Assessment of Enterprise Resource Planning systems in the Central Bank of the Republic of Azerbaijan: In the case of Financial Market Regulation and Supervision

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Abstract

Ensuring effective and efficient financial market supervision is challenging when a financial supervisory authority covers diverse range of financial institutions with unique risk profiles. Those authorities are therefore seeking Enterprise Resource Planning (ERP) systems in order to leverage technology based solutions to enhance the efficiency and effectiveness of their regulatory and supervisory roles.

In Azerbaijan the Central Bank of the Republic of Azerbaijan (CBAR) is assigned as the mega regulator in financial sector from 2020 on. Given that CBAR's supervision involves a large number and a various types of financial institutions, it must deal with complex supervisory tasks to ensure compliance with regulatory requirements. The objective of this study is to assess the ERP systems in CBAR used in financial market supervision.

The research was conducted in a qualitative fashion by interviewing CBAR's professionals to determine efficiencies and deficiencies of the existing ERP systems of CBAR by measuring how effective is the supervisory capacity in CBAR.

The findings showed that CBAR has several useful supervisory systems in place. However, it is lacking numerous necessary supervisory solutions to attain its supervisory goals. Without relevant ERP systems, CBAR is unable to effectively apply risk-based supervision, focus on risk profile of financial institutions and prioritize supervisory actions with targeted allocation of resources. To address the deficiencies identified, the study also provided recommendations to develop an integrated ERP systems for financial market supervision.

This thesis adds to the work on supervisory technology in financial market supervision. It may also be particularly useful to CBAR to develop adequate systems within the organisation.

Keywords: ERP, SupTech, supervision, data collection, data analytics, financial markets.

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List of Abbreviations

AI	Artificial Intelligence
API	Application Program Interface
ASIC	Australian Securities and Investments Commission
BaFin	Federal Financial Supervisory Authority in Germany
BNR	National Bank of Rwanda
BOI	Bank of Italy
BOL	Bank of Lithuania
BRSA	Banking Regulation and Supervision Agency in Turkey
BSP	Central Bank of Philippines
CBAR	Central Bank of the Republic of Azerbaijan
CETA	Centralised Exchange Trading System of Azerbaijan
CFTC	Commodity Futures Trading Commission in USA
CMB	Capital Markets Board in Turkey
ECB	European Central Bank
ERP	Enterprise Resource Planning
FCA	Financial Conduct Authority in the UK
FINRA	Financial Industry Regulatory Authority in USA
IOSCO	The International Organization of Securities Commissions
IRSA	Insurance Regulation and Supervision Agency in Turkey
MAI	Market Analysis and Intelligence System in ASIC
MAS	Monetary Authority of Singapore
ML	Machine Learning
NLP	Natural language processing
OeNB	Austrian Central Bank

PRA   Prudential Regulation Authority in the UK

SEC   Securities and Exchange Commission in USA

SupTech   Supervisory Technology

1. Introduction

1.1. Rational of the study

Effective financial market supervision is critical to ensure that financial stability is maintained, financial institutions are healthy and trusted by public, excessive leverage is prevented, integrity in the financial system is preserved, and consumers' protection from unfair business practices is achieved. Nevertheless, financial market supervision is challenging, because financial sector supervisory authorities (supervisory authorities) must collect wide range of data from different sources and conduct complicated quantitative and qualitative analyses to ensure compliance with regulatory requirements, which often involves judgement-based rules. These challenges are become much more complex when a supervisory authority supervises various financial markets and a large and diverse number of financial institutions with distinctive risk profiles. For instance, a supervisory authority's may not only supervise activities of banks, but also microfinance institutions, securities market participants, insurance companies, payment system providers, asset and portfolio managers, e-money issuers.

Many supervisory authorities are therefore in need of Enterprise Resource Planning (ERP) systems, that use innovative technology tools to increase the efficiency and effectiveness of their supervisory activities. ERP is a technology-enables solution that incorporates business processes and information within a single system to be used in an organisation. The use of adequate ERP systems within a supervisory authority can facilitate data collection and analysis from financial institutions, enhance supervisory business processes, enable the users to better monitor financial markets and detect sources of risks and improve interaction with supervised financial institutions.

In Azerbaijan the Central Bank of the Republic of Azerbaijan (CBAR) is assigned as the financial market regulator from the beginning of 2020. CBAR's supervisory powers cover

supervision for activities of banks, non-bank credit institutions, credit unions, operator of postal service, currency exchange operators, insurers, reinsurers, insurance intermediaries, actuaries, independent auditors, independent experts and legal entities engaged in ancillary insurance, investment firms, investment funds and investment fund managers, central securities depository, stock exchanges, clearing house, payment service providers, along with supervision over market conduct in credit market, insurance market and capital market. Given that CBAR's supervision mandate involves a large number and a various types of financial institutions, it must deal with complex supervisory tasks to ensure compliance with regulatory requirements. This study evaluates CBAR's capacity of ERP systems used for financial market supervision.

Although the literature dealing with ERP systems in the financial market supervision is very rare, this thesis is focusing on the technology-driven solutions used by supervisory authorities, by researching CBAR's current supervisory tools to determine how effective they are, what are the gaps and how can these systems further developed.

1.2. Research Objective and Research Questions

CBAR's primary goal is to ensure price stability in the county by implementing monetary and foreign exchange policy. Its goal is also to organize and ensure operation of centralized interbank payment systems. CBAR was also given the mandate of ensuring financial stability in the end of 2019. From the beginning of 2020, CBAR is implementing its regulatory and supervisory powers again for the activities of credit institutions, which had been discharged back in 2016. CBAR's regulatory and supervisory powers now also cover the securities market and insurance market, which are new areas for CBAR.

CBAR's supervisory powers in the financial sector include ensuring the stability of financial institutions, conducting inspections in the supervise entities to identify incompliance

risks, protecting the creditors, insured persons, investors and other consumers of financial markets from risks posed by financial institutions, implementing macroprudential supervision, conducting stress-tests at the regulated financial institutions and analysing system risks in financial markets, implementing licensing and authorization of financial institutions. CBAR also conducts enforcement measures in relation to noncompliance and violations of regulatory requirements by financial institutions.

The increased scope and complexity of regulatory and supervisory powers present a challenge for CBAR. In response, CBAR should have adequate ERP systems, that allow using technology-enabled solutions that automated supervisory business processes in order to increase efficiency and effectiveness in supervisory tasks.

The objective of this business consultancy project is to assess the ERP systems in CBAR used for financial market regulation and supervision. The study will identify efficiencies and deficiencies of the current ERP systems in CBAR by focusing on the supervisory goals and business processes for supervisory tasks and measuring how effective is the supervisory capacity in CBAR. Based on the shortcomings identified, the study will also provide recommendations to further develop adequate ERP systems that can increase the effectiveness and efficiency of CBAR's supervisory roles.

This study attempts to find answers to the following research questions:

1. What is the extent of the ERP systems implementation in CBAR for financial market regulation and supervision?

2. What are the gaps in the ERP systems that affects CBAR's supervisory capacity?

3. What are the further development needs of the ERP systems of CBAR in order to increase effectiveness and efficiency in supervisory work?

1.3. Research Approach

Based on the objective of the business consultancy project, the study will evaluate CBAR's ERP systems used for financial market supervision, determine the shortcomings in the systems and will provide recommendations for further development. In doing so, the research will conduct Strategy Analysis, which is performed to identify the business need, how to address that need, and how apply strategy for the change.

The Strategy Analysis takes into account current state analysis, future state analysis, gap analysis and change strategy. Current State Analysis is employed to identify the business need and how an organisation functions today. Current State Analysis of ERP systems in CBAR will incorporate analysing the effectiveness of the systems used in banking supervision, insurance market supervision and capital market supervision. Future State Analysis is conducted to define required conditions to comply with the business need. It will provide an adequate ERP system that aligns with CBAR's goals and objectives in supervision of financial markets. A gap analysis will be performed between current and future state to determine the deficiencies, and a change strategy will be proposed to reach the future state. Thus the study will prepare recommendations and a strategic action plan to upgrade CBAR's ERP systems in order to enhance its financial market supervisory capacity.

This thesis employs qualitative approach in collecting data, as described in Chapter 3.

1.4. Thesis Outline

This business consultancy project is consist of five chapters. The first chapter provides information on the research objective, determines research questions and briefly describes the research approach. The second chapter presents the literature review on the following topics: the concept of ERP, the concept of supervisory technology, the use of supervisory tools in practice by various supervisory authorities and describes the benefits and challenges of

adopting smart supervisory tools. This chapter provides detailed information on an ideal ERP system equipped with smart supervisory tools that can be used for various supervisor tasks based on the findings of the literature research.

The third chapter presents the research design, the research process, data collection and analysis conducted in the thesis. It also touches the ethical issues dealt with. The fourth chapter provides the results of the current state analysis of ERP systems in CBAR used for supervision of financial markets, then describes future state analysis based on data collected from literature review and recommendations from interviews. The chapter concludes with a gap analysis between current state and future state of ERP systems in CBAR for supervisory work.

Finally, the fifth chapter presents the conclusion to the business consultancy project and answers the research questions, provides a strategic action plan with description of roles and responsibilities to upgrade CBAR's ERP systems in order to conduct supervisory work more effectively and efficiently and mentions limitations in the study.

2. Literature Review

Based on the research questions given in Chapter 1, this chapter goes through literature review on ERP and supervisory solutions. It also mentions the use of smart technology solutions by various supervisory authorities in the world. The research also demonstrates how technology driven solutions increase the effectiveness and efficiency in supervisory work and contributes significantly to design and propose integrated ERP systems to CBAR in order to answer the research question 2 and the research question 3.

2.1. Enterprise Resource Planning (ERP)

ERP system integrates business information and functions into a single software within a company. ERP is considered one of the most important systems in an organisation, which

enables companies to integrate various business functions and also creates distinction between business functions through the use of automated solutions (Samwel and Patrick, 2013). In addition, ERP systems can facilitate the flow of data between internal business processes within an organisation and allows establishing a single database (Aslan, Stevenson and Hendry, 2015). ERP is also playing a significant role in facilitating business processes, subsiding costs and increasing operational efficiency (Beheshti 2006). ERP is the most widespread concept adopted by organisations to increase productivity and performance, and continuous use of ERP systems increases the activities of business by 30% thanks to enhanced speed of decision-making (Davenport, 2007). In the light of operational efficiencies and benefits, ERP systems have transformed to the heart of business intelligence for institutions as they provide an integrated view of business processes to organisations (Parr & Shanks, 2000).

2.2. ERP in Financial Regulation and Supervision

The financial sector in the world is going through a digital transformation and as digitalisation increases access to financial services and expands financial inclusion, governments should assure that digital financial services do not hurt people, thus governments are in need of adequate regulatory framework and consumer protection tools (Demirgüç-Kunt, Klapper, Singer, Ansar, and Hess, 2018). Robust supervisory policies and tools ensure the market integrity and financial stability in the financial sector. In this regard, Supervisory Technology (SupTech) provides necessary tools to address the abovementioned concerns.

SupTech is the technology solutions used by financial market supervisors to conduct monitoring and supervision in the financial sector, including banking supervision, insurance market supervision, securities market supervision, payment services supervision and AML/CFT supervision. Financial supervision is generally conducted by government authorities, such as central banks or specific government agencies. For instance, Securities and

Exchange Commission (SEC), Commodity Futures Trading Commission (CFTC) and Financial Industry Regulatory Authority (FINRA) in U.S., Financial Conduct Authority (FCA) and Prudential Regulation Authority (PRA) in the UK, Federal Financial Supervisory Authority (BaFin) in Germany, Central Bank of Russia in Russian Federation, Capital Markets Board (CMB), Banking Regulation and Supervision Agency (BRSA), Insurance Regulation and Supervision Agency (IRSA) in Turkey are financial market supervisors. Financial market supervisors have common objectives and responsibilities, which include ensuring proper functioning, stable, secure, transparent, fair and competitive financial markets, protecting the rights of consumers and investors, along with development of markets and financial inclusion.

Integrated SupTech tools form ERP systems used by supervisory authorities for business processes in implementing supervisory tasks. SupTech tools help supervisory authorities to effectively and efficiently execute their functions and responsibilities. SupTech tools enable supervisors to use technological solutions in their evaluation of compliance of financial institutions with the legal and regulatory requirements.

2.3. Overview of the SupTech tools

Information about the most commonly used SupTech tools are given below:

Application Program Interface (API) enables software programs to communicate with each other (Basel Committee on Banking Supervision, 2018). APIs allow the interaction between systems to ensure that data is accurately transmitted notwithstanding the architectural distinctions between software solutions. APIs improve the information flow between institutions and therefore allows development of innovative systems. Given the significant importance of data collection in financial supervision, APIs are especially beneficial in SupTech solutions.

Artificial Intelligence (AI) creates intelligent tools in the form of development of systems that executes tasks demanding human intelligence and competences (Basel Committee on Banking Supervision, 2018). AI incorporates several essential sub-fields, including machine learning (ML) and natural language processing (NLP). ML is focusing on improvement of problem-solving algorithms that progress automatically by learning. Machine analyse huge amounts of raw data, determine patters in the datasets and learns how to execute work flow (Matlab, 2020). NLP is the competence of software to understands language of people. These algorithms allow programs to analyse enormous amount of data within a short period of time (Duke SciPol, 2019). Therefore, NLP is gradually used in regulatory approval systems in order to support supervisory authorities to enhance reviewing of documents presented for approval.

Big Data Analytics is a process used to generate meaningful insights from the large volume of structured and unstructured data (Dias and Staschen, 2017). Big data can be referred to large volumes of heterogeneous information created and analyse quickly and can be helpful in yielding important conclusions (Stucke and Grunes, 2016). Big data and big data analytics are robust tools for its users given that they can be used in problem-solving, identifying market trends, patterns and correlations (Wibisono, Ari, Widjanarti, Zulen and Tissot, 2019).

Cloud Computing delivers provision of computing services via the internet. Cloud computing, which allows its users to have access to computing services without obtaining an IT systems, proposes remote and shared servers on the internet supported (Microsoft Azure, 2020). The technology is being increasingly used by organisations to as avoid from initial capital expenditure of investing in IT infrastructure and following maintenance expenses that are required for IT systems.
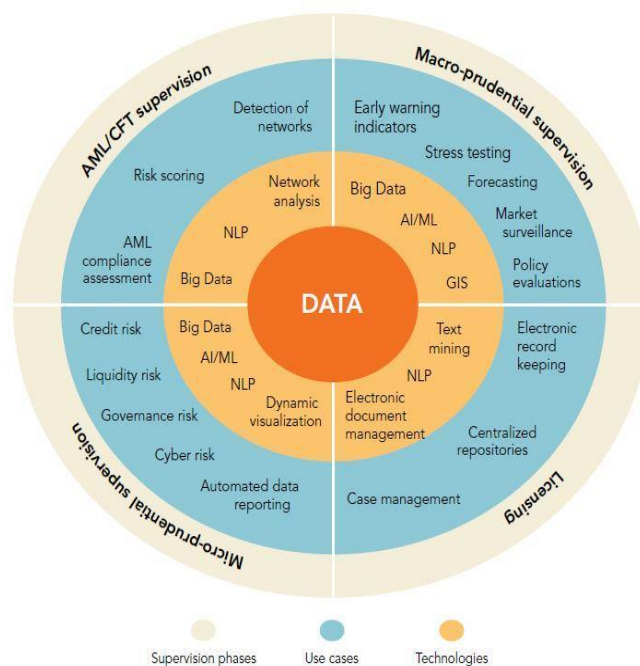
Figure 1: SupTech tools and use cases. Source: World Bank (2020).

2.4. Drivers of SupTech

After 2008 global financial crises regulatory requirements for financial institutions increased and as a result supervisory authorities are managing and handling much more regulatory requirements and information since then. To increase efficiency and effectiveness in the supervisory work, the use of digitalised supervisory solutions has become inevitable.

With the development and employment of SupTech solutions, supervisory authorities benefit from strong supervision and enforcement. SupTech solutions enable a rapid and reliable data collection from financial institutions compared with template-based approach thanks to embedded data scripts and data integrity tools. This decreases traditional communication between supervisor and financial institution to correct errors in reports. As a result, with less manual processes and improved monitoring, supervisors can take fast supervisory measures.

Financial Stability Board's 2020 report displays that enhancing efficiency is the main intention of SupTech use by supervisory authorities. It should also be noted that as information gathered from financial institutions expands, this supports supervisory authorities to apply more insightful policy, and risk-based and forward-looking supervision. This is considered very helpful to deal with better identification and mitigation of financial stability risks.

Evolving technology permits better, fast and intelligent analysis of regulatory data (Bauguess, 2017). For instance, securities market supervisors deal with thousands of regulatory reporting and it is impractical for them to go through each one thoroughly. SupTech applications can review all the reports and detect non-compliance risks with less human interaction. Broeders and Prenio (2018) state that SupTech makes rich analysis via integrating structured and unstructured data via applying AI and ML.

2.5. The Use of SupTech

SupTech solutions are employed for two main objectives - data collection and data analytics. With increased data reporting requirements, solutions that support supervisors with the quality, reliability, accuracy and volume of data is significantly helpful for supervisory work and enforcement. Data collection solutions help supervisors for reporting and data management. Data analytics applications assist supervisors to conduct market surveillance, misconduct analysis, microprudential and macroprudential supervision (Broeders and Prenio, 2018).
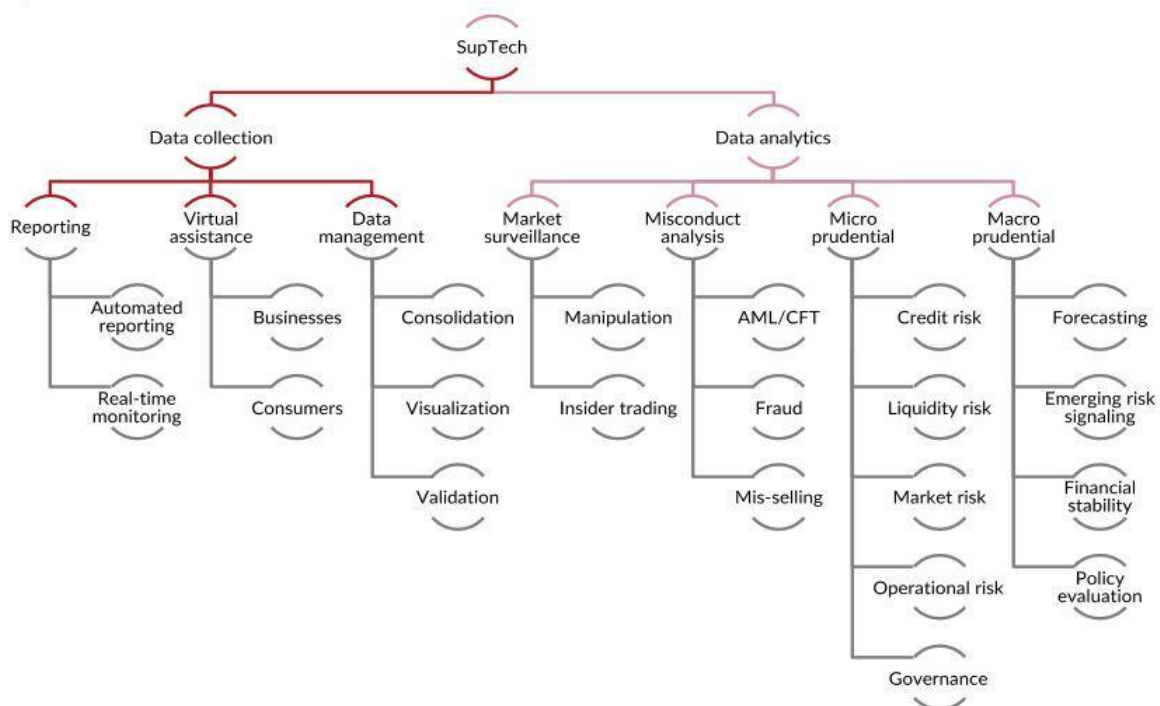
Figure 2: Areas of financial supervision in which SupTech applications are used.
Source: Di Castri, Hohl, Kulenkampff and Prenio (2019)

2.5.1. Data Collection.

Data collection is the submission of reporting data from regulated financial institutions to supervisory authorities with the help of infrastructure. Useful data is crucial for an adequate and effective surveillance of markets and monitoring of compliance. Dias and Staschen (2017) states that completeness, timeliness and accuracy is the factors that provides quality data. SupTech significantly increases the quality and volume of data, that improves efficiency of regulatory reporting.

With the absence of SupTech applications, supervisory authorities use template reporting, which generally contains aggregated data that does not provide flexibility to conduct detailed analysis by supervisors, to interpret and make necessary judgements and even assure that calculations are correct. When modifications are necessary to reports, this becomes very time-consuming and resource-intensive process due to aggregation methods (Dias and Staschen, 2017). Template reporting usually generates duplicate data, complex validation and consolidation, late data delivery, inconsistency and inaccuracy across data.

Post-crises reforms in financial regulation directed supervisory reporting to employ granular data instead of aggregated data with growing reporting frequency. Granular data, which provides much more detailed sets of information, enables supervisory to extract useful data and timely information in order to conduct more efficient supervisory work.

SupTech applications can facilitate increasing need of granular data for supervisory work. These solutions could potentially improve data collection process and reduce the disadvantages of classic supervisory approaches. Moreover, SupTech solutions could allow the automated collection of granular data to conduct better supervisory work including reporting, management of data and virtual assistance.

2.5.1.1. Supervisory Reporting.

AS an alternative to template based reporting, SupTech solutions provide improved data reporting via automated and real-time data collection. Automated reporting can be categorized as data push approach or data pull approach.

Data push approach allows regulated financial institutions to deliver their regulatory filings to supervisory authority's central database. The reports are submitted in a standardized granular form determined by the supervisory authority. The advantage of this reporting over template based reporting is that supervisors receive detailed data instead of aggregated data, which improves supervisory assessment and capability.

For instance, Austrian Central Bank (OeNB) with the regulated banks in 2014 transformed reporting model from template based reporting to data push reporting through Austrian Reporting System (Piechocki and Dabringhausen, 2015). Banks submit their data in a standard format to Austrian Reporting System, which creates a basic data cube. Then the platform divides basic data cube into various smart cubes, based on the business type, such as deposits, loans, asset management and push it to OeNB (Turner, 2016).

Basic cubes are granular data sets, which can be used and checked in several forms at any time. This provides extra flexibility to supervisors in their supervisory work. This also minimizes banks' non-compliance risks and hence, provides cost-saving to banks.
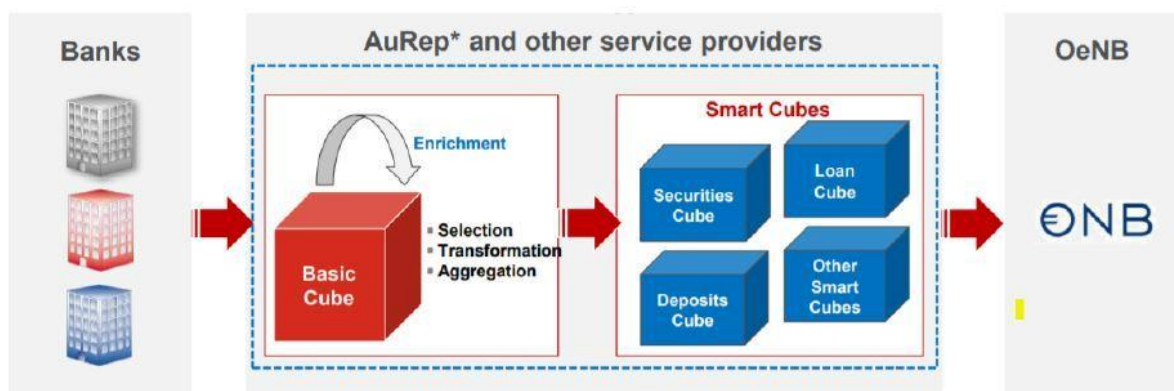
Figure 3: Data Flow Diagram of Austrian Reporting System. Source: Turner (2016).

European Central Bank (ECB) is currently working on revolutionizing supervisory reporting across European banks by creating a single data collection system (ECB, 2020).

Data pull approach allows supervisors to automatically extract data from the financial institutions' IT infrastructure. Data pull also enables supervisory to receive report either periodically or at the occurrence of specific events or trigger thresholds. One of the first data pull reporting was carried out by National Bank of Rwanda (BNR) in 2017. BNR collected data from financial institutions every 24 hours, and every 15 minutes depending on the type of data by using an electronic data warehouse (Broeders and Prenio, 2018).

Central Bank of Philippines (BSP) is another example that conducts data collection through data pull reporting. BSP, in 2018, transformed Excel-based templates to XML-based files by creating an API-based prudential reporting system, which pulls data from banks' IT infrastructure without any need for human intervention. Di Castri, Grasser and Kulenkampff (2018) report that BSP increased the efficiency in its supervisory work thanks to the new reporting process.
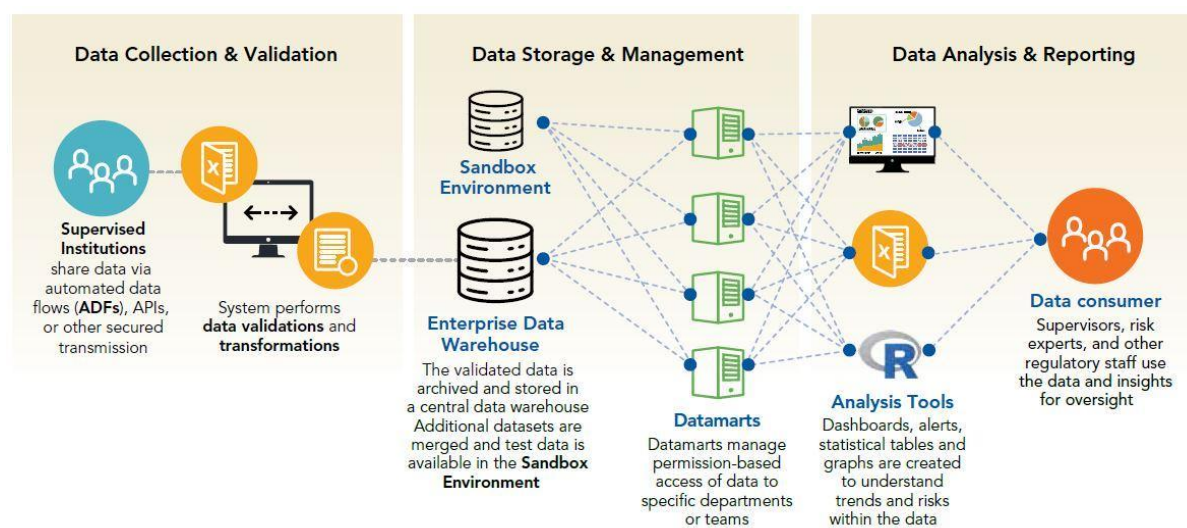
Figure 4: Data flow diagram for data-pulling reporting system. Source: World Bank (2021).

World Bank's Discussion Note in June 2018, compares OeNB's data push reporting approach with BNR's data pull reporting approach, and state that the second approach produces new concerns and challenges in terms of data privacy, operational and reputational risk.

Real-time monitoring is an advanced automated reporting method, which is considered as a further step of data pull reporting, that provides access to data within specific time intervals. Supervisors, using real-time monitoring system, can pull data any time there is a need. This method is generally used for monitoring financial transactions and markets. For example, Australian Securities and Investments Commission (ASIC) has developed Market Analysis and Intelligence system (MAI), which enables ASIC to monitor securities market transactions in real-time and examine for any unusual transactions that pose risk to financial markets (Broeders and Prenio, 2018).

2.5.1.2. Data management.

Data validation provides supervisors with the assurance of data quality. Dias and Staschen (2017) states that data validation identifies whether reports submitted within the determined dates, the data is correct, which implies that data is filled accurately and information is correct, and reports are consistent with the past and current reporting periods.

SupTech solutions provide automatic data validation examinations, that include data cleansing and data quality checks, which can be otherwise extremely time-consuming process for supervisors (Gogineni, 2019). The increase in data quantity marked the necessity of automation in validation process. For instance, Monetary Authority of Singapore (MAS) and the OeNB have been using ML in the identification and flagging of unusual data in reporting.

Data consolidation applications assist supervisors in combining huge amount of data from various sources in different formats. SupTech helps integration of various forms and types of data to form a single data set, which produces practical understanding of financial markets

for supervisors (Broeders and Prenio, 2018). SupTech also allows to aggregate micro data to formulate macro data, which displays a better picture of events going on in financial markets.

Data visualization of SupTech induces graphical or pictorial presentation of data that can provide valuable insights for supervisors. Supervisory authorities use charts, graphs, dashboards, interactive tools, scenario analysis, predictive modelling and other tools to identify unclear correlations, patterns and trends in data sets (EY, 2019). Rise of Big Data signifies the importance of data visualization tools that facilitates dealing with complex data sources.

Data storage functionality of SupTech is becoming very important as supervisory are dealing with increased amount of data. High cost of creating and maintain the relevant IT infrastructure and data privacy issues produces inefficient data storage and management, and also reduced the capability of supervisors to use data. Cloud computing allows users flexibility, security and efficiency in handling huge data of financial institutions, their storage and management (Di Castri et. al., 2018). Data lakes provide pull of raw data, which can be used by supervisors any time. Cloud computing is employed by FCA and SEC to store and manage huge data sets (Broeders and Prenio, 2018).

2.5.1.3. Virtual assistance.

Virtual assistance tools, such as chatbots and machine readable regulations are advanced SupTech functionality that leverages AI to support supervisors.

Chatbots applications allows conversations with humans with the help of AI. Chatbots can help supervisory authorities to communicate with financial institutions and also with consumers. Supervisory authorities can help financial institutions to explain the regulations, legislations and rulebooks. Chatbots are especially useful to receive consumer complaints. Dealing with complaints can assist supervisors to detect non-compliance or illegal activity of financial institutions that may otherwise not spotted.

Bank of Lithuania (BOL) is using an automated complaints-handling and dispute-resolution system to effectively evaluate complaints since 2016. World Bank (2018) reports that this system enhances access to the public for submitting a complaint, presents automation into complaints-handling processes, and optimizes data management for supervision. The work flow diagram of the system is given in Figure 5.
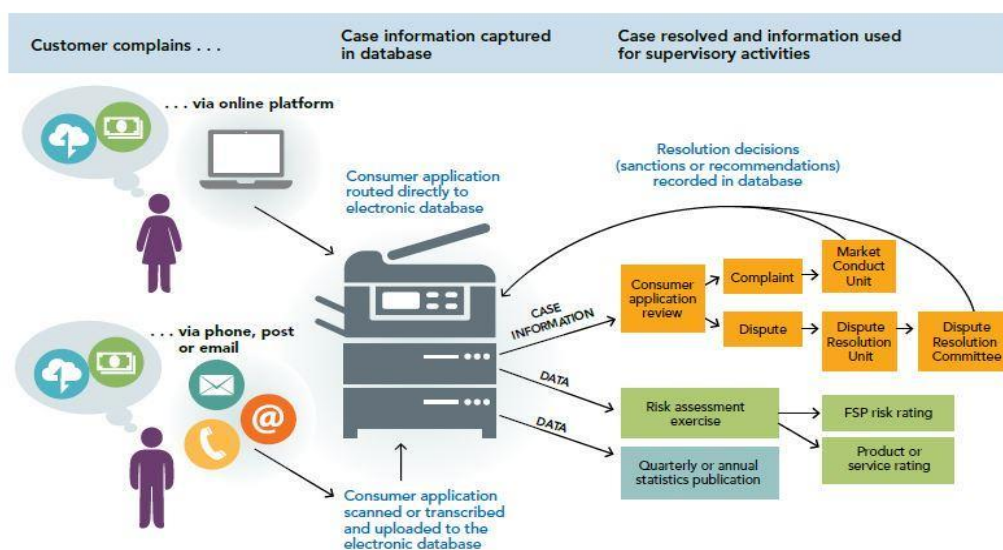
Figure 5: Data flow diagram for Complaint Management System in BOL.
Source: World Bank (2018).

Machine readable regulation concentrates on transforming regulatory texts into a machine-readable format, that can be read by IT infrastructure of financial institutions. These institutions can accurately interpret the new format of regulatory framework and could narrow the gap between regulatory requirements and its interpretation by market (World Government Summit & Accenture, 2018).

2.5.2. Data Analytics.

Digitalisation of data collection plays a significant role to conduct adequate and effective supervision. Innovative technology's main contribution, however, is data processing with advanced analytical solutions. For a profound understanding of things going on in finance

sector and markets, SupTech solutions offers effective data analytics tools, such as market surveillance, misconduct analysis, and prudential supervision.

2.5.2.1. Market Surveillance.

Market surveillance is conducted by supervisors to monitor and detect market abuse cases with securities market transactions in order to protect investors. Market abuse practices occurs when i) abusers trade listed stocks or bonds of a company based on information which is not publicly available (insider dealing), ii) abusers manipulate the market price of listed financial instruments, and iii) abusers spread incorrect information about a public company or its financial instrument. Market abuse practices creates unreasonable disadvantage to investors by abusers and criminals.

One of the main tasks of supervisory authorities is to ensure fair markets and protection of investors. SupTech applications are employed to help supervisors in market surveillance in order to identify and prevent market abuse practices, by analysing vast amounts of primary and secondary market transactions with financial instruments. These solutions are processing real-time securities market transactions to be able to detect patterns in the transactions data, and examines abnormalities in trading activity. Upon identification of insider trading and market misconduct, these solutions alert possible market abuse practice.

Supervisory authorities such as SEC, FCA, ASIC, CMB are using advanced market surveillance tools to deal with real-time transactions in order to enhance their supervisory capabilities (Broeders and Prenio, 2018).

2.5.2.2. Misconduct Analysis.

SupTech solutions can also support supervisors for misconduct analysis in financial markets. Supervisory authorities carry out misconduct analysis in order to detect AML and

CFT risks, fraud and mis-selling.

AML/CFT supervisors ensure the compliance with the requirements for the prevention of money laundering and terrorist financing risks of financial institutions. SupTech applications in the area of AML/CFT are concentrating on to find unusual transactions, relations and networks that cannot be observed by humans. Supervisory authorities in the leading countries use NLP and ML technologies to analyse suspicious transaction reports of regulated institutions to detect money laundering networks. For instance, Bank of Italy (BoI) uses big data in AML/CFT area to find potential unlawful actions with transactions over EUR 15,000 for last 5 years with checking for press reviews. Use of this technology reduce a time consuming supervisory processes to a few minutes.

Fraud. Smart technologies such as ML algorithms can help to detect possible fraud cases. For instance, SEC is using sequential method to find relations and patterns in the data of regulated entities. The technology filter transaction data to common data and outlier data of financial institutions and notify supervisors with potential risks. The algorithm learns patterns and trends in data, and then can easily identify possible fraud or misconduct (Bauguess, 2017). In contrast, without machine learning, basic algorithms provide a lot of alerts in data when they search for patterns, which do not help much in terms of accuracy of the process. Therefore, ML technology is particularly helpful for detection of complex fraud and money laundering cases.

Mis-selling occurs when a broker, financial adviser, insurer or a bank representative misrepresent a product or a service to people in order to complete a sale. FCA is employing random forest technique to detect the possibility of a financial institution mis-seling financial instruments. To fight for mis-seling of financial instruments, FCA is learning where mis-seling cases might likely to occur (Hunt, 2017). Supervisory authorities also use visual analytics to find possible misleading advertisement of financial products (World Government Summit & Accenture, 2018).

2.5.2.3. Microprudential and macroprudential analysis.

Before 2008 financial crises, individual risks of financial institutions were the primary object of financial supervision in order to protect the financial stability. The crises proved that microprudential supervision alone is not adequate in protecting the economy. Financial institutions are more connected with each other, which leads to systemic risks in the market arising from possible fail of systemically important financial institutions. Following the 2008 financial crises, supervisory authorities are combining microprudential supervision with macroprudential supervision in order to ensure financial stability in the economy. To do this, supervisors are monitoring both idiosyncratic risks of financial institutions and systemic risks in the financial markets. SupTech solutions are also used to conduct microprudential and macroprudential supervision via smart technologies.

For microprudential supervision SupTech solutions, via using machine learning, monitor liquidity risks and credit risks timely and accurately, as well as other risks such as market risks and operational risks. This enables supervisors to effectively apply risk based supervision to identify risky institutions, and prioritize onsite inspections to evaluate activities of financial institutions in place.

Banks, generally provides loans using deposits, and generally loans are long-term assets, whereas deposits are short-term liabilities. The time difference between loans and deposits can create maturity mismatch. This kind of banking operations, may expose banks to liquidity risks. If a bank comes across with the payment of deposits, this might lead to bankruptcy procedures, and even worse than that this can generate bank runs because of distress of trust among consumers. Therefore, supervisors continuously supervise liquidly risks of banks and other financial institutions.

SupTech applications can detect early signs of potential liquidity issues. Heuver and Triepels (2019) founded a method to identify liquidity risks by employing machine learning,

in which smart algorithms are trained in analysing transactions of risky and financially sound banks in order to determine their individualities. Another framework that proposed to predict bank-runs is creating auto-encoders to identify abnormal transaction flows of banks in the payment data from a real-time gross settlement (Triepels, Daniels and Heijmans, 2017). Tavana (2018) also proposed another model, which uses artificial neural and Bayesian networks to provide alerts of potential liquidity risks based on bank's balance sheet data.

ML is also used to evaluate potential credit risks. BoI is using ML algorithms, which sources data from various sources, including central credit register, credit bureau, financial statement of non-financial firms. By leverages various data sources, ML algorithms predicts loan defaults in comparison with the standard models.

Macroprudential supervision is in the main focus of supervisory authorities, which aims to leverage evolving technology to oversee the systemically important threats by identifying possible relations, trends and correlations in the financial markets. Big data is especially helpful for macroprudential supervision, which combines classic statistical methods and forecasting variables, including GDP, inflation, unemployment, real-estate prices. Big data helps to analyse massive amounts of data from financial market infrastructure, such as payment systems. It can also create significant efficiencies for evaluating bank-specific risks, behaviour of financial institutions and transactions data (Tissot, 2019).

Supervisors can also benefit from using text mining or NLP tools to take into account various data sources, that have not been used before. Text mining could process unstructured data, such as articles, written reports, social media and contribute to detecting macro events occurring in the markets. Loberto, Luciani and Pangallo (2018) state that information obtained from tweets and processed in BoI provided a useful signal for expectations in inflation.

Market expectations are significantly important for policy development. If a central bank's monetary policy rate is different from the expectations of the market, this will lead to

volatility in markets. Smart technologies can help to understand the expectations of various economic indicators. For instance, Bank of Indonesia, uses a ML algorithm to automatically identify expectations on the policy rate by various stakeholders (Zulen and Wibisono, 2018). The model displayed an accurate results compared to Bloomberg's monthly expectations index.

2.6. Benefits and challenges of SupTech

Smart technologies can help to minimize the technological gap between financial institutions and supervisory created by digital transformation in economy and rise of FinTech. Supervisory authorities are in need of new tools to cope with rapid digitalization of financial services, given that established supervision applications could be ineffective in supervising systemic risks. SupTech solutions provides advantages to supervisory authorities to monitor emerging risks of a digital financial system. Moreover, these tools create significant automation in several administrative and cumbersome processes.

Potential Suptech use cases

| Automated data collection processes (use of data-pull or data-input systems; machine readable and executable regulation) | Advanced data validation, analysis, visualization (cleaning and analysis of unstructured data; identification of spikes and trends) | Platform and database integration (examiner dashboards, workflow tools, merging disparate data sets) | Data management and storage (use of cloud computing to store big data) |

Potential Suptech supervisor-level outcomes

| Improved scope, accuracy, consistency, and timeliness of collected information | Enabling/enhancing risk-based supervision (better identification and measurement of risk) | More efficient use of resources (reallocation of staff away from manual tasks) | More efficient information flows between providers and supervisors, between consumers and supervisors, and across supervisors |

Potential Suptech impacts

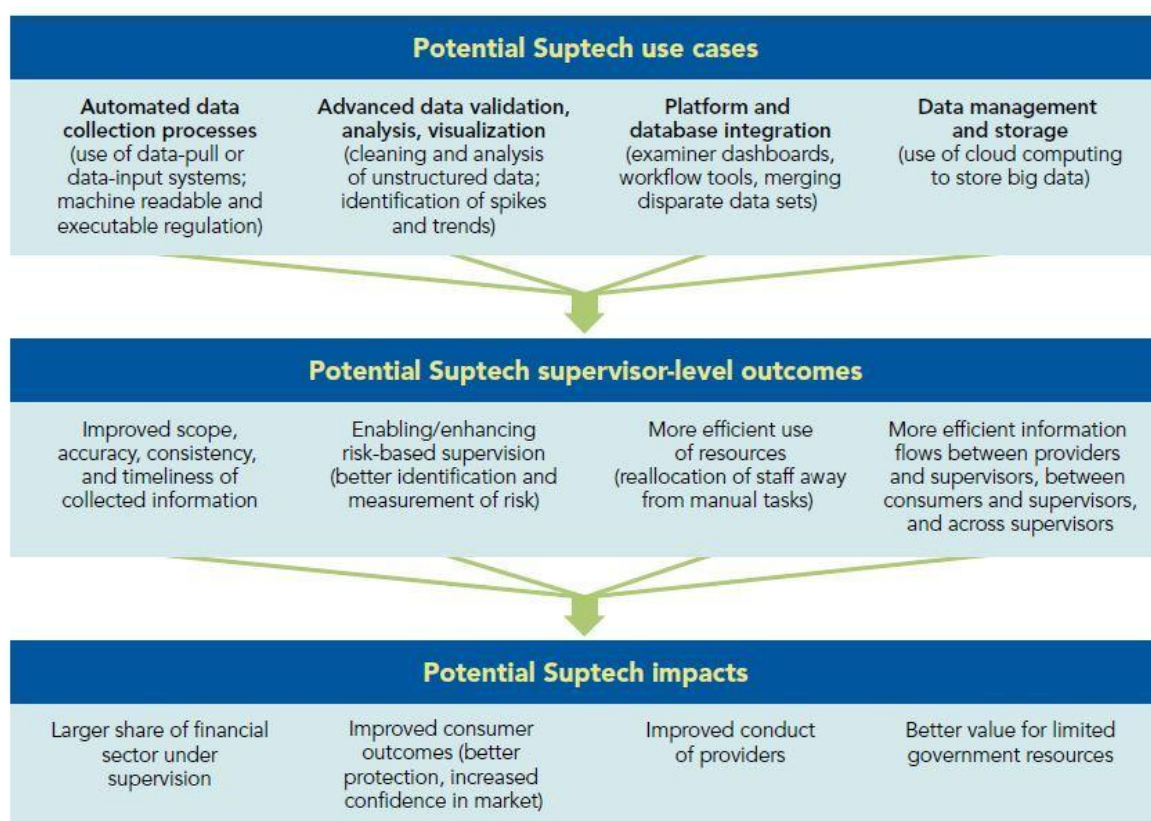| Larger share of financial sector under supervision | Improved consumer outcomes (better protection, increased confidence in market) | Improved conduct of providers | Better value for limited government resources |

Figure 6: Benefits and impact of SupTech. Source: World Bank (2021).

➢ **Ability to handle huge sets of data.** Supervisory can receive valuable insights from use of vast amounts data sets, that provide both structured and unstructured data in order to better oversee the financial markets and institutions.

➢ **Advanced analytical capabilities.** Smart technologies can provide sophisticated supervision tools to identify patterns and relationships in data in significantly less time compared to established tools.

➢ **Automation of work flow.** SupTech tools can improve efficiency, minimize manual errors, free up time and resourced to concentrate on more valuable tasks and improve supervisory capabilities.

➢ **Enhanced supervisory approach.** SupTech applications offer risk-based and data-centric approach to supervision, which focuses on risk profile of financial markets and institutions. This also facilitates the prioritization of supervisory actions, which leads to effective supervisory work with targeted allocation of resources.

➢ **Facilitated entry to the financial markets.** SupTech applications can facilitate licensing and compliance procedures and minimize entry barriers to financial sector. New players in the markets create strong competition and supports financial inclusion.

➢ **Improved cross-sector and cross-border cooperation.** Financial innovation lead to increased level of cross-border transaction via FinTech tools. SupTech solutions could increase data flow among national and international supervisory authorities.

It should be noted that development of SupTech applications is accompanied by various issues and challenges for supervisory authorities, such as technical, data quality, operational, legal and other issues (Broeders and Prenio, 2018).

SupTech solutions may not produce outstanding forecast of risks and non-compliance, instead applications may develop incorrect results. Consequently, a human supervisor should always assess the SupTech outputs before taking any action. Incorrect judgements of SupTech

applications may influence the reputation of supervisory authority. Data quality is another issue for SupTech applications, such that information from social media can be incomplete, and lead to wrong judgements.

Use of SupTech applications incorporates operational risks, such as cyber-risk. Using open source and cloud applications increases external risks when data is transmitted online (Financial Stability Board, 2019). Cyber-risks are also present in the supervisory reporting solutions, where the supervisory authority's and financial institution's systems are integrated. Data security is the primary risk in an automated environment, which could lead to data losses and discontinuation of supervisory work. Therefore, strong risk management framework should support SupTech solutions.

The use of SupTech applications require skilled resources, which is challenging. The intensive utilization of SupTech solutions will necessitate recruitment of data scientists and engineers. It is extremely difficult to find people with backgrounds in data science, computing science and supervision. Therefore, recruits with data science and computing science backgrounds, should go through trainings in regulatory and supervisory course of study. As a result of insufficiency in staff with the relevant background, supervisory authority may assign only one or two key persons for each SupTech application (Toronto Centre, 2018). As a consequence, continuity issues arise when the key staff leaves the organization. Supervisory authorities should also launch training programs for their employees, to enhance their technical skills.

2.7. Chapter Summary

Literature review in this chapter showed that ERP systems are multi-purpose solutions and their use is also critically important in financial market supervision. The chapter also highlighted how innovative SupTech tools revolutionized the supervisory framework. Self-

learning smart technologies, innovative solutions and platforms, real-time monitoring systems assist supervisors in coping with complicated regulatory requirements, enhance market analyses by leveraging expanded datasets and help them increase the efficiency and effectiveness in supervisory work. The findings in the chapter allowed the researcher to formulate and recommend integrated data collection and data analytics systems to CBAR, which also help to find answers to the research question 2 and the research question 3.

3. Methodology of the Business Consultancy Project

This chapter presents the research methodology used this project. It explains the research approach and the reasons of selection of qualitative analysis, describes the data sources used, data collection and data analysis methods employed.

3.1. Research Design

Research design comprises of the collection, processing and analysis of data, which involves experiments, interviews, focus groups, and simulation. The research design concentrates on the research question, explains data collection techniques and describes methodology employed to find answers to questions determined. Therefore, initially the research approach should be selected taking into account the objective of the project. As mentioned, the objective is the evaluation of ERP systems at CBAR used for financial market supervision. This is a business consultancy project, which involves a study that assesses ERP systems of CBAR.

Secondly, the research approach should be chosen, whether it is a quantitative or qualitative research. Quantitative researches focus on numeric data, such as numbers and figures, whereas qualitative research trust on opinions of people. Ghauri (2004) points out that when the researcher wants to explore and understand a phenomenon, which little is known

about, is typical example of qualitative research. Qualitative research does not take into account the facts and figures, it is based on data generated by answers to 'why' and 'how' questions (Bryman and Bell, 2011).

The researcher decided to use qualitative research in this project by through interviews by collecting data from the opinions of the respondents. The researcher came to conclusion that in order to evaluate CBAR's ERP systems used in financial market supervision, the most proper method is having dialogue with CBAR's professional staff to understand the supervisory capacity in the greater context of various supervision functions and to recommend the necessary ERP systems to increase effectiveness and efficiency of supervision.

The objective of this study require deep evaluation of ERP systems of CBAR in the field of financial supervision, therefore the researcher preferred to conduct communicative study rather than a survey study. The data is gathered through semi-structured interviews with CBAR's professional staff and the details are given in section 3.2.1.

3.2. Research Process

In this project the researcher collected both primary data and secondary data. Primary data, that is collected specifically for the research purposes, was obtained through interviews with CBAR's professional staff and it was the most significant source of data collection. Secondary data is collected in this study from respondents include requirements of laws, rules and regulations, and financial market indicators and statistics.

3.2.1. Interviews.

The objective of interviews was collecting data for this project to identify, based on CBAR's professional staffs' experience, what supervisory systems had been used for financial market supervision, how effective were the use of these systems in supporting the supervisory

work, and what kind of supervision processes were needed to be automated in order to increase efficiency of monitoring financial markets.

In qualitative researches, interviews are considered as the most substantial data collection method, which enables the researcher to deeply comprehend the concepts from the perspectives of the respondent (Kvale and Brinkmann, 2009). Interviews would also allow to leverage the respondents' ideas and experience to propose recommendations to implement relevant ERP systems which can increase effectiveness and efficiency of supervisory work at CBAR.

There are several types of interviews used for data collection. In this project, the researcher used semi-structured interviews in which conversations were loosely guided by elaborating different subjects in interview questions, provided in the Appendix of this study. Semi-structured interviews enable the interviewer to receive opinions of respondents in an unstructured way, which gives respondents independence to better understand the issue and perspective of a respondent. This type of interview well-matched with the research objective and therefore it became the choice of the researcher.

Since the research concentrated on the depth of the interviews to obtain relevant information, researcher digitally recorded the interviews to maintain his focus on the conversation instead of taking notes. This also allowed the researcher to review interviews through the recordings to assure the complete ideas and opinions of the respondents were fully understood.

The respondents were chosen on the basis of stakeholder analysis, which allowed identifying people before the project began. Since this project was focusing on CBAR's regulatory and supervisory roles, the interviewees were selected from the relevant departments from the organisational structure of CBAR, which is visible in its website. All interviewees were management level people working as either department directors or head of divisions in CBAR with at least 5 years of work experience. All respondents were denoted by the code

allocated to them in order to sustain anonymity. A brief description of each interviewee is presented in below.

The first respondent, coded ERP01, was a member of Credit Institutions Supervision Department at CBAR, which was responsible for supervision for activities of banks, non-bank credit institutions, credit unions, and currency exchange operators. The second respondent, coded ERP02, was a member of Insurance Supervision Department, which was responsible for supervision of activities of insurers, reinsurers, insurance intermediaries, actuaries, independent auditors, independent experts and legal entities engaged in ancillary insurance. The third respondent, ERP03, was a member of Capital Market Supervision Department, which was responsible for supervision over securities market and its participants, such as investment firms, asset management companies, central securities depository and stock exchange, and also registration of securities. The fourth respondent, coded ERP04, was a member of Financial Stability Department, which was responsible for overseeing systemic risks and any other risks that may affect financial stability in finance sector. The fifth respondent, ERP05, was a member of Legal Department, which was responsible for licensing of financial institutions and approval of financial products. The sixth respondent, ERP06, was a member of Information Technologies Department in CBAR.

Six interviews were hold to collect data. These interviews were sufficient, given that all interviewers were experienced professional staff working in the managerial level positions within the relevant departments of CBAR. Additionally, the interviews concentrated on depth of conversation rather than the number of respondents, and each interview took on average 75 minutes, which allowed to obtain numerous details from the conversations.

3.2.2. Documents.

In this study, the researcher used CBAR's website to obtain information about CBAR's regulatory and supervisory powers assigned by the Civil Code of Azerbaijan, Law on Central Bank, Law on Banks, Law on Non-Bank Credit Institutions, Law on Securities Market, Law on Insurance Activity, Law on Investment Funds, Law on Currency Regulation, and rules and regulations that determine regulatory framework to operate for regulated financial institutions. The study also took into account financial market statistics given in the Statistics section of CBAR's website.

3.3. Data Collection

Data collection for this thesis took place between 19th of April and 7th of May 2021. The researcher identified the key departments of CBAR, based on stakeholder analysis, to conduct interviews. The researcher emailed the selected interviewer and scheduled the time of interview. Due to pandemic, all interviews were conducted online via video conferences. The interviews were conducted in Azerbaijani language in order to give more flexibility and comfort to interviewers. Before starting the interview, the researcher introduced himself provided brief information about the project and anonymity was guaranteed to the respondents in writing their views and opinions in the project. Therefore, the respondents were mentioned in findings by a code assigned to them. The researcher asked if he can record the interviews and permissions was received before the recording.

During the interview, the researcher started with open questions to enable the respondent to express himself/herself freely and flexibly, then used specific questions to extract specific matters about the topic. After the interviews, transcription of the recordings was converted to text using word processor to ensure prevention of loss of any useful information from the interview.

3.4. Data Analysis

This section presents the data analysis processes used in this study. All interview transcripts were taken into account to implement a content analysis via coding (labelling). Content analysis allowed the researcher to organize properly the vast amount of data collected from interviews, to extract the essential information from the large amount of data, allocate them in various sections, and draw conclusions and reach to findings. Content analysis also ensured reliability in analysing data.

The researcher initially identified broad themes based on the supervisory functions, such as microprudential supervision, macroprudential supervision, market conduct supervision, licensing and authorisation and other areas. Transcripted data collected from interviews was organized into categories associated with these supervisory functions and initial coding table was formulated. Employing open coding principles while categorising the data by themes, such as ERP for microprudential supervision, ERP for macroprudential supervision, ERP for market conduct supervision and ERP for licensing and authorisation allowed a wide breakdown of categories. Undecided classifications necessitated analysing the information several times and keyword searches allowed identifying sub categories. The Chapter 4 provides the results of the content analysis.

3.5. Ethical Considerations

As mentioned in section 3.2.1, anonymity was guaranteed to the interviewers for utilizing their responses in this study. The recordings were conducted in order to ensure accuracy in data collected from semi-structured nature of interviews that provided significant amount of information. Before starting interviews, the researcher requested each respondent's oral consent that they agreed the recording of the interview and the recordings will be used in writing the thesis.

3.6. Chapter Summary

This chapter explained the bases for choosing a qualitative study. Data collection was conducted through semi-structured interviews with CBAR's professionals, selected on the basis of stakeholder analysis. Interviews was conducted online and content analysis was employed for data analysis purposes. The research also respected the ethical issues, including anonymity and consent of respondents.

4. Findings and Discussions

This chapter presents the findings from the data analysis processes given in the previous chapter. The researcher has categorized the findings in three sections:

The first section covers a description of overview of financial markets in Azerbaijan, outline of supervisory roles of CBAR and evaluation of ERP systems used in financial market supervision and identification of deficiencies in the existing systems. The second part presents future state analysis based on literature review and recommendations of respondents and proposes an integrated and adequate ERP systems that align with CBAR's goals and objectives in supervision of financial markets. The third section comprises of description of gap analysis between existing systems of CBAR and the future state and discussions on applying change strategy to reach the future state.

4.1. Overview of Financial Markets in Azerbaijan

This section provides an outline of financial markets in Azerbaijan, in order to better understand the scope and importance of financial supervision by CBAR.

Banking Sector. In Azerbaijan there is a bank-based financing model. Banking sector is financially most inclusive sector in the country, and it plays the most significant role in

financial intermediation compared to insurance sector and capital markets. In total, there are 26 banks operating in the banking sector as of the end of 2020. The service network of the sector consists of 447 branches, 2,715 ATMs, and 18,700 employees.

For the end of 2020, the assets of banking sector amounts to 32.1 billion AZN. Thus, the assets of the banking sector make up 94% of the assets of the financial system. The ratio of assets of banks to GDP is 44%. At the end of 2020, the deposit portfolio of banks is 20.7 billion AZN, and loan portfolio is 14.2 billion AZN.
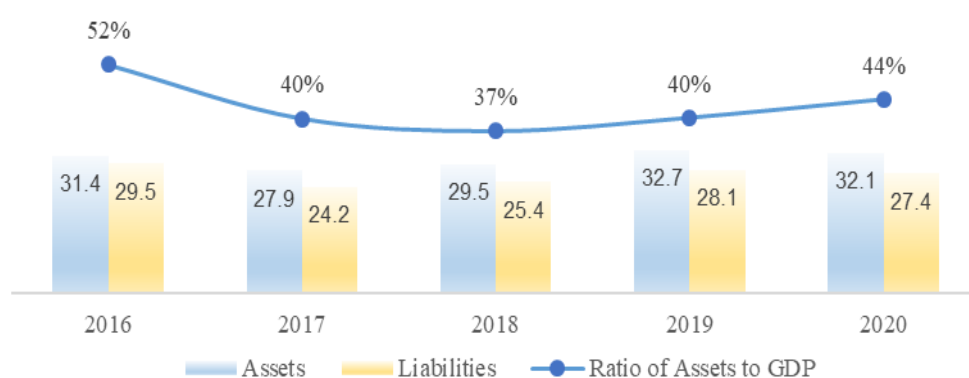
Figure 7: Assets and Liabilities of the Banking Sector (billion AZN). Source: CBAR

In 2020, the banking sector was resilient to exogenous shocks despite the spread of the global pandemic and growing uncertainty in the economy, because of tightening of the macro prudential policy framework in recent years, improvement of banks' risk management and credit underwriting policies, and strengthening of the liquidity and capital positions.

Capital Markets. The main actors in the securities market are CBAR, National Depository Centre, Baku Stock Exchange and investment companies. National Depository Centre is the central securities depository of Azerbaijan and its mandates are safekeeping securities in dematerialized form, forming and handling registry of shareholders of joint stock companies, clearing and settlement of securities transactions. Baku Stock Exchange is the only licensed stock exchange that provides trading floor to 10 exchange members.

The issuance and secondary trading of government securities, CBAR notes, corporate securities, mortgage bonds and International Financial Institutions bonds take place at Baku Stock Exchange, which also provides with repo and reverse repo transactions with these securities. Government bonds and CBAR notes remain the main driver in the capital market (61% or 8.6 billion AZN). The most active securities trading take place with shares of 500 companies privatized in the mid-1990s. Most equity trades are pre-arranged, traditional exchange-driven price discovery is not attained.
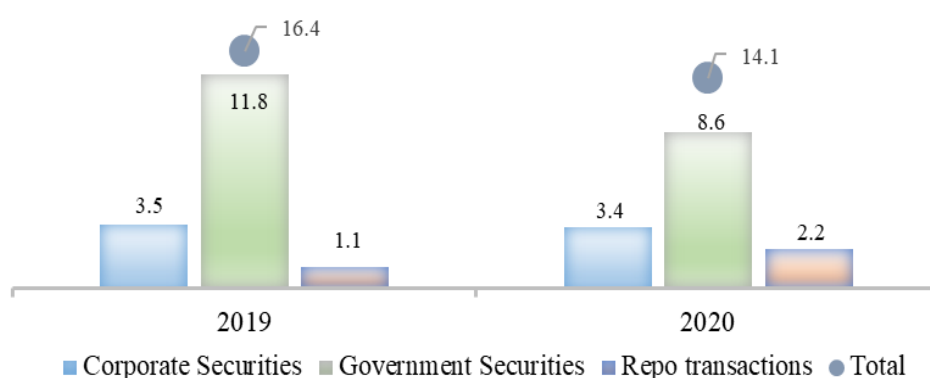
Figure 8: Securities market trade volume (billion AZN). Source: CBAR

CBAR is focusing on developing a highly effective securities market, which is modern, complying with the international standards, providing large capitalization opportunities for the economy and ensuring reliable risk management.

Insurance Market. As of the end of 2020, there are 19 insurers and 1 reinsurer in Azerbaijan's insurance market, of which 4 are life and 15 are non-life insurance companies. The activity of the insurance sector was also provided through 25 insurance brokers and 806 insurance agents. The assets of the insurance companies reached to 1.3 billion AZN in the end of 2020.

In 2020, collected insurance premiums climbed to 729 million AZN. The ratio of insurance premiums to the GDP reached to 1%, which is the highest figure for the last 5 years.

In general, insurance premiums have increased by 50% over the past 5 years, of which life insurance premiums increased by 107%, and non-life insurance premiums increased by 25%. Although the ratio of insurance premiums to the GDP has increased, the penetration rate of insurance market remains low compared to benchmark countries.

In 2020, insurance payments increased by 54% compared to the previous year and amounted to 465 million AZN. Insurance payments for life insurance reached to 283 million AZN. Insurance payments for non-life insurance products are mainly paid for health insurance and motor vehicle owners' compulsory third party liability insurance.
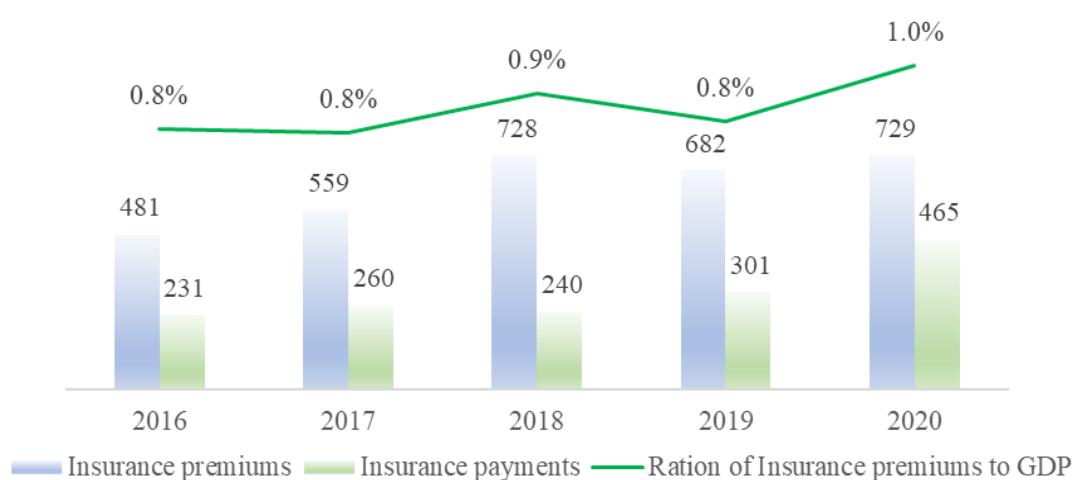
Figure 9: Insurance premiums and payments (million AZN). Source: CBAR

CBAR implements measures to improve insurance legislation, in order to bring it into line with best international insurance practices, digitize insurance activities, train professionals, and educate insurance consumers.

4.2. Current State Analysis of ERP at CBAR

This section presents the assessment of CBAR's existing ERP systems used in supervision of banking sector, capital markets and insurance market based on semi-structured interviews with

CBAR's professional staff. The analysis takes into account various supervisory functions and explores efficiencies and deficiencies in CBAR's systems.

4.2.1. Microprudential Supervision.

CBAR supervises the licensed financial institutions that provide financial services in Azerbaijan. It applies prudential supervision for the activities and operations of banks and other credit institutions, insurance companies and investment firms. These institutions must comply with the capital and liquidity requirements and should have adequate risk management tools.

CBAR conducts analysis on the basis of operational and periodic data submitted by supervised entities to determine their risk profile. CBAR collects and analyses reports and other regulatory information from supervised entities, monitor their compliance with the requirements of legislation and regulations, and prepare and submit various reports to management. CBAR also carries out inspections in the supervised entities, which provide important insights for supervision and if necessary result in further measures.

4.2.1.1. Prudential Reporting System. Banks, depending on the risk of their activity, is put into specific prudential category. Over the course of a year, each bank is required to submit a number of reports to CBAR. This includes financial reports (balance sheet, income statement, cash flow statement, changes in equity statement), risk management reports (credit risk report, liquidity risk report, currency risk report, interest rate risk report, market risk report and operational risk report), capital adequacy reports (own funds report, capital requirements for market risk, credit risk and operational risks report). These reports need to be submitted with various frequencies, either monthly, quarterly or annually.

Just like banks, insurance companies and investment firms are subject to prudential regulation and supervision. These companies submit monthly, quarterly and annual financial reports, capital adequacy reports and compliance reports to CBAR.

CBAR is using Banking Supervision System and Insurance Supervision System, which were developed in the beginning of 2010s by the relevant supervisory authorities at the time. Currently these systems are operated by CBAR and banks and insurance companies are using this system for regulatory filings. The systems are working as web portal data upload with central database, which allows banks and insurance companies to upload template based reports to the system to submit to CBAR at regular intervals. The systems allow reports only in EXCEL format and provide basic checks and validation of the submitted reports.

Below arguments belong to respondents ERP01 and ERP02, who describe the limited capabilities of existing reporting systems.

"Most of the submitted reports contain errors, and this leads to resource-intensive and manual data cleaning and validation processes by CBAR staff. These reports are less supportive when supervisors need to evaluate specific risks necessitating more detailed data in a follow-up information request."

The use of Banking and Insurance Supervision Systems do not contribute much to supervisory work of CBAR and hence, they do not bring efficiency with regard to conducting risk based supervision. It should be also noted that CBAR does not have any specific prudential reporting system for investment firms and other supervised entities. Consequently, most of the submitted reports by these companies are incomplete and inconsistent, contain errors, and data cleansing takes a lot of time.

4.2.1.2. Central Credit Register. CBAR has been using Central Credit Register effectively from 2011. This system allows CBAR to collect data on loans, credit lines and

guarantees that credit institutions grant to their customers. CBAR requires banks and other credit institutions to continuously deliver information on loans to the central database of CBAR. ERP01 explains the use of the system as follows:

"Individuals' and legal entities' credit data are grouped together in form if credit report and evaluated by CBAR for microprudential and macroprudential supervision purposes."

The respondent (ERP01) also notes that the system used to provide information on borrower's credit history upon request by prospective lenders to assess borrower's creditworthiness. However, this service was transferred to Azerbaijan Credit Bureau in 2018, when the first credit bureau in the country was created.

4.2.1.3. Currency Exchange Monitoring. Law on Currency Regulation of the Republic of Azerbaijan postulates that other than banks currency exchange operations can be provided by licensed natural and legal persons. Current regulations require that at a currency exchange point sale of foreign currency in excess of 500 USD equivalent amount to a customer, and purchase of foreign currency above 10,000 USD equivalent amount from a customer shall be carried out on the basis of an identity document. Each transaction at a currency exchange provider must be recorded and the recorded information must be stored in the relevant software of the exchange office for at least 3 years.

Currency exchange providers must submit to CBAR a monthly report on currency exchange operations. Besides this, currency exchange providers must report the annual financial statements of the exchange office to CBAR. Currency exchange providers must have an appropriate software to record each transaction. Supervision over the activity of the currency exchange providers is carried out on the basis of online information exchange with the central server of the software of CBAR. ERP06 points out the lack of the relevant reporting system in CBAR for regulatory reporting of currency exchange providers.

"Currently, there is not any licensed currency exchange providers by CBAR. It should be also noted that CBAR does not have relevant software to carry out supervision over the activities of licensed currency exchange providers".

4.2.2. Market Conduct Supervision.

CBAR's market conduct supervision cover all the financial service providers and comprises a set of tools, including monitoring financial institutions' treatment of individual customers, evaluating the effectiveness of those companies' complaints-handling mechanisms, detecting anticompetitive practices, and monitoring suspicious transactions.

➢ CBAR takes necessary measures to prevent market abuse in the securities market, as well as to prevent market manipulations and insider dealing.

➢ CBAR monitors disclosure of information by issuers whose securities are placed publicly and admitted to trading in a regulated market in order to ensure transparency and to eliminate information asymmetry in the securities market.

➢ CBAR monitors the compliance of the insurance companies with the requirements of legislation and their behaviour in the insurance market, including signing of insurance contracts, timely and fair fulfilment of obligations, fair treatment with the clients, insured, insured and beneficiary, provision of full and correct of information on insurance products, as well as prevention of conflicts of interest.

4.2.2.1. Capital Market Surveillance System. To modernise securities market infrastructure in Azerbaijan, the Centralised Exchange Trading System of Azerbaijan (CETA) was launched in February 2016, which includes trading, post trading and surveillance modules. The platform ensured automation of all major processes at the local capital market trading and post-trading (ERP03).

CBAR and Baku Stock Exchange are responsible for ensuring that the Azerbaijani capital markets are fair, efficient and compliant with The International Organization of Securities Commissions (IOSCO) Objectives, Principles and Standards. The goal of surveillance is to monitor the market to detect market manipulation, insider trading, breaches of disclosure, and other illegal activity that may impact the market. Detection of such activity enables CBAR and Baku Stock Exchange to investigate and potentially prosecute violations of the legislation and the underlying rules.

In response to the evolving Azerbaijani capital market structures and in order to strengthen the regulator's market surveillance role, it is intended to have a market surveillance system as a module of CETA system which meets international standards. The below statement by ERP03 summarises the lack of system and capacity in CBAR for securities market surveillance.

"Although Market Surveillance System was launched as a sub module of CETA system in 2016, it was used by the then securities market regulator for 3 years only. Currently, the system is not in use and does not have a support service. Therefore, CBAR does not have real time access to capital market transactions and it is unable to effectively monitor markets for possible market abuse risks, such as market manipulation and insider trading."

4.2.2.2. Information Disclosure System. One of the key IOSCO principles is transparency of market data to allow all investors equal and fair access to the information necessary to make an informed decision. In most markets listed companies are required to disclose their financial statements, annual meeting minutes and relevant corporate information. There are three categories of people involved in disclosure:

CBAR is using and managing Information Disclosure System, which is a centralized information system for collection, storage and dissemination of information by issuers whose

securities are offered to the public and admitted to trading on a regulated market. Issuers are registered in the system, and submit their information to CBAR for disclosure purposes. The system captures relevant data from issuers for review by CBAR (Information Administrators) and then the reports are publicly disclosed.

The following data is disclosed by issuers via CBAR's Information Disclosure System: prospectus and information memorandum, annual and semi-annual financial and management reports, inside information, insider deals, information on shareholder meetings, information on withdrawal of securities from circulation, information on acquisition and alienation of a significant share and etc.

Below statement by ERP03 describes the benefits of CBAR's Information Disclosure system.

"CBAR's Information Disclosure System increases efficiency of information in relations with to investors, creates possibility to receive information from a single source and free of charge, provides effective control over information disclosure and eliminates information asymmetry. Submission and dissemination of information by issuers, and access to disclosed information by public on Information Disclosure System is free of charge. CBAR in addition to its supervisory roles, is responsible to promote the Azerbaijan market to all current and future market participants. All participants want to be assured that the market is well managed and fair. The disclosure system provides data relevant to securities and their issuers."

4.2.2.3. Insurance Market Surveillance. One of the major supervisory roles of CBAR in the insurance market is monitoring the insurers' market behaviour towards consumers. CBAR takes necessary measures to protect the rights and legitimate interests of insurers, policyholders, insured, beneficiaries and other participants in the insurance market and ensure

the restoration of the violated rights. ERP02 explains CBAR's market conduct roles in insurance market as follows.

"In 2020, CBAR received 2262 complaints from the consumers in the insurance market. The main consumer complaints were related to difficulties in insurance payments, refusal of insurance payments to insured by insurance companies, dissatisfaction with the results of the assessment during insurance events. As a result of the investigation of complaints received from consumers during the period, CBAR issued a total of 372 mandatory instructions to the supervised entities, of which 117 instructions were issued to the insurance companies."

CBAR does not have a surveillance system which could provide real-time access to information on insurance contracts, reinsurance contracts and insurance events (ERP06). ERP02 also notes the consequences of the deficiency as follows.

"CBAR does not have access to all the relevant data about the voluntary and compulsory insurance contracts to oversee the behaviour of insurance companies during the insurance events, how they handle the process and whether they protect the interests of insured persons and parties who suffer damages and losses."

4.2.2.4. Complaints Management. ERP06 briefly describes the volume of complaints CBAR has to investigate and handle in below.

"In 2020, CBAR received a total of 18,133 complaints from the financial market consumers. CBAR does not have an automated complaints-handling system. Therefore, all consumer submissions are communicated via post, by e-mail, or in person at CBAR."

Information relating to the complaints are received and investigated largely through a tiring manual process. This limits the timeliness and usefulness of such data for supervisory activities. Even calculation and categorisation of complaints within CBAR is a time consuming process (ERP01, ERP02 and ERP03).

4.2.3. Licensing and authorisation.

CBAR licenses companies wishing to engage in financial-market activity by evaluating whether they comply with the relevant regulatory requirements. There are various licenses authorized by CBAR, which includes licenses for banks, non-bank credit institutions, credit unions, insurers, reinsurers, investment firms, stock exchanges, clearing houses, investment funds, investment fund managers and investment fund depositories.

CBAR maintains a public register of all licensed institutions mentioned above, and their branches, departments and representative offices. Only companies that meet with the financial, personnel and organisational requirements qualify for authorisation by CBAR.

One of the supervisory tools in the securities market is state registration of securities before issuance. CBAR approves prospectus and information memorandum of companies that want to publicly offer their securities in a regulated market. CBAR also approves products offered by insurance companies and investment funds.

4.2.3.1. Licencing Management. The licensing process is often characterized by several manual steps. ERP05 outlines the consequences of manual licensing and authorization processes in CBAR.

"CBAR does not have a licensing system, that can automate the process, provide a single database and application tracking functionality. All the licensing procedures are fully burdensome paperwork. This is also the case with the approval process of the new products of insurance companies and investment funds. To be effective in licensing, we need to automate our work".

CBAR publishes the register of all licensed institutions in its webpage. Register of the licenses in CBAR is supported only by EXCEL.

4.2.3.2. Securities Registration System. Securities market legislation requires the regulator to conduct state registration of the securities before issuance, including stocks, corporate bonds, government bonds, Central Bank notes, mortgage bonds, depository receipts, real estate certificates, promissory notes, pledge paper, investment fund units (Article 992 of the Civil Code of the Republic of Azerbaijan).

Previous securities regulator launched the Securities State Registration System in 2010 and currently the system is used by CBAR (ERP03). The Securities Registration System includes information on i) issuers (name, Tax Identification Number, legal address), ii) securities (name of the issuer, date of registration, type of securities, form of securities, number, nominal value and total nominal value of securities) and iii) approved prospectuses. The following statement by ERP06 portrays the situation with the Securities Registration System.

"This system was originally developed, using Oracle 8 database running on a Linux Red Hat operating system. The estimated annual number of transactions is about 6,000 with a historical file of about 3,000 records. However, the Securities Registration System is not working properly, there are several bugs in the system, and the system does not have a support service. The system should be redesigned to be practical".

4.2.3.3. Securities Issuance Procedure. Issuance of securities by corporate issuers is a multi-stage process and requires a lot of paper work. For publicly offered securities the issuer develops a prospectus or information memorandum and applies to CBAR for the approval of these documents and state registration of securities. CBAR reviews the documents within 20 business days. Unless there are grounds for refusal of registration, the issuance of securities is state registered and the prospectus or information memorandum approved. CBAR submits to the issuer an extract from the state register of investment securities and a written notice on

approval of the prospectus. The issuer makes public the prospectus or information memorandum through CBAR's Electronic Data Disclosure System (ERP03 and ERP05).

The issuer signs an agreement with the National Depository Centre on provision of the services on safekeeping of securities and maintaining the register of owners of securities. Then the issuer signs a listing agreement with Baku Stock Exchange and publicly places its securities in the stock exchange. Within 10 business days after the placement of securities, the issuer submits to the CBAR a report on results of public offering of securities. After the report is approved by CBAR, the issuer makes this information public through CBAR's Electronic Data Disclosure System.

ERP03 proposes to develop an automated system between CBAR and other institutions to facilitate securities issuance procedures.

"Currently, securities issuance process is fully burdensome paperwork and time-consuming process for issuers and for us. This process also hinders the competitiveness of capital markets compared with banking sector, consequently for companies financing from securities market is very time-consuming process compared to financing from banks. To achieve effectiveness in our work, CBAR should develop an automated system, that integrates with other institutions, and effectively facilitates our internal processes and issuers' financing needs from capital markets".

4.2.3.4. State Registry for Encumbrance of Movable Property. CBAR is operating State Registry for Encumbrance of Movable Property, an integrated movable asset registry, which facilitates the access of small and medium-sized enterprises (SMEs) to loans by using their movable property as collateral. ERP01 briefly explains the advantages of this system in below.

"State Registry for Encumbrance of Movable Property benefits credit institutions with transparent and centralised information on the movable assets of SMEs used as collateral for

loans. It allows banks to verify whether the collateral carries any charges elsewhere. The system also helps banks to choose the best collateral for the secondary market and makes it easier for banks to sell the collateral in case of the bankruptcy of SMEs."

4.2.4. Macroprudential Supervision.

CBAR assesses the stability of the financial sector in the country and formulates policy tools to neutralize risks. CBAR conducts stress tests for banks to measure whether they can absorb the losses that might arise in severe macroeconomic stress scenarios. The stress testing is employed to identify potential crisis related to banks' financial soundness and to ensure that they have enough capital buffers in place to resist possible risks at any time. If an institution fails a stress test, CBAR can order it to reduce risk positions or strengthen its capital base. ERP04 briefly describes the application of macroprudential supervision in CBAR.

"CBAR conducts macroprudential supervision by using data and reports received from banks, Central Credit Register and prepare their analysis via traditional econometric models. CBAR does not have a specific technology driven tool to forecast systemic risks in the financial markets."

4.2.5. Correspondence with Supervised Entities.

CBAR does not have an electronic communication system with supervised entities. ERP06 mentions that

"All the official letters, surveys, enforcement proceedings and measures are communicated with the supervised entities via post. As a result, all the communications are paper based, which are resource intensive process and also slow down the pace of communication. We are planning to automate our correspondence processes in CBAR".

4.3. Future State Analysis of ERP at CBAR

This section shows the future state analysis of ERP systems that associate with CBAR's goals and objectives in supervision of financial markets based on i) the experiences of various supervisory authorities' SupTech systems described in Chapter 2 and ii) the ideas and recommendations of respondents proposed during interviews. The following figure depicts future state ERP systems for CBAR.
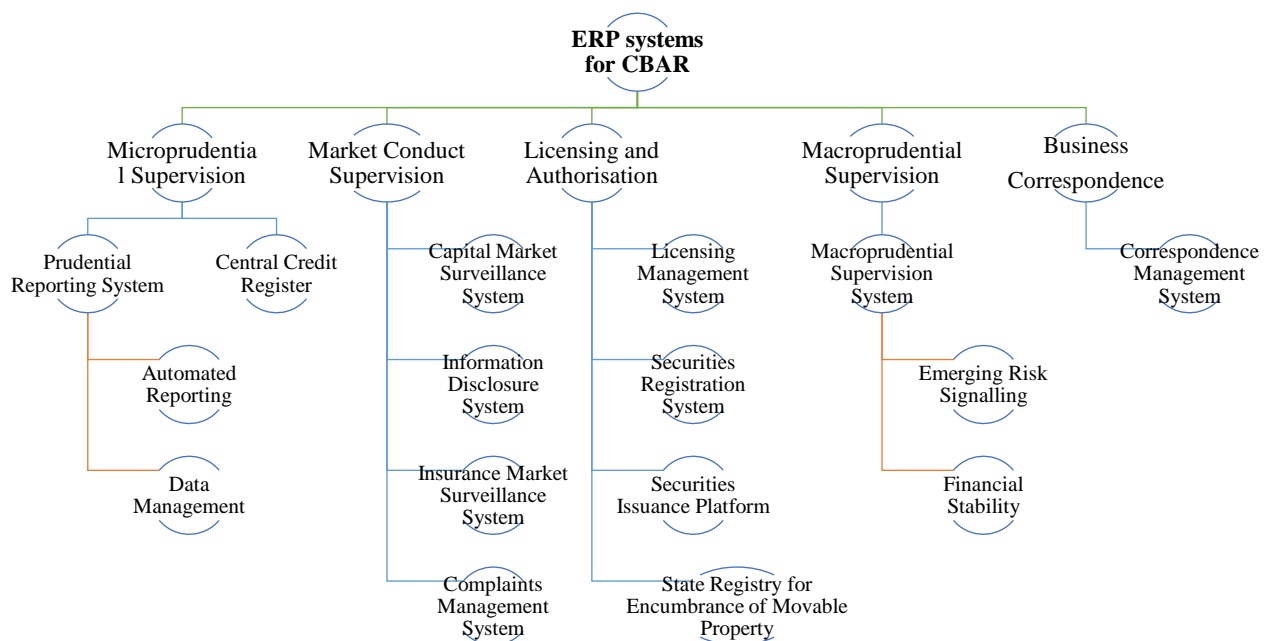
Figure 10. Proposed ERP systems for financial market supervision in CBAR

4.3.1. ERP systems for Microprudential Supervision.

4.3.1.1. Prudential Reporting System. To automate data collection and validation processes CBAR should employ a new Prudential Reporting System for all supervised financial institutions, leveraging data push approach based on the experience of OeNB's Austrain Reporting System, given in section 2.5.1.1 of this study. The Prudential Reporting system should be more than a web portal data upload with central database, like CBAR's current systems for reporting by banks and insurance companies. Instead the system should support automated data submission via API.

The proposed Prudential Reporting System has the following capabilities:

➢ For prudential reporting, banks, insurance companies, investment firms, currency exchange operators and other supervised entities can prepare database extracts for their financial reports, capital adequacy reports and compliance reports and share their data with CBAR via API transmission;

➢ The system is designed with a data push approach, such that raw data extracted from financial institutions' core systems is converted into a single encrypted XML file and pushed directly to CBAR;

➢ The system has direct machine-to-machine transmission via API;

➢ Data and report transmissions in a machine-readable format will reduce the operational burden on CBAR with manual processing, data cleaning and validation;

➢ Data validation is conducted in real time;

➢ Financial institutions also see the status of filings and validation results. Validation results is used as a guide to show whether errors or warnings are in submissions.

➢ The system provides a secure environment;

➢ There is a reporting calendar, which is personalized and highlights dates important for filings;

➢ To aid timely delivery regulatory reporting obligations, the system generates automated email to supervised entities to notify them of upcoming and due obligations.

The Prudential Reporting System will replace template based reporting to automated data extracts. This single unified reporting system will replace dozens of previous reports submitted separately. The system will also minimize reporting burden and compliance costs of financial institutions. For CBAR, the solution will shrink staff time for processing and managing data.

With the use of this Prudential Reporting System CBAR will easily apply a risk-based supervision for financial institutions and reduce incompliance risks of these companies while watching over financial stability.

4.3.1.2. Central Credit Register. Central Credit Register is a database that collects data from banks and other credit institutions on the loans and guarantees issued to their customers. The system has the following capabilities:

➢ The system provides a centralised database for information on loans and guarantees granted to individuals and legal entities;

➢ The system allows credit institutions to deliver information to the database using data upload functionality;

➢ The system provides customizable credit report data for users.

The analysis of CBAR's Central Credit Register shows that the system in fact meets with the abovementioned functionalities, and supports effective monitoring of credit data for microprudential and macroprudential supervision.

4.3.2. ERP systems for Market Conduct Supervision.

4.3.2.1. Capital Market Surveillance System. CBAR should adopt a comprehensive surveillance system to monitor orders and transactions with securities in order to detect possible market manipulation and insider dealing cases, based on the experience of supervisory authorities mentioned in section 2.5.2.1 of this study. A good surveillance system provides the following capabilities:

➢ The system supports real-time monitoring of trading;

➢ The system has the capacity for both real time surveillance and post trade analysis of market activity;

> ➢ The system identifies unusual trading activity quickly in any instrument traded in the market;

> ➢ The system analyses accurately trading data and market news to determine if further investigation is needed;

> ➢ The system collects, documents and manages information efficiently relating to suspicious trading activity;

> ➢ The system provides documentation to support enforcement action;

> ➢ The system includes feeds from trading, clearing and depository, provide views for displaying data and must support handling news.

The Market Surveillance System will be appropriately scaled to match the relatively straightforward nature of the market. The system will support monitoring market activities, setting alerts, running reports to track unusual market behaviour.

4.3.2.2. Information Disclosure System. An effective Information Disclosure System has the following capabilities:

> ➢ The system provides correct and full information dissemination to investors and other securities market participants that enhances transparency in the markets;

> ➢ The system provides centralized storage of disclosed information;

> ➢ The system increases efficiency in use of information for all investors and eliminate information asymmetry in the markets;

> ➢ The system provides a database to receive information from a single source and free of charge;

> ➢ The system increases the effectiveness of supervision over information disclosure by supervisory authority.

The analysis of CBAR's Electronic System for information Disclosure, described in the section 4.2.2, demonstrates that the system in fact meets with the mentioned functionalities, and supports transparency in the securities market.

4.3.2.3. Insurance Market Surveillance System. To increase the effectiveness of supervision over the insurance market and protect the rights of insured, CBAR should establish a relevant registration and monitoring system in order to have real-time access to information on insurance contracts, reinsurance contracts and insurance events. The system provides the following capabilities:

➢ The system displays real-time information about compulsory and voluntary insurance contracts;

➢ The system reflects compulsory insurance data from the systems of Compulsory Insurance Bureau of Azerbaijan;

➢ The system provides information on compulsory insurance cover for real property insurance, third party liability insurance of motor vehicles, property and compulsory personal accident insurance of passengers;

➢ The system allows insurers and reinsurers to form and sign voluntary insurance contracts within the system;

➢ The system allows to set up company profile in the system for each insurance company and to assign relevant persons from insurance companies as system users;

➢ The system supports a communication channel between CBAR and insurance companies, whenever CBAR contacts with these companies, the assigned persons will receive notifications and a specific window displaying all of the notifications.

CBAR staff will have access to all the relevant data about the voluntary and compulsory insurance contracts, will be able to oversee the behaviour of insurance and reinsurance

companies during the insurance events and will monitor how they handle the process and whether they protect the interests of insured persons and parties who suffered damages and losses.

4.3.2.4. Complaints Management System. To increase efficiency in complaints-handling, CBAR should employ an electronic system, Complaints Management System, to obtain complaints data more effectively and to incorporate it in its supervisory work, based on experience of BOL's Complaints Management System given in section 2.5.1.3 of Chapter 2. The system will allow consumers to submit their complaints online and also enable CBAR to store and track progress on the filings within a single database. Essentially, the data obtained by the Complaints Management System will be incorporated into CBAR's supervisory tasks and risk monitoring. Complaints Management System has the following capabilities:

➢ The system allows consumers to submit a complaint directly through CBAR's website using an electronic signature;

➢ The system automatically matches the complaint with the record of relevant supervised entity in the internal database;

➢ Data and findings from complaint are sent to the relevant supervision department within CBAR;

➢ The data is used to decide whether to conduct an inspection or to apply an administrative sanction for a specific financial institution. All actions and decisions about the complaint should be stored in the internal database;

➢ Database generates a risk profile report for each supervised entity and these reports are available to supervisors at any time.

CBAR will analyse complaints data to evaluate risks may appear from a financial institution's activities. Complaints Management System will allow CBAR to better evaluate a

financial institution's compliance with regulatory requirements and how properly they treat their customers. This will also allow CBAR to adopt risk-based approach to market conduct supervision, where resources are directed towards much risky financial products, services or institutions, that pose higher risk to consumers.

4.3.3. ERP systems for Licensing and Authorisation.

4.3.3.1. Licensing Management System. To increase effectiveness in licencing activity, CBAR should use an automated Licensing Management System with the following capabilities:

- ➢ The system has a single database that includes information on the background checks and qualifications of the applicants;
- ➢ The system allows the use of standardized input forms, which assure consistency of data and provide a means of tracking the history of applicants;
- ➢ The system allows using electronic forms to input data (either by input clerks or by the user). Hard copies can be printed and signed for verification if necessary;
- ➢ The system is supported by NLP to conduct automated review of documents and information submitted by applicants for licensing or product approval by insurance companies or investment funds in the future;
- ➢ The system enables NLP technology to undertake an automated check and provide either approval or advice for further testing. These checks are based on legal rules created by CBAR.

The system will enable CBAR to handle burdensome licensing works with an automated licensing tracking and evaluation processes. Licensing Management System will lower regulatory entry expenses and minimize licensing bureaucracy in order to facilitate new players entering into the financial markets. New firms promote competition and brings growth in the

market. With the use of Licensing Management System, CBAR will focus on the review of higher-risk applications more than on the manual review of each application.

4.3.3.2. Securities Registration System. One of the major supervisory tools of CBAR in the securities market is the state registration of securities before issuance. CBAR should use an automated securities registration system with the following capabilities:

- ➢ The system provides a single database for all the registered securities, including stocks, corporate bonds, government bonds and other securities, and approved prospectuses and information memorandums;

- ➢ The database provides detailed information about issuer (name, Tax Identification Number, legal address), securities (name of the issuer, date of registration, type of securities, form of securities, number, nominal value and total nominal value of securities) and electronic copies of approved prospectuses;

- ➢ The system allows extracting various data and reports from its database;

- ➢ The system is integrated with Securities Issuance Platform, described in below, and CBAR's electronic extract on state registration of securities is delivered to issuer through Securities Issuance Platform.

The use of an automated securities registration system and a single database within CBAR is significantly important for effectively dealing with securities registration.

4.3.3.3. Securities Issuance Platform. Securities issuance process is a multi-stage process, which consumes significant human resource for CBAR. It also negatively affects the development of securities market. To increase the effectiveness of supervisory task and to also stimulate securities market CBAR should establish an electronic Securities Issuance Platform, which has the following capabilities:

- ➢ The system provides an automated document circulation platform and a single database between CBAR, National Depository Centre and Baku Stock Exchange;

- ➢ Issuers use the platform to apply CBAR for state registration of their securities and approval of prospectus using electronic signature;

- ➢ Upon approval of prospectus and state registration of the securities, issuer receives the electronic approval documents within the platform;

- ➢ As a next step issuer applies to National Depository Centre and Baku Stock Exchange for signing contracts for depository services and listing, respectively, within the platform;

- ➢ The system allows issuer to sign contracts in the platform using electronic signature, and make payments for depository and listing services;

- ➢ The system provides communication channel among CBAR, National Depository Centre, Baku Stock Exchange and issuer, such that issuer receives a notification upon completion of necessary work by these institutions;

- ➢ The system allows underwriter of the securities issue to follow the issuance process too;

- ➢ The system is integrated with Securities Registration System, described above, and Information Disclosure System, described in section 4.3.2. Issuer is able to use the platform to submit its prospectus to CBAR for disclosure purposes.

Securities Issuance Platform should also be used for other regulatory authorisation procedures, such as merger, split, change of nominal price and conversion of securities, withdrawal of securities form circulation, making changes to approved prospectus and approval of report on result of placement.

Securities Issuance Platform will make CBAR's relevant supervisory work significantly more effective and efficient, and facilitate securities issue and other related process for issuers, and increase competitiveness of the capital market financing.

4.3.3.4. Registry for Encumbrance of Movable Property. Registry for Encumbrance of Movable Property is an information system possesses an integrated database of notices on registration of encumbrance of movable property. It created transparency with regard to collateral for loans and therefore eases access to loans. The system has the following capabilities:

- ➢ The system has a centralised database for information on movable assets;

- ➢ The system ensures the entrance of the data into the database and processing of it;

- ➢ The system records the notices entered into the registry and ensure that the notices are accessible for search by anyone;

- ➢ The system integrates with necessary information systems of other government authorities;

- ➢ The registry is equipped with an adequate security system to prevent third party risks.

Analysis of CBAR's State Registry for Encumbrance of Movable Property System, described in the section 4.2.3.4, demonstrate that the system in fact meets with the mentioned functionalities, and enables more parties to have access to financial resources and loans.

4.3.4. ERP systems for Macroprudential Supervision.

CBAR will adopt a macroprudential supervision system to identify signalling risks in the financial markets. The system has the following capabilities:

> ➢ The system supports Big Data capacity to analyse the data from payment systems, including Real Time Gross Settlements system (AZIPS) of CBAR;

> ➢ The system uses data in AZIPS and convert them into risk indicators, using traditional econometric methods;

> ➢ The system is also integrated to Prudential Reporting System, described in section 4.3.1, to extract daily or other data from supervised entities to highlight potential heat maps that may lead to financial stability issues;

> ➢ The system focuses on predetermined risk indicators to evaluate potential risks such as unsecured interbank money market loans. The rise of these loans can be an indicator for potential financial crises;

> ➢ The system produces report on potential systemic risks, which will be used in order to formulate policy to timely address these risks.

Macroprudential Supervision System will obtain and process all the data from various sources, including payment systems, Prudential Reporting System and other financial market infrastructures like central securities depository, clearing houses, stock exchange. Based on these analysis, the system will produce customised reports on emerging systemic risks, that will need a detailed monitoring from CBAR. This will enhance CBAR's macroprudential supervisory capacity significantly. The system will enable CBAR to use these analyses for policy development purposes.

4.3.5. ERP system for Correspondence.

CBAR should adopt an automated Correspondence Management System to electronically communicate with the supervised financial institutions in order to facilitate policy dialogue, surveys, supervisory measures, enforcement proceedings and etc. The system has the following capabilities:

- ➢ The system allows CBAR to send documents electronically (in real time) to supervised entities with a qualified electronic signature;

- ➢ Electronic documents sent through the Communication system is encrypted;

- ➢ The system centralises and manages the creation and delivery of secure and interactive business correspondences between CBAR and supervised entities;

- ➢ The system allows to track all the incoming and outgoing business correspondence of CBAR and make it available to staff according to their roles and access.

- ➢ The system allows to identify the status of the filings made;

With the use of Correspondence Management System CBAR will send documents and official letters to supervised entities more quickly than it would via normal post. The system will have the functionality to effectively manage vast amount of electronic correspondences. The use of the system will enable CBAR to benefit from cost reduction, process efficiency and transform its interaction with supervised entities.

4.4. Gap Analysis of ERP at CBAR

The section presents a gap analysis, which determines the difference between current state and future state capacity. To perform gap analysis for CBAR's ERP systems, current state analysis in section 4.2 is compared to future state analysis conducted in section 4.3 of Chapter 4.

4.4.1. Gap analysis based on CBAR's Supervisory Goals.

Gap analysis has identified the gaps that prevent CBAR from ensuring effectiveness and efficiency in its supervisory tasks. A change strategy is proposed to build the missing capabilities. The results of gap analysis are given in Table 1.

Table 1. Gap Analysis and Change Strategy

Supervisory goals of CBAR	Current state	Future state	Gap	Action Plan to close gap
Microprudential Supervision	o CBAR's Banking Supervision System and Insurance Supervision System are working as web portal data upload; o Reporting is template-based; o The systems provide basic validations check; o Submitted reports contain errors, manual data cleaning and validation processes are required; o There is no automated reporting system for other supervised entities; o Lack of systems to monitor currency exchange transactions.	**Prudential Reporting System**: o Full automation of data collection and validation processes for all supervised entities; o Allows direct machine-to-machine data transmission via API; o Uses data push approach, extracts data from financial institutions' systems, converts into a single encrypted XML file and pushes to CBAR; o Data validation is conducted in real time; o Provides a reporting calendar, which is personalized and highlights dates important for filings; o Generates automated email to supervised entities to aid timely delivery regulatory reporting obligations.	o Lack of an automated data collection system except for banks and insurance companies; o Template based reporting for banks and insurance companies is not effective; o Ineffective and inefficient conduct of microprudential supervision without risk-based approach.	o Adoption of Prudential Reporting System, described in the Future state; o Establishing API integration between CBAR and all supervised entities.
	o CBAR is operating Central Credit Register system, which collects data on loans and guarantees granted by credit institutions.	**Central Credit Register** o A centralised database for information on loans and guarantees granted by credit institutions; o Allows credit institutions to deliver information to the database using data upload functionality; o Provides customizable reports on credit data.	o No gaps is found, current system complies with the Future state requirements.	o No action is required
Market Conduct Supervision	o CBAR's Capital Market Surveillance System is not in use.	**Capital Market Surveillance System**: o Supports real-time monitoring of trading; o Identifies unusual trading activity quickly in any	o Lack of an automated Capital Market Surveillance System;	o Adoption of Capital Market Surveillance System, described in the Future state;

Supervisory goals of CBAR	Current state	Future state	Gap	Action Plan to close gap
		instrument traded in the market; o Analyses accurately trading data and market news to determine if further investigation is needed; o Collects, documents and manages information efficiently relating to suspicious trading activity; o Provides documentation to support enforcement action; o Has capacity for both real time surveillance and post trade analysis of market activity; o Monitors market activities, setting alerts, running reports to track unusual market behaviour.	o Ineffective and inefficient monitoring of market abuse risks, such as market manipulation and insider trading with securities.	o Integrating the system with trading system of Baku Stock Exchange and depository system of National Depository Centre.
	o CBAR is using Electronic Information Disclosure System for dissemination of information by issuers that publicly offered their securities in a regulated market.	**Information Disclosure System:** o Provides correct and full information dissemination to investors and other securities market participants; o Provides centralized storage of disclosed information; o Increases efficiency in use of information and eliminates information asymmetry in the markets; o Provides a database to receive information from a single source and free of charge; o Increases the effectiveness of supervision over information disclosure.	o No gaps is found, current system complies with the Future state requirements.	o No action is required
	o CBAR does not use Insurance Market Surveillance System; o CBAR does not have real time	**Insurance Market Surveillance System:** o Displays real-time information about compulsory and voluntary insurance contracts;	o Lack of an automated Insurance Market Surveillance System;	o Adoption of Insurance Market Surveillance System, described in the Future state;

Supervisory goals of CBAR	Current state	Future state	Gap	Action Plan to close gap
	access to information on insurance contracts or insurance events.	o Sources and reflects compulsory insurance data from the systems of Compulsory Insurance Bureau of Azerbaijan; o Allows insurers and reinsurers to form and sign voluntary insurance contracts within the system; o Allows to set up company profile in the system for each insurance company and to assign relevant persons as system users; o Support a communication channel between CBAR and insurance companies.	o Ineffective monitoring of the behaviour of insurance companies against consumers.	o Integrating the system with the systems of Compulsory Insurance Bureau of Azerbaijan and insurance companies.
	o CBAR does not have an automated complaints-handling system; o Complaints are received and investigated through a tiring manual processes.	**Complaints Management System:** o Allows consumers to submit a complaint directly through CBAR's website using an electronic signature; o Automatically matches the complaint with the record of relevant supervised entity in the internal database; o Data and findings from complaint are sent to the relevant supervision department within CBAR; o All actions and decisions about the complaint is stored in the internal database; o Database generates a risk profile report for each supervised entity and these reports is available to supervisors at any time.	o Lack of an automated Complaints Management System; o Ineffective complaints management does not allow to apply risk based supervision for market conduct risks in supervised entities.	o Adoption of Complaints Management System, described in the Future state.
Licensing and Authorisation	o CBAR does not have an automated licensing system; o All the licensing and product	**Licensing Management System:** o Has a single database that includes information on the background checks and	o Lack of an automated Licensing Management System;	o Adoption of Licensing Management System, described in the Future state.

Supervisory goals of CBAR	Current state	Future state	Gap	Action Plan to close gap
	approval procedures are fully burdensome paperwork.	qualifications of the applicants; o Allows the use of standardized input forms, which assure consistency of data and provide a means of tracking the history of applicants; o Supported by NLP to conduct automated review of documents submitted by applicants; o NLP technology review provides either approval or advice for further testing.	o Ineffective and inefficient handling of the licensing processes to facilitate entry into the financial markets.	
	o CBAR's Securities Registration System is not working properly or supported.	**Securities Registration System:** o Provides a single database for all the registered securities and approves prospectuses; o Allows extracting customized data and reports from the database; o Delivers electronic extract on state registration of securities to issuer through Securities Issuance Platform.	o Bugs and inefficiencies in the functioning of CBAR's existing Securities Registration System; o Ineffective dealing with state registration of securities.	o Improving CBAR's existing system based on the Future state requirements; o Integrating the system with CBAR's Securities Issuance Platform.
	o CBAR does not have an automated approval of securities issuance; o Approvals for issuance of securities is a multi-stage process and requires a lot of paper work for CBAR and for issuers.	**Securities Issuance Platform:** o Provides an automated document circulation platform and a single database between CBAR, National Depository Centre and Baku Stock Exchange; o Issuers use the platform to apply CBAR for state registration of their securities and approval of prospectus using electronic signature; o Allows issuer to sign contracts within the platform using electronic signature, and make payments for depository services and listing fees;	o Lack of an automated Securities Issuance Platform; o Ineffective and inefficient approval procedures for securities issuance and for other products.	o Adoption of Securities Issuance Platform between CBAR, National Depository Centre and Baku Stock Exchange, as described in the Future state; o Integrating the system with CBAR's Securities Registration and

Supervisory goals of CBAR	Current state	Future state	Gap	Action Plan to close gap
		o Notifies issuer upon completion of authorisation by CBAR and other institutions; o Allows issuer and underwriter of the securities issue to follow the authorisation process; o Integration with Securities Registration System and Information Disclosure System.		Information Disclosure Systems.
	o CBAR is using adequate State Registry for Encumbrance of Movable Property, that facilitates access of SMEs to loans and guarantees by credit institutions.	**Registry for Encumbrance of Movable Property** o A centralised database for information on movable assets; o Ensures the entrance of the data into the database; o Records the notices entered into the registry and ensure that the notices are accessible for search by anyone; o Integrates with information systems of other government authorities; o Equipped with an adequate security system to prevent third party risks.	o No gaps is found, current system complies with the Future state requirements.	o No action is required
Macroprudential Supervision	o CBAR does not have an automated macroprudential supervision system to analyse systemic risks in financial sector.	**Macroprudential Supervision System:** o Has Big Data capacity to analyse the data from payment systems, including Real Time Gross Settlements System (AZIPS) of CBAR; o Uses data in AZIPS and convert them into risk indicators, using traditional econometric methods; o Focuses on predetermined risk indicators for specific transactions, such as unsecured interbank money market loans;	o Lack of an automated Macroprudential Supervision System; o Ineffective and inefficient monitoring of emerging systemic risks in the financial markets.	o Adoption of Macroprudential Supervision System, described in the Future state; o Integrating the system with CBAR's AZIPS and Prudential Reporting System.

Supervisory goals of CBAR	Current state	Future state	Gap	Action Plan to close gap
		o Integrated to Prudential Reporting System to extract daily or other data from supervised entities to highlight potential heat maps that may lead to financial stability issues; o Produces customised reports for policy development purposes based on data analysis from various sources.		
Business Correspondence	o CBAR do not have an electronic correspondence management system with supervised entities.	**Correspondence Management System:** o Allows CBAR to send documents electronically (in real time) to supervised entities with a qualified electronic signature; o Electronic documents sent through the Communication system is encrypted; o Centralises and manages the creation and delivery of secure and interactive business correspondences between CBAR and supervised entities; o Allows to track all the correspondence of CBAR; o Allows to identify the status of the filings made.	o Lack of an electronic correspondence system with supervised entities; o Ineffective and inefficient management of huge amount of correspondences with supervised entities.	o Adoption of Correspondence Management System, described in the Future state; o Integrating the system with all supervised entities.

4.4.2. SWOT Analysis.

SWOT analysis is used to evaluate strengths, weaknesses, opportunities, and threats to CBAR's ERP systems used in financial market supervision. The results of the analysis are given in the following table.

Table 2. SWOT Analysis of CBAR's ERP systems used in financial market supervision

Strengths	Weaknesses
o CBAR's new mega regulator powers and financial stability mandate; o Automated reporting system for banks and insurance companies; o Adequate Central Credit Register system for data on loans and guarantees provided by credit institutions; o Adequate Electronic Information Disclosure System for companies that publicly offered their securities; o Adequate State Registry for Encumbrance of Movable Property that facilitates access of SMEs to loans; o User experience with Securities Registration System.	o Template based reporting for banks and insurance companies is inefficient; o Lack of automated reporting for other supervised entities; o CBAR's Securities Market Surveillance System is not in use; o Lack of real time access to information on insurance contracts or insurance events; o Complaints are received and investigated through a tiring manual processes; o Licensing procedures are fully paperwork; o CBAR's Securities Registration System is not working properly; o Approvals for issuance of securities requires a lot of paper work; o Lack of automated macroprudential supervision tools to monitor systemic risks; o Lack of an automated correspondence system with supervised financial institutions.
Opportunities	Threats
o Adequate resources to adopt integrated ERP systems for financial market supervision; o Adoption of automated data collecting and data analytics systems; o Digitalization and automation of operational and administrative tasks; o Advanced analytical capabilities; o Transformation to risk-based supervision, that focuses on risk profile of financial markets and institutions.	o Fail to address to idiosyncratic and systemic risks in the financial markets in the absence of adequate SupTech solutions; o Loss of reputation as a new mega regulator due to inadequate protection of financial consumers; o Adoption of ERP systems may lead to cyber security risks.

Strengths

CBAR, as the new mega regulator in the financial sector, has all the regulatory and supervisory powers. It was given a new mandate from 2020 on to ensure financial stability in the markets, and has legal framework, personnel and procedures to efficiently monitor the markets and protect the rights of financial consumers.

CBAR is using Banking Supervision System and Insurance Supervision System for prudential reporting of banks and insurance companies. These systems provide web portal data upload functionality and they are capable to conduct basic validations of data in the submitted reports. CBAR's current experience can be further extended to other supervised financial institutions.

CBAR's Central Credit Register system is a centralised database that collects data from credit institutions on the loans and guarantees granted to customers. The system enables CBAR to evaluate credit report data for microprudential and macroprudential supervision purposes.

CBAR's State Registry for Encumbrance of Movable Property has a centralised database for information on movable assets that can be used as collateral for loans. The system creates transparency with regard to collateral for loans and therefore eases access to loans for SMEs.

Information Disclosure System also meets with international standards and ensures transparency in the capital markets. CBAR also has an automated Securities Registration System, which needs necessary improvement.

Weaknesses

CBAR has limited capacity in terms of ERP systems to effectively and efficiently conduct its financial stability mandate. CBAR has significant deficiecies in supervisry tools for data collection and data analytics.

CBAR does not have automated reporting systems for supervised financial institutions other than banks and insurance companies. As a result, CBAR's supervisors receive financial and compliance reports of these institutions in EXCEL format. Most of the reports contain errors and this leads to significant consumption of time and resource with data cleansing and data validation processes. Consequently, risk based approach for supervision is not attained.

CBAR also has serious deficiencies in securities and insurance market supervision. It is lacking real time access to securities market transactions to prevent market abuse cases, such as manipulation of securities prices and insider dealings. CBAR also has not real time access to information on compulsory and voluntary insurance contracts or insurance events. Therefore, when CBAR receives a customer complaint about an insurance company's behaviour, it spends significant amount of time to investigate the case and resolve the dispute.

CBAR does not have technology driven macroprudential supervision tools to effectively oversee potential systemic risks in the markets. This limits CBAR's capacity to effectively and efficiently oversee systemic risks in the market.

CBAR's licensing, authorisation and complaints management procedures and correspondence with supervised entities are manual, which prevents CBAR from effectively use its resources.

CBAR is lacking an automated correspondence with supervised entities. All official interactions with financial institutions are fully manual and paper-based. This prevents CBAR from effectively and efficiently using its resources.

Opportunities

CBAR has capital and personnel resources to purchase and use modern ERP systems in order to effectively execute its financial stability mandate. CBAR also has sufficient IT experts to provide timely internal maintenance services to the systems.

CBAR can transform its supervisory capacity by adopting modern data collection and data analytics tools for supervisory purposes, which can incorporate smart technologies such as API integration, Big Data analytics, NLP technology and cloud computing technology. CBAR can also upgrade its systems in the future to build in AI and ML technologies.

CBAR can increase efficiency and effectiveness of its supervisory roles. With the use of SupTech applications risk-based and data-centric approach to supervision can be attained, which focuses on risk profile of financial markets and institutions. This also facilitates the prioritization of supervisory actions, which leads to effective supervisory work with targeted allocation of resources.

Threats

In the absence of adequate supervisory solutions, CBAR may fail to ensure proper functioning, stable, secure, transparent, fair and competitive financial markets, and protecting the rights of consumers. With the lack of SupTech tools, CBAR may not succeed in effectively and efficiently executing its supervision, surveillance and enforcement roles and protecting consumers from risks posed by financial institutions.

CBAR may also face with difficulties in monitoring emerging systemic risks in the markets, which can threat the financial stability in the markets. Inadequate execution of its financial stability mandate may pose significant reputation risk to CBAR.

To prevent these risks, CBAR can adopt modern and adequate ERP systems with smart technology solutions. Use of SupTech applications incorporates operational risks, such as cyber-risk. Using open source and cloud applications increases third-party risks when data is transmitted online, especially when CBAR's and financial institution's systems will be integrated.

4.4.3. Fishbone Diagram

A fishbone diagram is used to reveal the potential causes of gaps in ERP systems of CBAR's financial market supervision. The diagram displays cause-and effect relationships.
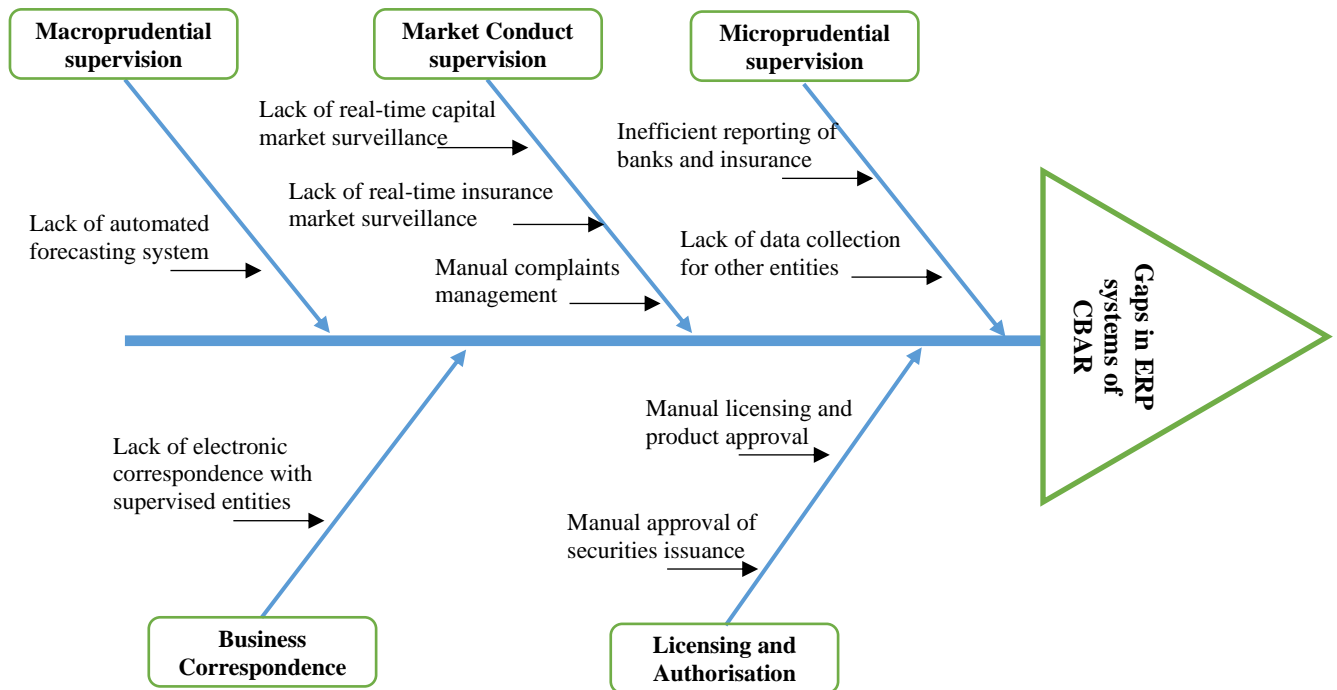
Figure 11. Fishbone Diagram

Diagonal lines to the spine depicts categories of potential causes of the gaps in ERP systems of CBAR used for financial market supervision. The categories are the main supervisory roles of CBAR, identified in section 4.1.2. For each category, the causes of deficiencies are displaced:

➢ Inefficient data collection systems for regulatory filings of banks and insurance companies and lack of data collection systems for other supervised institutions hinders the effectiveness of microprudential supervision;

➢ Lack of real-time access to securities market transactions, registration of insurance contracts and insurance events and manual handling of complaints of customers impede implementation of effective market conduct supervision;

➢ Lack of big data analytics and forecasting system leads to inefficient monitoring of signalling systemic risks that pose risks to financial stability in the sector;

➢ Manual licensing, product approval and securities registration approval procedures produce resource intensive process for CBAR staff and also negatively affects entry into the markets by new players, competition and growth and financial inclusion in the markets;

➢ Without an electronic correspondence system with supervised financial institutions result in inefficient and ineffective management of huge amount of correspondences.

All these deficiencies in CBAR's ERP systems restricts CBAR's supervisory capacity and capabilities, thus CBAR is unable to apply risk-based supervision effectively to focus on risk profile of financial markets and institutions and to prioritize supervisory actions with targeted allocation of resources.

4.5. Chapter Summary

The chapter answered research questions 1 and 2 by providing the findings from current state analysis, future state analysis and gap analysis of ERP systems for financial market supervision, and presented proposal for the change strategy. Recommendations for the change strategy was described in detail in the final chapter below.

5. Conclusions and Recommendations

This study introduced the topic of business consultancy project in the first chapter, presented a literate review of the concepts of ERP systems and various SupTech solutions used by supervisory authorities for financial market supervision in the second chapter, explained the employed methodology and reported the findings in third and fourth chapters, respectively.

This chapter summarises the main findings of the project and answers the research questions, which are given below:

1. What is the extent of the ERP systems implementation in CBAR for financial market regulation and supervision?

2. What are the gaps in the ERP systems that affects CBAR's supervisory capacity?

3. What are the further development needs of the ERP systems in order to increase effectiveness and efficiency in CBAR's supervisory work?

Research question 1 and research question 2 have been answered in Chapter 4 within the current state analysis, future state analysis and gap analysis. Finally, this chapter will answer research question 3 and will provide recommendations to enhance ERP systems, CBAR's used for financial market supervision. This chapter will also present limitations of the study and indications for future research.

5.1. Conclusions

The findings of this project draw the following conclusions:

Research question 1 has been answered during the current state analysis conducted in section 4.2 of Chapter 4, which identified CBAR's existing ERP systems employed to conduct financial market supervision as follows:

➢ CBAR is using Banking Supervision System and Insurance Supervision System for prudential reporting of banks and insurance companies. These systems provide web portal data upload functionality and banks and insurance companies prepare their financial reports, capital adequacy reports and other compliance reports based on the predetermined templates and submit to CBAR. These systems also conduct initial checks and data validation for submitted reports. The systems also provide a database for submitted reports.

➢ CBAR's Central Credit Register system is a centralised database that collects data from credit institutions on the loans and guarantees granted to customers. The system enables CBAR to evaluate credit report data for microprudential and macroprudential supervision purposes.

CBAR's State Registry for Encumbrance of Movable Property has a centralised database for information on movable assets that can be used as collateral for loans. The system creates transparency with regard to collateral for loans and therefore eases access to loans for SMEs.

➢ CBAR is using Electronic Information Disclosure System, which provides a centralized information system for collection, storage and dissemination of information by issuers whose securities are offered to the public and admitted to trading on a regulated market. Issuers are registered in the system, and submit their information to CBAR for disclosure purposes, the system captures relevant data from issuers for review by CBAR and then publicly disclosed. By operating this system CBAR ensures transparency in the capital markets and allows all investors equal and fair access to the information necessary to make an informed decision.

➢ CBAR also has an automated Securities Registration System, which provides a single database for all the registered securities and approved prospectuses. The

system supports CBAR for approval of securities before issuance. The system allows extracting various data and reports from its database. However, the system is not working properly, there are several bugs in the system, and the system does not have a support service.

Research question 2 has been answered based on the future state analysis and gap analysis results in section 4.3 and 4.4 of Chapter 4 and identified gaps in the ERP systems that hinders CBAR's supervisory capacity as follows:

➢ CBAR is lacking automated reporting systems for supervised financial institutions other than banks and insurance companies. These institutions send their financial, capital adequacy and compliance reports in hard copy to CBAR and also in EXCEL format to the supervisory staff. When supervisors identify a mistake in the reports, they call the company and discuss the issue, or ask them to correct the report. Hence, data cleansing and data validation processes are very resource intensive and time consuming process for CBAR.

➢ CBAR is lacking market surveillance system, therefor it is unable to have real time access to securities market transactions to prevent market abuse cases, such as manipulation of securities prices and insider dealings. These risks can be identified post factum only. As a result, CBAR does not have adequate capacity to effectively and efficiently oversee these risks in the capital markets.

➢ CBAR does not have real time access to information and data on compulsory and voluntary insurance contracts or insurance events. Therefore, when CBAR receives a customer complaint of for an insurance company's behaviour, it spends significant amount of time to investigate the case and resolve the dispute.

➢ CBAR does not have technology driven macroprudential supervision tools to identify vast amount of data from payment systems, supervised entities and other

financial market infrastructure. This hinders CBAR's ability to effectively and efficiently oversee systemic risks in the market.

➢ CBAR is lacking an automated licensing and authorisation processes. As a result, licensing, approval of securities issuance and approval of new insurance products and other products are fully manual and paper-based. This prevents CBAR from effectively and efficiently using its resources.

➢ CBAR is lacking an automated complaints management system. All complaints handling is fully manual and paper-based. This prevents CBAR from effectively and efficiently using its resources.

➢ CBAR is lacking an automated correspondence with supervised entities. All official interactions with financial institutions are fully manual and paper-based. This prevents CBAR from effectively and efficiently using its resources.

To conclude, CBAR has several useful supervisory systems in place. However, it also is lacking necessary supervisory solutions to attain its supervisory goals. CBAR is unable to effectively apply risk-based supervision and focus on risk profile of financial institutions and prioritize supervisory actions with targeted allocation of resources. Thus, CBAR has limited capacity in order to effectively and efficiently conduct its financial stability mandate.

5.2. Recommendations

To address the deficiencies identified in CBAR's ERP systems used in financial market supervision and to answer research question 3, recommendations, including strategic action plan, project roles and responsibilities and expected procurement costs are prepared. The study recommends the following integrated ERP systems for CBAR based on i) experiences of various supervisory authorities' SupTech systems described in Chapter 2 and ii) ideas and recommendations of respondents proposed during interviews.
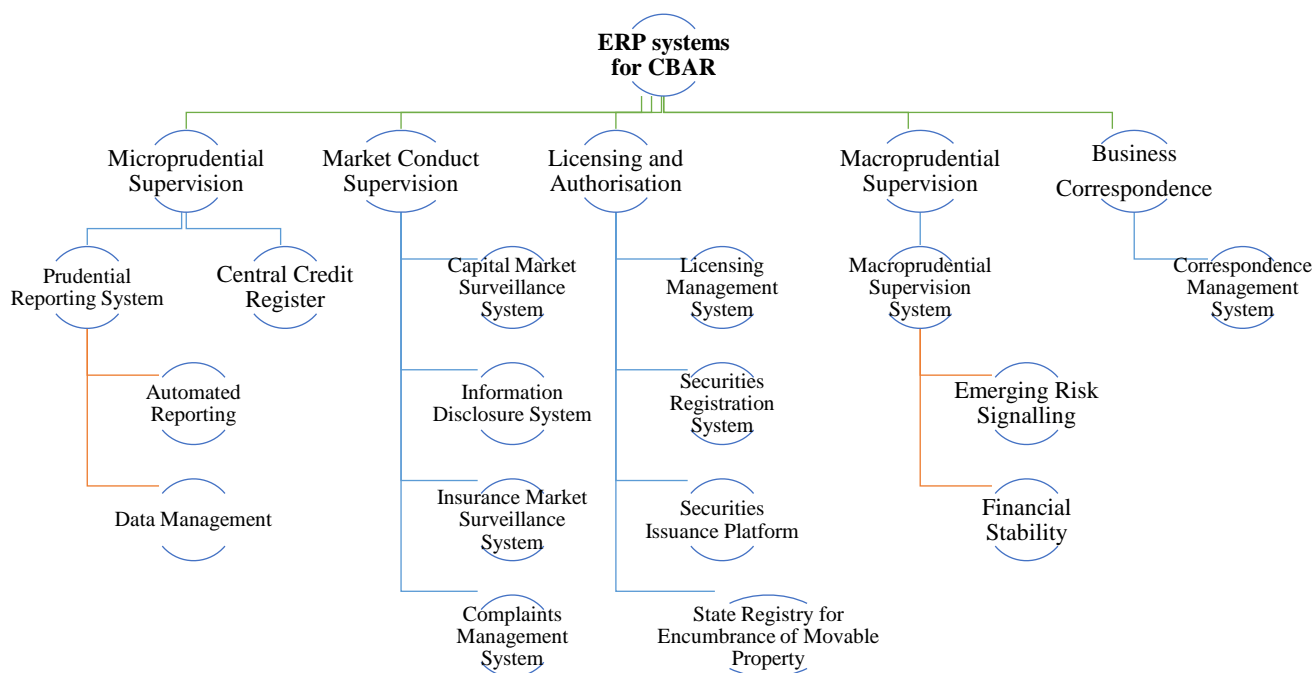
Figure 12. Recommended ERP systems for financial market supervision in CBAR

5.2.1. Project Description.

The following table shows the details of proposed project, including the objectives of the project, scope of development, required skills and quality expectations of the project.

Table 3. Project Description

Project name	Adoption of ERP systems for Financial Market Supervision
Project Objectives	Establishment of integrated ERP systems in CBAR for financial market supervision, which allows to: o Integrate the existing information systems into a single ERP system; o Automate data collection and data analytics procedures for supervisory purposes; o Create a single database to increase its information coverage and quality parameters; o Provide real-time monitoring of various financial markets and transactions;

	o Automate all manual processes for licensing and authorisation; o Automate all manual process for managing consumer complaints and business correspondence with supervised entities; o Increase the security parameters of the database.
Project structure	Development of the following systems within the Project: o Prudential Reporting System; o Capital Market Surveillance System; o Insurance Market Surveillance System; o Complaints Management System; o Licensing Management System; o Securities Registration System; o Securities Issuance Platform; o Macroprudential Supervision System; o Correspondence Management System.
Required skills	o Knowledge on financial technologies and innovations; o Research and data analysis; o Training and presentation; o Preparation of manuals and procedures; o Programming and technical knowledge; o Experience in automated business processes; o Leadership and managerial skills.
Quality expectations of users	o Automation of data collection and data analytics; o Automation of manual processes and procedures; o Access to convenient and functional information systems.

5.2.2. Strategic Action Plan

The following table presents a strategic action plan to implement the project. The action plan categorized the project implementation tasks in 5 phases and outlines start data, finish date and duration for each task.

Table 4. Strategic Action Plan

Phases	Tasks	Duration	Start	Finish
Phase 1. Planning and Design	1.1. Allocation of a Project Team	11	22/11/2021	03/12/2021
	1.2. Development of Solution Specification and Project Plan that includes broad business issues and goals for the implementation based on the findings of this study	35	06/12/2021	10/01/2022
	1.3. Procurement procedures: o Announcement of Request for Proposal; o Evaluations of submitted proposals; o Selection of an adequate proposal for implementation of ERP systems; o Budget Approval; o Procurement of ERP systems software and hardware.	151	10/01/2022	10/06/2022
Phase 2. Development	2.1. Prudential Reporting System	201	13/06/2022	31/12/2022
	2.2. Capital Market Surveillance System	180	04/07/2022	31/12/2022
	2.3. Insurance Market Surveillance System	172	08/08/2022	27/01/2023
	2.4. Complaints Management System	137	12/09/2022	27/01/2023
	2.5. Licensing Management System	109	10/10/2022	27/01/2023
	2.6. Securities Registration System	115	01/11/2022	24/02/2023
	2.7. Securities Issuance Platform	115	01/11/2022	24/02/2023
	2.8. Macroprudential Supervision System	116	05/12/2022	31/03/2023
	2.9. Correspondence Management System	116	05/12/2022	31/03/2023
Phase 3. Documentation and Testing	3.1. Preparation of User Manuals and Technical Manuals	32	03/04/2023	05/05/2023
	3.2. Training	18	08/05/2023	26/05/2023
	3.3. Testing	18	29/05/2023	16/06/2023
Phase 4. Deployment	4.1. User Acceptance Testing	18	19/06/2023	07/07/2023
	4.2. Participant Certification	25	10/07/2023	04/08/2023

Phases	Tasks	Duration	Start	Finish
	4.3. Pilot run	18	07/08/2023	25/08/2023
	4.4. Pilot execution reporting and review	11	28/08/2023	08/09/2023
Phase 5. Support and Updates	5.1. Organize Maintenance and Support	11	11/09/2023	22/09/2023
	5.2. Live Cutover	11	25/09/2023	06/10/2023

5.2.3. Project Roles and Responsibilities.

The following table presents the roles and responsibilities of a project team in detail.

Table 5. Project Roles and Responsibilities

Role	Structural Unit	Responsibilities
Project Sponsor	Director of Information Technologies Department	o Project planning and appointment of project staff; o Provide time, funding and other resources required for the project; o Supervise the preparation of project documents; o Regularly monitor and control the development of the project; o Resolve strategic issues in the project; o Appoint project management team; o Ensuring that all project team members have a clear understanding of their roles and responsibilities in order to get the expected benefits from the project; o Monitor the progress of the project at the strategic level by periodically reviewing the business status of the project; o Ensuring that the project is sustainable from a business perspective; o Implement Project Assurance from a business perspective.

Role	Structural Unit	Responsibilities
Project Clients	Representatives of: o Credit Institutions Supervision Department; o Insurance Supervision Department; o Capital Market Supervision Department; o Financial Stability Department; o Consumer Relations Department; o Legal Department; o Secretariat Division.	o Identify the needs of users; o Define quality expectations and acceptance criteria for the project; o Ensuring that the expected benefits are achieved; o Implement Project Assurance from a User Perspective.
Supplier	CBAR will announce Request for Proposal (RFP) to select supplier	o Ensuring that product design and creation suggestions are realistic; o Advise on methods of adoption and development, selection of additional product design; o Provide the supplier resources required for the project; o Inform non-technical team members on project supplier aspects; o Ensuring proper execution of quality procedures and compliance with product requirements; o Continue Project Assurance from a supplier perspective.
Change Manager	Director of Information Technologies Department	o Take appropriate decisions on issues that require changes or do not meet the requirements within the scope of authority; o Inform senior management about issues that go beyond his/her authority and escalate issues.
Project Assurance Manager	Deputy Director of Information Technologies Department	o Maintaining relationships between business, user and supplier interests; o Risk management;

Role	Structural Unit	Responsibilities
		o Involvement of relevant competent persons in the process of creating a description of the project; o Involvement of relevant competent persons in quality control during the creation of project products; o Proper application of quality control methods in the project; o Proper implementation of quality control measures; o Internal and external communication is active; o Use of applicable standards.
Project Manager	Head of Development of Information Technologies Division of Information Technologies Department	o Ensure daily project implementation; o Ensuring that the required project products produce results within a specified time, cost, quality, volume, risk and benefit tolerance; o Prepare project documents and reports (Extensive Project Report, Final Project Report) to be submitted to the Project Staff; o Lead and motivate the Project Team; o Establish and manage project procedures (risk, quality, communication and configuration management); o Planning, monitoring and managing the work of the Project Team; o Coordinating work with Project Sponsor to avoid overlapping work on product development included in the action plan.
Project Team	Representatives from the departments that will use the systems	o Participate, in part or in full, in the activities of the Project Team; o Contribute to the overall goals of the project and the creation of specific team products; o Communicate issues to the Project Manager for referral to appropriate decision-makers.

5.2.4. Expected Project Costs.

The following table provides an expected cost analysis of the implementation of the project based on desktop study. The analysis showed that total license cost and implementation costs could be approximately AZN 4,500,000 and annual maintenance costs could be around AZN 204,000.

Table 6. Expected Project Costs

License Costs	
Licence costs should be one-time perpetual costs	
➢ Prudential Reporting System	₼ 550,000.00
➢ Capital Market Surveillance System	₼ 350,000.00
➢ Macroprudential Supervision System	₼ 460,000.00
Implementation Costs	
Implementation costs should include all analysis and design, development, implementation, project services, and expense related costs:	Cost (AZN)
➢ Prudential Reporting System	₼ 550,000.00
➢ Capital Market Surveillance System	₼ 280,000.00
➢ Insurance Market Surveillance System	₼ 980,000.00
➢ Complaints Management System	₼ 240,000.00
➢ Licensing Management System	₼ 240,000.00
➢ Securities Registration System	₼ 160,000.00
➢ Securities Issuance Platform	₼ 190,000.00
➢ Macroprudential Supervision System	₼ 350,000.00
➢ Correspondence Management System	₼ 150,000.00
Total One-Time Cost: ₼ 4,500,000.00	

Annual Maintenance and Support	
Annual Maintenance and Support should include 24/7/365 remote support plus regular updates and	15% of licence costs

new releases and mandatory regulatory changes at no additional license fee.	
➢ Prudential Reporting System	₼ 82,500.00
➢ Capital Market Surveillance System	₼ 52,500.00
➢ Macroprudential Supervision System	₼ 69,000.00
Total Annual Cost: ₼ 204,000.00	

5.2.5. Expected Project Benefits

The following table presents key performance indicators for the implementation of the project.

Table 7. Key Performance Indicators (KPI)

Supervisory Task	Description of KPI	Current state	Target
Microprudential supervision	Prudential reporting of banks and insurance companies	Template-based reporting (delays in data delivery, duplicate data, inconsistency and inaccuracy in data)	Automated and real-time data collection of data via API integration
	Prudential reporting of other supervised entities	EXCEL	
	Validation of submitted reports	2-5 business days	60 seconds
	Monitoring of currency exchange operators reports and transactions	NA	Real-time
Market conduct supervision	Monitoring of securities market transactions	Post-factum	Real-time
	Monitoring of insurance market contracts	Post-factum	Real-time
	Evaluations of consumer complaints with regard to insurance payments and refusal of insurance payments	7-15 business days	2-3 business days
	Average complaints handling		
Licensing and authorisation	Review of documents submitted for licensing	10-15 business days (manual review)	1-2 business days via NLP solutions

	Review of document for insurance product approval		
	Review of prospectus for public offering of securities		
	Issuance of securities and placement on a stock exchange	20-30 business days	10 business days
Macroprudential supervision	Monitoring of data from payment systems	NA	Real-time via Big data analytics
	Monitoring of data from banks' filings	Post-factum	Real-time
Other areas	Correspondence with supervised entities	3-5 business days (manual and hard copy)	60 seconds via electronic communication

5.3. Limitations

The study has some limitations. The evaluation of CBAR's existing systems was implemented based on the data collected in interviews. Consequently, the findings were built on the opinions and feedbacks of respondents. The study did not, however evaluate the systems and processes of CBAR in place. For a comprehensive and realistic assessment of ERP systems in CBAR, an examination of the management controls within IT infrastructure is required. This can shed light to deeper current state analysis in CBAR. Additionally, without an in place assessment of CBAR's systems, it is not possible to accurately measure how long the supervisory works takes time currently. Therefore, the current state indicators illustrated in Table 7 are based on loose estimates.

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Appendix: Interview Questions

1. What are CBAR's supervisory roles and powers in finance sector?

   ➢ What are supervisory roles in Banking Supervision, Insurance Market Supervision, Capital Markets Supervision;

   ➢ What are the regulatory requirements for financial institutions to operate?

   ➢ How CBAR protects financial consumers from risks?

   ➢ What measures CBAR takes for incompliance of financial institutions with regulatory requirements?

2. What are the supervisory tools of CBAR in the following supervision functions?

   ➢ Microprudential supervision tools;

   ➢ Market conduct supervision tools;

   ➢ Macroprudential supervision tools;

   ➢ Licensing and authorisation tools.

3. What systems or technology solutions CBAR use for its supervisory roles?

   ➢ In Banking Supervision, Insurance Market Supervision, Capital Markets Supervision;

   ➢ What are benefits of the existing systems?

   ➢ Are the existing systems have any integration among each other?

   ➢ How the existing systems are supported?

   ➢ What are the deficiencies and risks in the existing systems?

4. Which supervisory functions are time-consuming processes and how long they take?

5. Would kind of automations CBAR needs in order to better implement its supervisory functions?

6. What supervisory systems should CBAR adopt in order to increase its supervisory capacity?

7. What supervisory systems they know that foreign supervisory authorities employ in their work?

8. Anything else the respondent prefer to mention, which he/she thinks it is important?