A COBIT BASED APPROACH FOR MIGRATING LEGACY SYSTEMS TO CLOUD INFRASTRUCTURE

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Abstract

Cloud computing is evolving as a key computing platform for sharing technological resources including infrastructures, software and business applications. Cloud has proven to bring many promising benefits to organizations. As a result, increasing number of companies are migrating legacy applications to cloud infrastructure. To live up to the demands of the new digital transformation economy, organizations must cease relying on outdated software and modernize their core technologies. Enterprises will benefit only when they stop seeing modernization as a one-time project and embrace it as a cycle. But various technical challenges and business risks exist in moving the systems from existing infrastructure to cloud. The complexity and potential risk involved in technology transformation project discourages organizations to pursue the legacy system migration. Failure may sink the entire business; however, Success can lead to strategic benefits. But there is a gap in the availability of a formal framework that could be adopted to envision risks and challenges at the early stages of the project lifecycle. A qualitative study in this area identifies factor that contributes to the organization's resistance in migrating its systems and analyse if an integrated approach, such as COBIT framework, would serve to influence the factors required for successfully migrating legacy systems to a cloud infrastructure.

Keywords: legacy system, cloud computing, cloud migration framework, Cobit 2019

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A COBIT based approach for migrating Legacy Systems to Cloud Infrastructure

Introduction

An attempt to migrate a legacy system to cloud infrastructure caused a technology meltdown at UK based Trustee Saving Bank (TSB) that costed the bank £330.2 million. According to the reports, migration failure that happened in April 2018 occurred when TSB's customer data was migrated from a legacy IT system operated by Lloyds Banking Group, previous parent company, to a new IT infrastructure that was managed by the new Spanish owner, Sabadell. The problem surfaced when bank customers were unable to login to their online accounts after bank completed the migration of its legacy applications from Lloyds to a modern suite of applications in part in the public cloud. TSB bank was moving to a Sabadell owned Proteo platform, that is based on Accenture's Cobol-based Alnova system which is hosted on Amazon Cloud. But TSB made many mistakes during the transition, including aggressive timelines, inadequate testing, and number of technical mistakes. As with other legacy migration efforts, however, the biggest mistake was tackling the entire effort as a single 'big bang' initiative caused losses to the bank that could have been easily avoided if a systematic approach was used for transition from traditional systems to the new age Cloud Computing Services.

A study conducted by Gartner Inc. in 2019 forecasted that the global market demand for cloud computing services will grow by 17.3% in 2019 to a total of $206.2 billion. According to another survey conducted by McAfee in 2018, about forty percent (40%) of IT leaders surveyed indicated that their organization is slow in adopting various cloud solutions due to a shortage of needed skills and resources for an effective cloud implementation. Therefore, an ability for organizations to successfully migrate their

legacy systems into a cloud environment through a well defined and systematic approach has, and will continue to be, an important priority for enterprises.

In a rush to take advantage of the many benefits offered by cloud infrastructure, companies take irrational decisions without consideration of the implications. A system implementation failure occurs when a process is not governed, not properly initiated and then not managed to ensure that benefits are realized. A focussed study is needed to facilitate the identification of critical challenges, facilitate anticipation of risk events, and suggest certain success factors in order to realize the expected beneficial outcomes from the migration process (Raghavan et al., 2017). Information System Executives (IS) performing the migration should follow a defined framework to carry out a risk aware approach, instead of struggling to identify what areas should be addressed for avoiding a poor and an unsecured migration that could cause huge loss of investments. The literature review showcases various cloud migration process in research papers that uncovered critical activities, concerns, risks and challenges. Using a framework that is covering the full end-to-end business and IT functional areas of responsibility would help organizations avoid migration failure. Research focussed on understanding the challenges, risks inherent to legacy system to cloud migration process. Results will support using of an integrated framework in the management of all such risks in an efficient way. This study is intended to test the application of COBIT Implementation Framework 2019 (CIF) and parts of the COBIT Design Guide 2019 (CDG) for the development of a framework that will be called ‘Cloud Migration Framework’ (CMF). Resulting framework, CMF, can help executives manage the complex migration process in a systematic and secure manner. The proposed COBIT 2019 compliant, cloud centric

CMF can be used as a guide for handling all known migration risks in an effective and cost-efficient manner.

Remaining parts of the paper continue with Section 2, where other related work in this topic of research is discussed and how this study is situated in the context of the current research. Section 3 explains the research methodology that was followed in order to find answers for the research questions and same section defines the boundaries of the research in terms of the scope and limitations. Section 4 is the discussion and presentation of the results in form of the framework. Finally, Sections 5 concludes the paper and provides recommendations for future work.

Literature Review

Current cloud computing awareness lacks overarching view on reengineering a legacy system for cloud services. Due to lack of well researched frameworks in this area many organizations do not feel confident of migrating the legacy applications which are critical to the core business activities. There is a need of a framework that is focussed on the challenges and risks and provides detailed steps for controlling such risks. According to the resources, intensive research has been done on the topic of cloud migration, but it was observed that within an organization, whether technological and a non-technological, a gap still exists between the understanding of using a standard methodology for migration (Ali et al., 2018). Researchers in the past suggested various migration frameworks but most of the research focus on addressing the specific area of concern.

A recent research conducted by Gholami et al. (2017), identifies the challenging activities in migrating legacy systems using a software re-engineering process and provides insight into the risk and challenges. Migration process was studied and defined

to pursue phases with an endeavour of migration of legacy systems to cloud, but the theoretical model was proposed that did not augment the phase called Post Migration phase, that occurs after the legacy system is transitioned from the on premise hosted environment to a target cloud infrastructure. There are many challenges to overcome in the post migration of the legacy systems that were missed in the scope of this research like Business continuity management in case of business interruption. Sabiri et al. (2015) in the research paper tested a three-step method for application migration from an enterprise to cloud and elaborated the modernization process of a legacy system before moving to cloud. An architecture driven modernization approach was proposed based on the analysis that drives activities on the modernization of architectural models. But the study did not factor in the risks and challenges that arise during the migration cycle and neither proposed any framework that could be used as reference for planning a safe transition. Zheng et al. (2015) in a research on migrating system components on cloud infrastructure came up with a reliability-based approach. In the report, the viewpoint of the researcher was clear directed towards the identification of challenges in optimizing applications for cloud and calculate the impact and failure rate of the components during the migration cycle. The scope was limited to the legacy application analysis i.e. component extraction and invocation extraction process. Researcher's proposed a framework that was focussed on improving error prone components of applications before moving to the cloud. Proposed framework did not take into consideration impact on the non-technical components and challenges that are inherit to the migration of other components to cloud. Another research conducted by Gholami et.al (2016) in the area of cloud migration has conceptualised the migration process and has proposed a meta model

as an abstraction of activities and tasks incorporated in a transition process. Results of the report essentially acts as a language structure that unifies the model of migrating old systems into the cloud computing systems. However, the research did not base the proposed meta model to any globally recognised framework that could be trusted and fails to provide a detailed description of the root causes that can cause a migration failure. In a detailed study on cloud migration conducted by Zheng (2013), proposed a general framework and methods to assist with the Evolution of Legacy Systems 'Into' or 'Within' the cloud environment. Here the study was focussed on the technical aspect in software evolution but failed to take into consideration the factors that contributed to the improper governance control during an IT implementation.

Primarily, the gaps identified during the literature reviews clearly support the need of an integrated framework that will serve as a comprehensive guide for handling risks and challenges arising from a system migration. The study helped determined whether there is a need of focussed study in developing an in depth understanding of the migration process including common activities, challenges and recommendations. It is important to understand the relationships between components and process elements in order to apply an integrated approach. This qualitative study will help many organizations in getting a clear picture of all the risks and challenges that contributes to the organization's resistance in migrating a legacy system to cloud infrastructure. Study of existing frameworks proposed by COBIT served as a base to determine if the use of an integrated approach serves to influence the factor in enablement of systems for migration. Although there are other frameworks available today that could be used for conducting a legacy system migration, but most of them lack a detailed study of the factors that could

cause a failure. Adopting COBITs approach would help organization optimize business processes, reduce risk levels and increase productivity by integrating with many other common resources. In the next section, we define what is a legacy System and cloud computing.

Legacy System

Legacy system was first described in an IT literature back in 90s as an outdated computer system that are deemed business critical, high maintenance, inflexible to integrate with other technology, using outdated hardware and has outdated documents (Gholami et al., 2017). A legacy system could also be an old computer system that is in use even after the organization has made investments in terms of time and money or the database holds some valuable data (Sabiri et al., 2015). An application is considered as a main component of a legacy system and in the current era applications continue to become obsolete due to rapid evolution in technology. The maintenance and support for legacy applications is increasingly becoming a problem since technology organizations focus on new technology to stay in business. Studies have also suggested that enabling a legacy application for cloud is seen as an opportunity for organizations to innovate and sustain with technology. With the evolution in technology there are many possibilities of modernizing the systems to cope up with the advancement in IT. Other research in this area support the fact that most legacy systems can be reused by extension, transformation, integration and migration using new technology. Next part discusses about what is Cloud Computing and what are the benefits of transitioning to cloud.

Cloud Computing

Cloud computing services are defined as the delivery of computing services over the internet. Cloud is believed to offer innovation, flexibility of resources, and scalability (Mahmoud et al. 2019). A cloud can offer services that include servers, databases, networking, storage and intelligence. Cloud services fall into 3 categories: Software as a Service (SaaS); Platform as a Service (PaaS), a platform for developing applications; Infrastructure as a Service (IaaS), a complete computing infrastructure (Microsoft Azure, n.d.). Cloud offers many benefits when compared to the old systems. It offers reduction in the capital expense needed for upgrading hardware and software. Cloud provides on demand services so that computing resources are provisioned in the shortest time that gives organizations flexibility to timely plan the resources. Cloud computing offers benefits over to scale elastically by using shared resources (Gholami et al., 2017). Cloud computing saves time by reducing tasks for maintaing on-premise IT systems. Technically Cloud computing use a network of secure datacenters across the world. Using cloud over a single datacenter reduces network latency and provides economies of scale. Cloud makes data backup and business continuity easier and cheap. Data can be mirrored at multiple datacenter in the network giving complete protection against loss of data due to system interruption. Cloud providers use technologies and controls to help protect data and infrastructure from the potential threats. Cloud Computing services offers dynamic allocation of resources to improve redundancy and scalability of legacy system. Moving to cloud can also reduce costs for maintaing a private infrastructure by decreasing hardware costs (Zadok, 2017). While cloud-based services offer unique opportunities but there are many complexities associated with cloud services. A cloud deployment of legacy application may vary based on the model that fits for the

organization. According to Gholami et al. (2016), there are 5 possible ways of deploying legacy applications to cloud: 1) Deployment of business logic layer in IaaS will offer reusable functionalities; 2) Replacing system components with a fully tested SaaS solution.; 3) Moving the legacy database to data provider using IaaS deployment. Parts of logic layers are hosted in local network and a database is deployed on a cloud data network; 4) Converting and modifying the data to a cloud database; 5) Deploy the stack of legacy system using IaaS service delivery model. In this case legacy system runs on a virtual environment and then it is hosted on the cloud technology. But a successful deployment on cloud requires a well researched migration approach that would uncover and resolve areas of ambiguity and risks.

Migration Process

System migration is defined as the systematic process of redeploying an IT system component on a new and advanced platform. A cloud migration is the movement of data and components hosted on servers inside the org to the cloud computing infrastructure (Ahmed et al. 2019). A migration process must consider alignment of Technology and Information Security; timing of system replacements or triggers for emerging requirements; perform impact analysis on the capital expenditure due to migration; eliminate complexities of integrating existing processes to a cloud-based services (Jamshidi et al., 2014).

A typical cloud migration process starts with system architecture review because an architectural model helps analyzing all the legacy system components in one instance. In a study conducted by researchers Sabiri & Benabbou (2015), researchers based the migration model of moving an on-premise hosted system to cloud infrastructure on three

points: a) Understanding the architecture based on three layers: Business, Technical and Application. b) Research and choose the type of cloud environment that is best suited for legacy system and identify parts of the applications that could be moved instead of the moving the whole application at once. c) Categorize the various types of solutions for migrating architectural components. A migration theory proposed by Raghavan & Shiva Murthy (n.d.), define the method of transition to cloud in a three-phase approach as follows:

Phase 1: Evaluating existing environment –The first phase of migration should basically cover application dependency mapping, auditing the IT systems, and conduct analysis on the customer experience.

Phase 2: Plan and Design – Based on the findings in phase 1, in the second phase identify steps to finalise a cloud provider that is suitable, assess potential customer service, plan and design steps for migration

Phase 3: Migrate and verify – This is the final stage that would cover the steps needed to start migrating services. At this step verify and monitor services for a period of time and report to the management.

Similarly, a migration model proposed by Gholami et.al. (2017), as seen in Figure.1, describes a process for transitioning legacy application to cloud without any situation-specific technical details. Like other approaches studied, this research provides explanation of process elements that are organised in three different phases namely: Pan, Design and Enable.

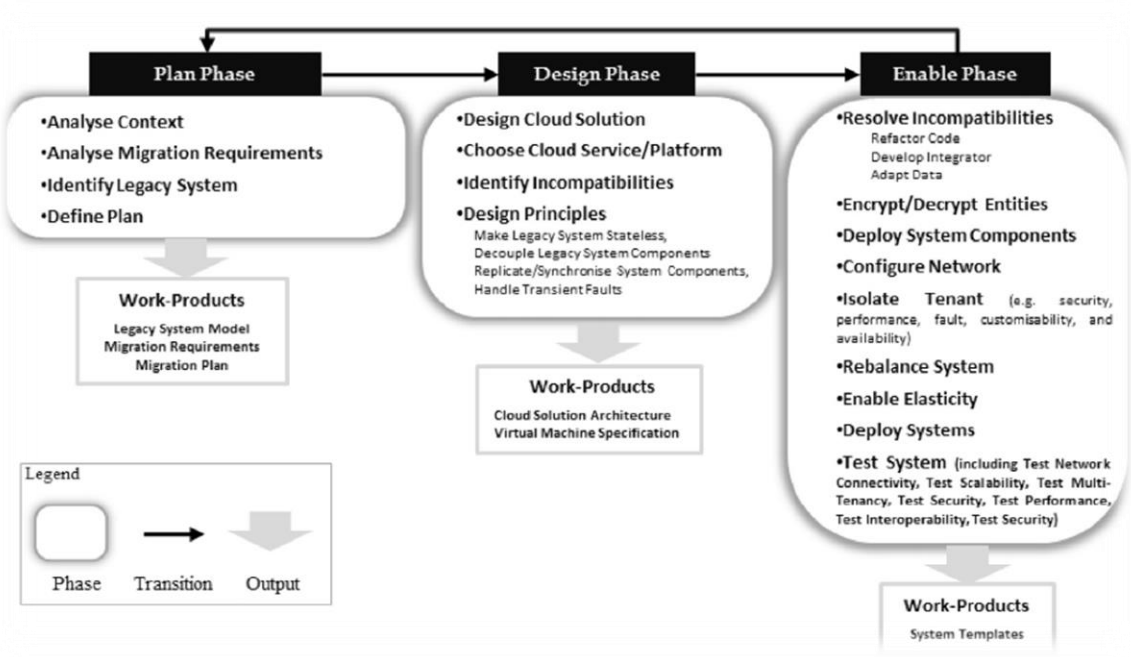


Figure 1. Critical process elements in moving legacy systems to cloud platforms (Gholami et al. / Information Systems 67 (2017) 100–113)

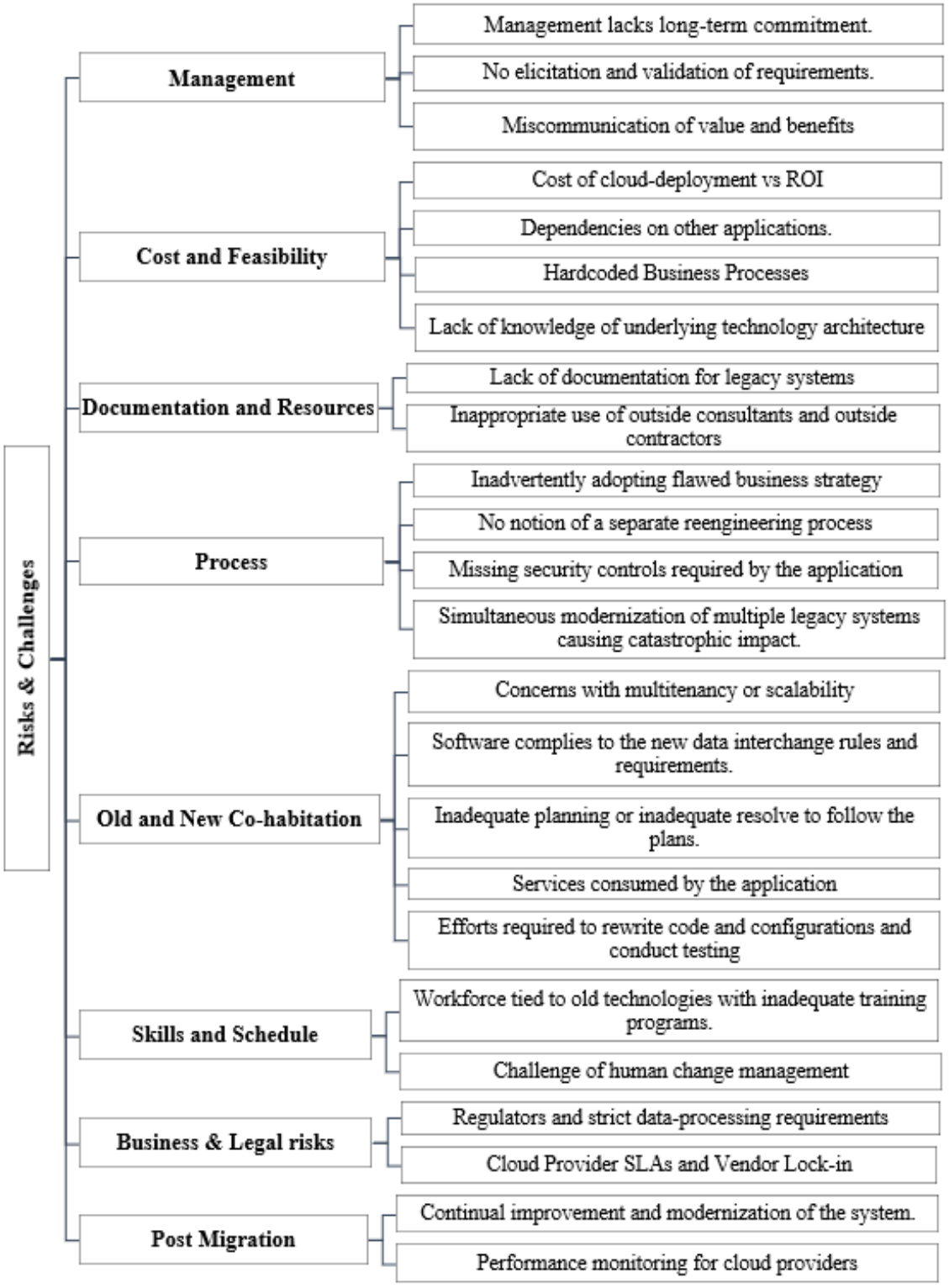
According to a survey conducted by Barr, S. (2018), practically it isn't feasible to migrate all components of a legacy system to cloud at one instance. Organizations are expected to sequence the migration process, starting with system components for which cloud migration can deliver certain performance improvements or cost savings. Cloud migration methodologies proposed by researchers so far mainly cover activities for analyzing systems, understanding migration objectives and system requirements, migration planning and process designing, understanding components of legacy systems, selection of cloud provider, re-architecting legacy systems, user testing and configuration. Studies reveal that in the long run, benefits from using cloud overcome the investments, ROI but nevertheless it is worthwhile for organizations to manage risks that could cause problems achieving the desired results. Next part highlights key risks and challenges in the legacy system migration that are gathered from various sources.

Risks & Challenges in a migration process

The study has shown benefits of migrating to cloud based environment, but cloud present its own set of concerns when utilising the technology, primarily in the areas of compliance and security. Most organizations are concerned with the availability of client business systems, disclosure of proprietary data, and technical difficulties due to inflexible IT architecture. A cloud provider could serve multiple consumers on the same hardware hence there is a need to implement controls to minimize any impact on the Confidentiality, Integrity and Availability of the system (Barr, S., 2018). There were concerns noted for data storage and compliance with privacy laws. Many concerns were noted from the literature review. Table 1 presents a consolidated list of risk and challenges pertaining to Legacy System, System Migration, Governance of IT or Cloud Computing. (Watts, 2019; Ahmed, 2019; AltexSoft, n.d.; Bloomberg, 2018; Gholami, 2017). The list categorizes the risks in eight different segments as follow:

Table 1

A compiled list of Risks and Challenges in a Legacy Systems to Cloud Migration



COBIT 2019

A study guide by Lainhart, Conboy, Saull (2018b), described COBIT as an integrated framework that was designed by ISACA for Information and Technology (I&T) governance and management. The word I&T refers to the information processes and technology that organization has in place to accomplish organization goals, regardless of the size and type of business. Today, a digitized organization is dependent on IT for growth or survival. A governance model for I&T had become an important component of enterprise risk management and is perceived as value generation for businesses. Companies have started putting emphasize on IT governance for creating value from an IT investment. As defined by ISACA in the Cobit manual, Enterprise Governance of Information and Technology (EGIT) aims at delivering value through digital transformation. Study of EGIT can be used as a guide for the managing risks resulting from a digital transformation. EGIT is designed such that it is flexible and easy to tailor for application to any project specific needs. A successful adoption of EGIT will influence to get 3 types of outcomes: Benefits Realization, Risk Optimization. Resource Optimization. COBIT Implementation Framework 2019 (CIF) and parts of the COBIT Design Guide 2019 (CDG) provides the overall approach for implementing EGIT. As the enterprise tailors its implementation guidance provided to match processes, practices, policies and procedures, (p. 11). Research is intended to test application of CIF and CDG for design of an integrated framework that will assist in systematic enablement of legacy system for cloud infrastructure. Working within a framework enables development of appropriate governance processes and other components of the management system. If

appropriately tailored, EGIT will operate effectively as part of an organizations normal business practice with support from management.

The implementation guide makes a distinction between role of governance and role of management in the EGIT implementation lifecycle (Lainhart et al., 2018b). In its approach, Cobit has defined all the components that would define how decisions should be taken, and who will take the position. In Cobit, the approach used for IT implementation is based on empowering business and stakeholders to take ownership of related governance and management decisions. A program is considered closed when the process for focusing on IT-related priorities generates a measurable benefit, and program embeds in the ongoing operation activity. COBIT has made adoption of EGIT easy by formulating the strategy in a step by step process.

The first step is creation of appropriate environment. During IT migration initiatives failure could happen due to inadequate oversight. Chances of success of EGIT implementation increases with a well governed and well managed program. Organization need to plan that EGIT is implemented as an integral part of an overall governance approach. Executive management must be involved in the implementation irrespective of the size of legacy system and should drive value creation for organization. Management team must also set and maintain the governance framework in an integrated manner with business objectives. Executives need to make decisions based on facts; reliable information; and diverse, well founded opinions from business, managers, auditors, customers and users. COBIT framework will facilitate communications by providing a common language for executives to express objectives and expected results. Second step, towards EGIT is use of Continual Improvement Life Cycle approach. Complexities and

challenges encountered in implementation of EGIT are addressed at this stage. The life cycle constitutes 3 interrelated components: a) Continual improvement life cycle is at the core; b) Change Enablement in the middle section to address cultural and behavioral aspects; and c) the outermost deals with Program Management for handling the process of migration in a safe manner. Further, implementation lifecycle is divided in 7 phases (See Figure 1 by Lainhart, Conboy, Saull (2018b):

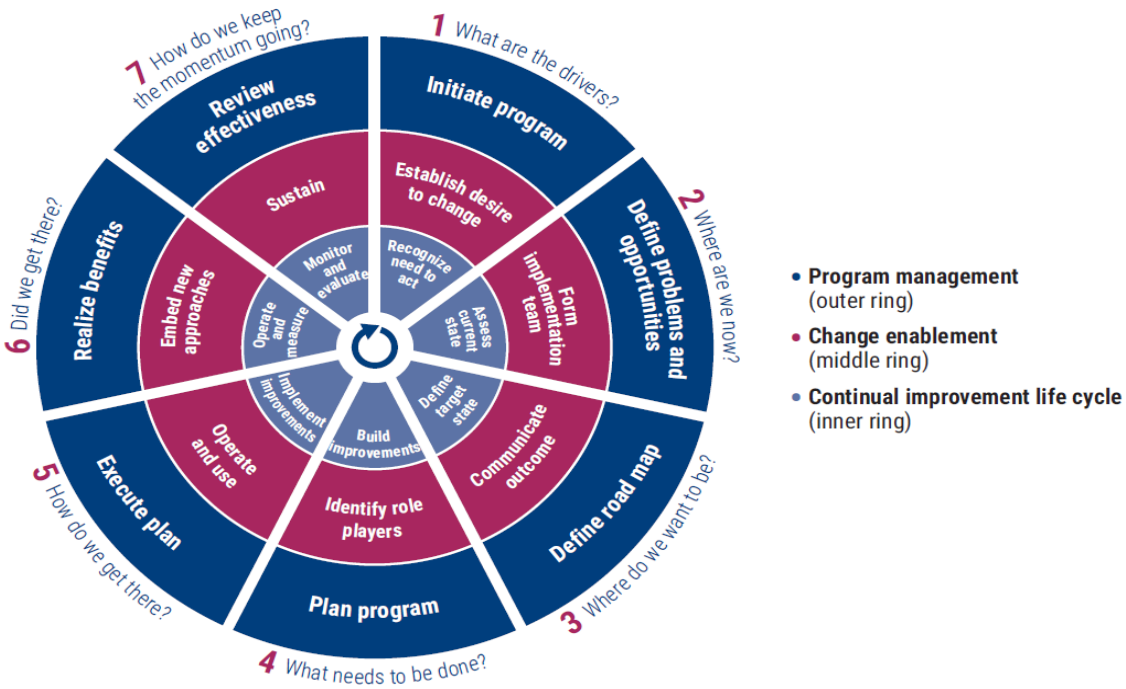


Figure 2. COBIT Implementation Road Map: Illustration of seven phases in EGIT implementation road map. From COBIT® 2019 Implementation Guide by Lainhart, J., Conboy, M., Saull, R. (2018b). Copyrighted ISACA

Each phase of implementation lifecycle approach is defined as follows:

Phase 1 - What Are the Drivers?

This phase identifies the main driver for the change and then creates a desire to change as a business case. A driver for change can be seen as an event whether it is internal or external, key issue. Events like software implementation and even the goals of the

enterprise can act as change drivers. At this stage obtain an understanding of the program background and objectives behind the migration. Commitment and buy-in of all key stakeholders are obtained at this phase.

Phase 2 - Where Are We Now?

Alignment of IT objectives with risks, objectives and goal. In second phase executives should focus on identification of how IT can create value by enabling business transformation, enhancing performance of current business processes, and meet governance-related requirements such as complying with legal and regulatory requirements and manage risks.

Phase 3 - Where do we want to be?

This phase emphasizes on scoping improvement in the process. Organizations carry gap analysis in order to identify potential solutions. Further, at this stage executives determines gap between the current and future positions. Gaps identified are converted and incorporated as improvement opportunities in the plan.

Phase 4 - What Needs to Be Done?

At this phase implementor describes a feasible plan and solutions by defining projects supported by justifiable business cases. Improvement opportunities are translated into justifiable projects and any high-impact projects are prioritized. Any improvement projects are integrated in the migration program.

Phase 5 - How Do We Get There?

This phase breaks the proposed solutions in business practices and establishes measures, monitoring systems for business alignment of the process with objective, and measure

performance. Implement the detailed improvement projects by leveraging standards, practices and project management capabilities within the organization.

Phase 6 - Did We Get There?

This phase focus on transition of the new and improved governance practices into normal business operations. It further focuses on monitoring achievement of the proposed improvements using the performance metrics and expected benefits. Integrate the metrics for project performance and benefits realization of the overall governance improvement program into the performance measurement system for regular and ongoing monitoring.

Phase 7—How Do We Keep the Momentum Going?

Enterprise reviews the overall success of the initiative, identifies further governance or management requirements and reinforces the need for continual improvement. Assess the results and experience gained from the program. Ensures required actions create iterations of the life cycle process. Continually monitor performance and ensure that results are regularly reported.

Experiences from EGIT implementations shows that several issues need to be overcome for the migration to be successful and for a sustained continual improvement system. Identifying Challenges, Risk Factors and Success Factor for every phase because there are several practical issues that needs to be dealt in each phase of implementation of EGIT. Post the challenges and success factor in a process the next step is to focus on Change Enablement. COBIT defines change enablement as a holistic process of ensuring that stakeholders are to the changes involved in moving from a current state to a desired future state. All key stakeholders should be involved. A change enablement typically

entails: Impact Assessment of the change, Impact on people and other stakeholders; Next sections discuss about the methodology used to achieve the outcome of this research.

Methodology

Following the objective of the research and in the light of literature review conducted, it is imperative to define boundaries of this research. This section details the scope, limitations and methodology used in the research.

Research scope is limited to the factors contributing to the migration of legacy application to a cloud computing services. Research explores design factors that influence a workflow for planning a tailored approach for the migration. Research results and conclusion are intended to be based on COBIT 2019 Implementation Guide. To ensure large application of the resultant framework, our Literature review was scoped to cover multiple dimensions of migration approaches in order to identify risk and challenges that are common to a migration process and has greatest impact on the outcomes.

The research has some limitation that should be understood. Due to unavailability of a cloud infrastructure and unavailability of a legacy application the theoretical model generated is based on a qualitative study. Results will not be validated until a follow-up quantitative research is undertaken. Another limitation of this study is that even though the model is drawn from the literature and evaluated using domain experts, we do not claim its generalizability. However, using COBIT frameworks conforms to the standards that will be applicable to organization of all sizes. Another limitation is that the chosen sample of literatures reviewed might fail to capture all the factors that influence the migration process however, the selection was based on the sample characteristics that

considers the model to have broad application in the industry. There also remains a possibility that the proposed model would not fit best to the migration process outside the defined scope or to an application with characteristics that are not covered in the research sample.

Further study in this topic is focussed to answer the following research questions:

RQ1. What are the major risks, challenges and key drivers in legacy application migration process?

RQ2. How can the COBIT Implementation Guide help address the risks and challenges posed by legacy systems migration process?

A methodology that helped in deriving the resulting framework was divided in 3 phases. In the first phase, we specified the research questions and reviewed the scope in order to formulate search strings for literature extractions. Second phase concluded the study of various legacy system migration processes with the identification of risks and challenges inherent to the migration strategies. Based on the findings identified from second phase, the third phase focussed on the study of COBIT 2019 Implementation Roadmap and application of Continual Improvement Lifecycle Management approach for the design of a integrated framework that can be used a for handling challenges and risks that are inherent to the system migration in an effective and secure manner

Presentation & Discussion of Results

Operating IT on an old legacy system is emerging as a programmatic challenge in the ability to deliver effective services. Capability to operate as a modern organization depends on the investments in system upgradation and resource optimization. Although organizations are committed to advance IT infrastructure with investments in new

technology like Cloud Computing, but an unplanned approach to migration poses a serious threat of failure. Risks and challenges inherent to the migration process can compromise confidentiality, integrity and availability of the systems. Adoption of an integrated approach is becoming important to identify the gaps and mitigate the risks while also managing enablement of IT systems for Cloud Computing. This research was conducted to uncover the challenges posed by the change in technological infrastructure through literature review. Study propose a solution that provides guidance for conducting systematic and secure migration of legacy systems into cloud. A Cloud Migration framework proposed by this research can serve as a guide for organizations to carrying out a safe and secure migration. This framework is based on COBIT 2019 - Implementation approach, that is globally accepted as a standard for Enterprise Governance of Information Technology. Reason for using COBIT was to use an integrated framework that covers implementation challenges involved with IT transformation and could be customized to meet the needs to an extent that it reduces the chances of system failure during migration. The seven phases defined by Continual Lifecycle Management tool is used as pillars for designing a framework that translates into a migration strategy. Each phase covers various stages of migration starting from the identification of the drivers for change and ends at how to keep up the momentum of change. Challenges and risks at every stage in a migration process is mapped to challenges defined by COBIT. The Root Causes and Success factors elaborated by COBIT in its Implementation guide are used as guiding principles to take an informed decision for planning risk management activities around the process for ensuring secure transition. Furthermore, from the perspective of information system development, the

model presented in this research provides a tool to analyse and appraise acquisition method alternatives when moving from legacy to cloud platforms, as well as better understanding of the shortcomings, strengths, similarities, and differences among these alternative methods.

In order to sum up the results of the research, Table 1 is the proposed framework that follows an integrated approach to manage risks and challenges in seven phases of migration. List of risks is obtained from the review carried out for migration processes to Cloud. Typical pain points are listed as challenges in each phase accompanied by the root causes and success factors that can serve to influence migration cycle. Continual Improvement tasks and Change Enablement tasks are included as considerations for managing complete lifecycle using a single integrated framework. Theoretically the proposed framework provides insights into the challenges that might affect the project and provides guidance on the technique that need to be followed to accommodate the complexity of the shift for the organization.

Table 2.

Snapshot of the Proposed Migration Framework

Date:	April 08th 2020
Resources used:	COBIT 2019 - Implementation Guide & Design Guide, Research Journals, Online Articles
About	Proposed framework is a result of the study conducted in order to identify the challenges and risk in migrating legacy systems to cloud. This framework is derived to help organizations take a strategic approach in mitigating critical risks. A system migration can be managed as a project that typically breaks it in different steps. COBIT Implementation Guide was found to have a similar perspective of using an integrated approach for handling a Information Technology implementation in phases. COBIT takes into account . In its approach, Cobit researchers intensively studied various IT implementation programs and identified challenges that cause major issues in getting successfull with impementation. Each challenge is sub sectioned into Root Causes that gives insight of the reasons. And further lists Successfactors that are basically the suggested best practices for planning the actions steps. The risks associated with storing and processing information in the cloud needs to be managed through a holistic approach of governance and management. Migration risks and challenges are mapped to the general IT Implementation challenges identified in Cobit guide. Purpose of the exercise is to design a framework that will serve as a guide for executives to take an educated approach for conducting a secure migration. Organization can use this framework to rest assured that the implementation

Phase 1—What Are the Drivers?

Description of Phase: Obtain an understanding of the program background and objectives behind the migration and current management approach. The buy-in and commitment of all key stakeholders is obtained in this phase.

Cloud Migration Challenges	COBIT Challenges	Root causes	Success factors	Continual Improvement Tasks	Change Enablement task
Management lacks long-term commitment.	a) Lack of senior management buy-in, commitment and support b) Difficulty in demonstrating value and benefits	Lack of understanding (and evidence) of the importance, urgency and value of improved governance to the enterprise Lack of resources Poor understanding of the scope of the migration process and the differences between governance and management. Implementation driven by a short-term reaction to a problem rather than a proactive, broader justification for Concern about "another project likely to fail"; lack of trust in IT management	Make migration process a board, audit committee and risk committee agenda item for discussion. Create a committee or leverage an existing committee, such as the I&T governance board, to provide a mandate and accountability for Avoid making migration appear to be a solution looking for a problem. There must be a real need and potential benefit. Identify leader(s) and sponsor(s) with the authority, understanding and credibility to take ownership of implementation success. Identify and communicate pain points that can motivate a desire to change the status quo.	For continual improvement approach at this stage understand enterprise strategy, goals and understand the risk profile. Recognize the need to act by identifying business and IT pain points, events that trigger the need. Identify	The purpose of change enablement in this phase is to understand the breadth and depth of the envisioned change, the various stakeholders that are affected, the nature of the impact on, and involvement

Note: For more details please refer the excel file 'Cloud Migration Framework'.

Framework is also accessible using the following link or by using the excel icon:

CLOUD MIGRATION FRAMEWORK (Gdrive link)

Cloud Migration Framework_08APR202

Conclusions and Recommendations

Cloud solutions provides access to high computational power at a fraction of the cost. Although industry leaders and customers have wide range of expectations from cloud computing, privacy and security concerns remain a major impediment to widespread adoption. Benefits of Cloud computing motivates organizations to consider moving the Legacy Systems to Cloud. When organizations decide to migrate the legacy system to Cloud in full or in part, a framed and planned approach is needed to ensure protection of services and data. Organizations must consider number of challenges arising throughout the transition process and should follow best practices in order to achieve a successful integration of applications within cloud. There is a need for systematic architectural support for adaptation purposes during cloud migration. A framework is required that clearly indicates the steps advisable to follow in order to assess and mitigate the risks at every migration stage, the techniques most appropriate to implement the security aspects of systems for the purpose of achieving complete assurance of system configuration. After analysis conducted through this research, it can be concluded that proposals that provide theories on safe migration of legacy applications to the Cloud clearly lacks the guidance of an integrated approach for managing risks with the perspective of governance and management activities. Prior research in the cloud computing emphasizes the availability of mechanisms that can ensure increased benefit and effectiveness of the cloud computing technology. To extend the trend grounded in an extensive qualitative analysis and issues entangling implementation aspects of cloud migration, this framework provides generic insight into the key challenges in transition. These insights include analyses in organizational context, understanding cloud migration requirements, planning, understanding legacy systems, impact of cloud platform for maintaining

incompatibility between legacy systems and cloud services. There are still areas to augment the framework by including new elements which have received less attention in the current literature. These elements may be related to the continuous monitoring and collecting critical data about legacy system health to assure SLAs with cloud provider.

For future work, researcher can add other aspects in defining migration process while considering additional security aspects that could have been missed. The field of system migration is still in a formative stage, but stabilizing. We identified a need for a concrete migration framework to enable systematic migration to the cloud. Our study indicates that cross cutting concerns are not yet adequately addressed. We also observed a lack of tool support for enhancing the cloud migration process. We believe that to mature the field further, cloud computing and software engineering researchers need to propose the use of a standard framework approach to mitigate the risks.

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