

PARTICIPANT'S SIGNATURE:

DATE:

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHERS CONTACT DETAILS:

Name: Sean Michael Cahill

Email: cahills5@tcd.ie

Mobile Number: 0872642082

INVESTIGATOR'S SIGNATURE:

Date:

Appendix 5: Informed Consent Form for Online Participants

LEAD RESEARCHER: Sean Michael Cahill

PROJECT TITLE: Why is there a gap between human audit and automated compliance?

BACKGROUND OF RESEARCH: The online questionnaire is part of a research project designed to examine and evaluate why there is a gap between human audit and automated compliance. The scope of this research will examine and evaluate if managers, payment and business audit experts within similar supporting service organisations under the umbrella of Bank of Ireland share the same attitudes, opinions, and views on why is there a gap between human audit and automated compliance? The research study will contribute to the Masters Programme M.Sc. in Management of Information Systems in the School of Computer Science and Statistics, Trinity College Dublin, Ireland.

PROCEDURES OF THIS STUDY: Questionnaire 2 is an online survey and is composed of thirty plus questions targeted at payment and business auditing experts across each of the service organisations identified under the umbrella of Bank of Ireland. The online survey will be a structured questionnaire and it will link back to 5 themes identified. It will take a maximum of 20 minutes to complete the survey. It will be based on multiple choice answers from IT payment and business auditing experts and their views on automated compliance versus human audit.

PUBLICATION: Only general findings will be reported, without reference to identifiable individual results. Results of the research will form part of the dissertation in the Taught Masters Programme M.Sc. in Management of Information Systems in the School of Computer Science and Statistics, Trinity College Dublin, Ireland. The dissertation will be submitted to the School of Computer Science and Statistics on the 1st of September 2017.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form. I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.
- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

RESEARCHERS CONTACT DETAILS:

Name: Sean Michael Cahill

Email: cahills5@tcd.ie

Mobile Number: 0872642082

PARTICIPANT'S NAME:

PARTICIPANT'S EMAIL:

DATE:

Appendix 6: Senior Manager Interview Questions

Sub questions to each to the main questions were also asked during the semi-structured interviews to gather as much information as possible:

Time for Interview: 60 - 90 Minutes
Participant:
Date:
Time:
Location:

Interview: Semi Structured Interview
Why is there a gap between human audit and automated compliance?

Strategic Theme

1. What do you think automation means to Bank of Ireland?
   Behaviour:

Happy Positive Thinking Confused Annoyed

2. Is there any formal strategy in place to manage automation within the organisation?
   Behaviour:

Happy Positive Thinking Confused Annoyed

3. Is there any defined role in your part of the organisation that manages automation?
   Behaviour:

Happy Positive Thinking Confused Annoyed

4. What benefits do you think automation offers Bank of Ireland?
   Behaviour:

Happy Positive Thinking Confused Annoyed

5. Do you think your senior management team encourage the use of automation in the organisation?
   Behaviour:

Happy Positive Thinking Confused Annoyed

6. Has the practice of your role changed since implementing any automation within your functional area?
   Behaviour:

Happy Positive Thinking Confused Annoyed

31. Do you think the adoption of automation tools for auditing and compliance purposes will have an impact on your future role for the organisation?
    Behaviour:

Happy Positive Thinking Confused Annoyed

Audit Theme

7. Is auditing for your functional area currently conducted manually today?
   Behaviour:

Happy Positive Thinking Confused Annoyed

8. Is there any automated software used for any auditing compliance within your function for Bank of Ireland?
   Behaviour:

Happy Positive Thinking Confused Annoyed

9. Are you aware of any regulatory compliance around automation software for the organisation?
   Behaviour:

Happy Positive Thinking Confused Annoyed

10. If Yes. Are there any standards you use in your role to support automated compliance for Bank of Ireland?
    Behaviour:

Happy Positive Thinking Confused Annoye

11. Do you think human audit and automated compliance are separate functions within Bank of Ireland?
    Behaviour:

12. Do you think they complement each other or not complement each other?
    Behaviour:

In your opinion, what do you think are the gaps between human auditing and automated compliance?
Behaviour:

Operational Theme

13. Automation is the application of technology that allows employees in a company to configure computer software or a "robot" to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems. Do you agree with this statement?
    Behaviour:

14. Where do you believe automation adds real operational value within Bank of Ireland?
    Behaviour:

Happy Positive Thinking Confused Annoyed

15. Is there a tool or mechanism to measure automation effectiveness throughout the organisation?
    Behaviour:

Happy Positive Thinking Confused Annoyed

16. Are multiple automation or robotics tools in place for payment services across Bank of Ireland?
    Behaviour:

Happy Positive Thinking Confused Annoyed

17. Are you aware if a front web application exists for the automated software deployed in Bank of Ireland?
    Behaviour:

Happy Positive Thinking Confused Annoyed

18. Do you know what types of users exist that use the automated software today?
    Behaviour:

Happy Positive Thinking Confused Annoyed

Technical Theme

19. Are you aware of the technical environments that the software is deployed on?
    Behaviour:

20. Do you use automation or robotic tools for your area?
    Behaviour:

21. Is the automation tool or automated technique used easily configurable?
    Behaviour:

22. Are you aware if automated software performs audit log and compliance history functions?
    Behaviour:

23. Do you think automated software used for auditing and compliance can accelerate the development of new processes/practices for Bank of Ireland?
Behaviour:

Happy Positive Thinking Confused Annoyed

24. What automation tools do you use within your functional area to support payment services?
Behaviour:

Happy Positive Thinking Confused Annoyed

25. Is there a mechanism to evaluate automation effectiveness throughout the organisation?
Behaviour:

Happy Positive Thinking Confused Annoyed

Risk Theme

26. What main processes does automation support for Bank of Ireland?
Behaviour:

Happy Positive Thinking Confused Annoyed

27. Are key controls in place to govern the use of automation tools for Bank of Ireland?
Behaviour:

Happy Positive Thinking Confused Annoyed

28. What main processes do automation for Bank of Ireland?
    Behaviour:

Happy Positive Thinking Confused Annoyed

29. What main processes do automation for Bank of Ireland?
    Behaviour:

Happy Positive Thinking Confused Annoyed

30. What risks or challenges do you think the organisation could face using an automated auditing/compliance tool?
    Behaviour:

Happy Positive Thinking Confused Annoyed

Appendix 7: Online Survey Questions

Why is there a gap between human audit and automated compliance?

Page 1

Please be reminded that answering all questions in this survey is optional.

You are invited to participate in this research project.

"Why is there a gap between Human Audit and Automated Compliance?"

Your participation is voluntary.

Before you decide to take part in this survey, please read the information sheet below to find out the reasons behind the research, and your role in the process.

Thank you

Sean Michael Cahill

INFORMATION SHEET FOR ONLINE SURVEY PARTICIPANT

LEAD RESEARCHER: Sean Michael Cahill

PROJECT TITLE: Why is there a gap between human audit and automated compliance?

BACKGROUND OF RESEARCH: There is a current trend within the payment services industry to automate activities and tasks as much as possible. Automated self-services are on the increase which is been driven by an increasing pressure on service organisations to reduce its operational costs and overheads. Worldwide there has been an increase in regulatory reforms and organisations are struggling to keep pace with the changes. With the increase in stronger regulatory compliance and auditing on payment processing, new risk and control practices being introduced it is much more difficult for organisations to compete with non-bank institutions when implementing new technologies in automating payment services. The study will examine and evaluate why there is a gap between human audit and automated compliance. The scope of this research will examine and evaluate if managers, payment and business auditing experts within similar supporting service organisations under the umbrella of Bank of Ireland share the same attitudes, opinions and views.

PROCEDURES OF THIS STUDY: The online survey is composed of approximately thirty plus questions targeted at payment and business auditing experts across each of the service organisations identified under the umbrella of Bank of Ireland. The online survey will be a semi-structured questionnaire. It will take a maximum of 20 minutes to complete the survey.

PARTICIPANTS: The participant (you) will either be a payment or business auditing expert under the umbrella of Bank of Ireland. The sample will include both male and female experts within an age range from 25 to 50 years. A mixture of participants has been selected from those starting out in their careers to those who are much more experienced.

DEBRIEFING ARRANGEMENTS: The online survey will be conducted online and the input will be anonymised. The debriefing page will immediately follow the last question on the online survey. Participants will be thanked for their contribution and more information on the study will be provided. The researcher's contact information will be listed and each participant will be reminded to print a copy of the debriefing from for their records. Participants will also be given the option to withdraw their data at any point. In the extreme unlikely event that illicit activity is reported to me during the study I will be obliged to report it to appropriate authorities. There is no potential for conflict of interest at any stage during the process. Anonymised data will be encrypted and held onto storage space on a private cloud. After the online survey is completed, the anonymised data will be destroyed after 180 days. I will also request a stay for the dissertation so that it does not enter the TCD library for 5 years.

PUBLICATION: Only general findings will be reported, without reference to identifiable individual results. Results of the research will form part of the dissertation in the Taught Masters Programme M.Sc. in Management of Information Systems in the School of Computer Science and Statistics, Trinity College Dublin, Ireland. The dissertation will be submitted to the School of Computer Science and Statistics on the 1st of September 2017.

DECLARATION:

- I am 18 years or older and am competent to provide consent.
- I have read, or had read to me, a document providing information about this research and this consent form.

I have had the opportunity to ask questions and all my questions have been answered to my satisfaction and understand the description of the research that is being provided to me.

- I agree that my data is used for scientific purposes and I have no objection that my data is published in scientific publications in a way that does not reveal my identity.
- I understand that if I make illicit activities known, these will be reported to appropriate authorities.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I understand that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

Statement of investigator's responsibility: I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent.

I have read the information sheet explaining the process.

I am 18 years or older and am competent to supply consent.

I wish to proceed and I consent to participate in the study that has been described above.

◯ yes

◯ no

Strategic - Please be reminded that answering all questions are optional

What does automation mean to your role in Bank of Ireland?

- ◯ Increased Efficiency
- ◯ Less Manual Intervention
- ◯ All of the above

Is there any formal strategy in place to manage automation within the organisation?

- ◯ yes
- ◯ no

Is there any defined role in your organisation who manages automation change for Bank of Ireland?

- ◯ yes
- ◯ no

What benefits do you think automation offers Bank of Ireland?

- ◯ Increased speed of processing payment transactions
- ◯ Less manual implementation and workarounds
- ◯ Improved operational ability
- ◯ Improved scalability
- ◯ Improved compliance
- ◯ Enhance Customer Experience
- ◯ All of the above

Do you think senior management encourage the use of automation in Bank of Ireland?

◯ yes
◯ no

Has the practice of your role changed by implementing automation change?

◯ yes
◯ no

Audit - Please be reminded that answering all questions is optional

Are audits within your function currently conducted manually?

◯ yes
◯ no

Is there any automated software used for auditing compliance?

◯ yes
◯ no

Are you aware of any regulatory compliance around automation software for your organisation?

◯ yes
◯ no

If Yes are there any standards you use in your role to support automation within Bank of Ireland?

Do you think human auditing and automated compliance are separate functions within Bank of Ireland?

◯ yes
◯ no

Do you think human auditing and automated compliance could complement each other?

◯ yes
◯ no

In your opinion if they do not, where do you think there are gaps?

Where do you believe automation adds real operational value within Bank of Ireland?

- ◯ Strategic - Increases collaboration between business and IT
- ◯ Improves quality processes
- ◯ Elimination of manual processing
- ◯ Improves compliance
- ◯ Enhances customer experience
- ◯ Reduces costs
- ◯ All of the above
- ◯ None of the above

Is there a mechanism to measure automation effectiveness throughout the organisation?

- ◯ yes
- ◯ no

Who would you say are the main users of automation within Bank of Ireland

- ◯ Technology Services
- ◯ Group Operations
- ◯ Business
- ◯ ChangeZone
- ◯ All of the Above
- ◯ None of the Above

Operational - Please be reminded that answering all questions is optional

Automation is the application of technology that allows employees in a company to configure computer software or a "robot" to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems. Do you agree with this statement?

- ◯ yes
- ◯ no

Where do you believe automation adds real operational value within Bank of Ireland?

- ◯ Strategic - Increases collaboration between business and IT
- ◯ Improves quality processes
- ◯ Elimination of manual processing
- ◯ Improves compliance
- ◯ Enhances customer experience
- ◯ Reduces costs
- ◯ All of the above
- ◯ None of the above

Is there a mechanism to measure automation effectiveness throughout the organisation?

- ◯ yes
- ◯ no

Where is automation mostly deployed within Bank of Ireland

- ◯ Technology Services
- ◯ Group Operations
- ◯ Business
- ◯ ChangeZone
- ◯ Auditing/Risk
- ◯ All of the Above
- ◯ None of the Above

Are multiple automation tools in place for payments processing across Bank of Ireland?

- ◯ yes
- ◯ no

Technical - Please be reminded that answering all questions are optional Do you use any automation tools for your role?

- ◯ yes
- ◯ no

Is the tool you use a Robotic Process Automation Tool?

- ◯ yes
- ◯ no

Is the automation tool configurable?

- ◯ Yes
- ◯ No - I don't use an automation tool within my role

Can the automation tool gather audit logs for payment processing technologies?

- ◯ yes
- ◯ no

If the automation tool supports audit log information is it provided to support auditing or compliance within Bank of Ireland?

- ◯ Yes
- ◯ No
- ◯ Manual intervention is required to support auditing/compliance
- ◯ I am not sure
- ◯ None of the above

What are the automation tools you use if any?

Is there a mechanism to evaluate automation effectiveness throughout the organisation?

If there was an automated tool or product you could use to collect auditing data to support your role would you use one?

◯ yes

◯ no

Do you think the progress and adoption of automation for compliance purposes in Bank of Ireland will have an impact on your future role?

◯ yes

◯ no

Your Contact Details - Optional

Contact Details

First and last Name

Email Address

Phone Number

Thank you very much for your contribution to the online questionnaire, further information on the study can be provided upon request

Name: Sean Michael Cahill
Email: cahills5@tcd.ie
Mobile Number: 0872642082

Audit - Please be reminded that answering all questions are optional

What processes does automation support for Bank of Ireland?

- ◯ Strategic Processes
- ◯ Operational Processes
- ◯ Technical Processes
- ◯ Risk Processes
- ◯ Business Processes
- ◯ All of the Above
- ◯ None of the Above

Are controls in place to govern the use of automation within Bank of Ireland?

- ◯ yes
- ◯ no

How many manual audits would you support in your role on an annual basis?

- ◯ 1 - 5
- ◯ 6 - 10
- ◯ 11 -15
- ◯ 15+
- ◯ None