

الجمهورية الجزائرية الديمقراطية الشعبية
République Algérienne Démocratique et Populaire

Ministère de l'Enseignement Supérieur
et de la Recherche Scientifique

Ecole Nationale Supérieure de Management
Koléa



وزارة التعليم العالي و البحث العلمي

المدرسة الوطنية العليا للمناجنت
القلعة

End of Studies Thesis in order to obtain

Professional masters agree in Strategic and Information
System Management

**The Implementation Process of the Business Intelligence Solution
within the banking industry
Case: the head office of SGA Bank, Algiers**

Submitted by:

MENASRIA Hadil

members of the jury:

Dr. BOUCHETARA Mehdi

Dr. KADI Omar

Supervised by:

Dr. DERRAR Hacene

**University year
2023 /2024**

Acknowledgment

First of all, I would like to thank almighty God for giving me the chance in this life to reach this point.

After god's mercy on me, I would like to take a minute and thank my parents for all the efforts they made in order I reach this point in my life; I would never be able to take a step in this world without their support and love they provided me with; whether financially, mentally or emotionally.

I would like to thank myself also, who was patient and courageous to not give up in front of life struggles, and push me to do my best in whatever I put my feet.

I also wish to convey my sincere appreciation to my teacher and promoter Dr. DERRAR Hacene for always giving me his precious time, his intellectual assistance, Furthermore, I want to thank his attentive listening, and his guidance that helped me produce this thesis.

Furthermore, I want to thank the people I met in my journey who made the person I became at this point, especially this last period who were there for me when I had no one.

Lastly yet importantly, I would like to thank Sam ALTMAN.

RESUME

Cette étude examine comment les solutions BI sont implémentées et utilisées dans l'industrie bancaire, en se concentrant sur les stratégies, les défis et les meilleures pratiques tout au long de leur cycle de vie. En utilisant une approche de recherche qualitative avec des entretiens semi-directifs et des observations sur le terrain, nous avons analysé la gestion de la qualité des données, la sécurité, l'intégration et les stratégies de formation des utilisateurs. Malgré l'efficacité de l'approche par phases de l'implémentation du BI pour gérer les délais et les budgets, des défis persistent en matière de qualité des données, notamment la documentation et la saisie des données. Un cadre structuré a été appliqué pour évaluer la performance du système BI sur plusieurs dimensions : fonctionnalité du système, qualité des données, formation des utilisateurs et optimisation continue. Les domaines clés à améliorer incluent le renforcement des pratiques de gouvernance des données et la formation continue des utilisateurs. Les implications pratiques de cette recherche fournissent des directives pour les banques souhaitant implémenter ou améliorer leurs solutions BI, en mettant l'accent sur une gouvernance des données robuste, des audits réguliers des données et des programmes de formation complets. Cette recherche souligne l'importance d'une mise en œuvre efficace des solutions BI dans l'industrie bancaire, en insistant sur la gouvernance des données et l'engagement des utilisateurs pour assurer le succès, et offre des recommandations précieuses pour une prise de décision améliorée et un avantage concurrentiel

Mots clés : Business Intelligence, performance, mise en œuvre, gouvernance des données, industrie bancaire.

Abstract

This study examines how BI solutions are implemented and utilized in the banking industry, focusing on strategies, challenges, and best practices throughout their lifecycle. Using a qualitative research approach with semi-structured interviews and field observations, we analyzed data quality management, security, integration, and user training strategies. Despite the effectiveness of the phased BI implementation approach in managing timelines and budgets, challenges in data quality, particularly documentation and data entry, persist. A structured framework was applied to evaluate BI system performance across several dimensions: system functionality, data quality, user training, and continuous optimization. Key areas for improvement include enhancing data governance practices and continuous user training. Practical implications of this research provide guidelines for banks to implement or improve their BI solutions, emphasizing robust data governance, regular data audits, and comprehensive training programs. This research highlights the importance of effective BI implementation in the banking industry, emphasizing data governance and user engagement for success, offering valuable recommendations for enhanced decision-making and competitive advantage.

Keywords: Business Intelligence, performance, implementation, data governance, banking industry

المخلص

تبحث هذه الدراسة في كيفية تنفيذ حلول الذكاء التجاري واستخدامها في صناعة البنوك، مع التركيز على الاستراتيجيات والتحديات وأفضل الممارسات طوال دورة حياتها. باستخدام نهج بحث نوعي مع مقابلات شبه موجهة وملاحظات ميدانية، قمنا بتحليل إدارة جودة البيانات، والأمان، والتكامل، واستراتيجيات تدريب المستخدمين. على الرغم من فعالية النهج المرحلي لتنفيذ الذكاء التجاري في إدارة الجداول الزمنية والميزانيات، لا تزال هناك تحديات تتعلق بجودة البيانات، لا سيما في التوثيق وإدخال البيانات. تم تطبيق إطار منظم لتقييم أداء نظام الذكاء التجاري عبر عدة أبعاد: وظيفة النظام، وجودة البيانات، وتدريب المستخدمين، والتحسين المستمر. تشمل المجالات الرئيسية للتحسين تعزيز ممارسات حوكمة البيانات والتدريب المستمر للمستخدمين. تقدم الأثار العملية لهذا البحث إرشادات للبنوك التي ترغب في تنفيذ أو تحسين حلول الذكاء التجاري الخاصة بها، مع التأكيد على حوكمة البيانات القوية، والتدقيق المنتظم للبيانات، وبرامج التدريب الشاملة. يسلط هذا البحث الضوء على أهمية التنفيذ الفعال لحلول الذكاء التجاري في صناعة البنوك، مع التركيز على حوكمة البيانات ومشاركة المستخدمين لضمان النجاح، ويقدم توصيات قيمة لاتخاذ قرارات محسنة وميزة تنافسية.

الكلمات المفتاحية: ذكاء الأعمال، الأداء، التنفيذ، حوكمة البيانات، الصناعة المصرفية

Table of Contents

ACKNOWLEDGMENT	II
RESUME	III
TABLE OF CONTENTS.....	VI
LIST OF TABLES.....	VIII
LIST OF FIGURES.....	IX
LIST OF ABBREVIATIONS AND ACRONYMS	XI
INTRODUCTION	13
CHAPTER ONE: THE THEORETICAL FRAMEWORK	16
1. LITERATURE REVIEW.....	17
1.1. <i>Business Intelligence in the banking industry</i>	17
1.1.1. Business intelligence application within the bank's system.....	18
1.1.2. Business intelligence implementation	19
1.1.3. The factors that influence the BI usage in the banking sector	22
1.1.4. The strategic importance of the BI in the banking industry	24
2. CONCEPTUAL FRAMEWORK	25
2.1. <i>The bank's profile</i>	25
2.1.1. Definition of the bank.....	25
2.1.2. The bank's typology	27
2.1.3. The structure of the bank's system in Algeria.....	29
2.1.4. The adaptation of New Information and Communication Technologies "NICTs" within the banking sector:.....	33
2.1.5. The banks' objectives by adopting technological solutions:	40
2.2. <i>The Business Intelligence profile</i>	44
2.2.1. Definition of the Business Intelligence.....	46
2.2.2. Historical development of Business Intelligence.....	46
2.2.3. Data framework for BI.....	48
2.2.4. Business intelligence process stages	50
2.2.5. Benefits and challenges of Business Intelligence	53
CHAPTER TWO: DATA AND METHODOLOGICAL FRAMEWORK.....	55
1. PRESENTATION OF THE HOSTING ORGANIZATIONS	56
1.1. <i>SDG GROUP enterprise identity</i>	56
1.2. <i>Global presence</i>	56
1.3. <i>Value proposition</i>	56
1.4. <i>the technological partners of SDG Group</i>	60
1.5. <i>The organizational chart of SDG group</i>	60
1.6. <i>The Algerian clients portfolio of the SDG group</i>	61
1.7. <i>SOCETE GENERALE ALGERIE BANK presentation</i>	61

2. THE METHODOLOGICAL APPROACH.....	62
3. THE DATA TO COLLECT AND THE METHODS OF COLLECTION.....	63
3.1. <i>The observation</i>	64
3.2. <i>The documentary study</i>	64
3.3. <i>The interview</i>	65
4. DATA ANALYSIS TOOL:.....	66
5. INTERVIEW GUIDE.....	66
5.1. <i>Context</i>	66
5.2. <i>Presentation</i>	66
CHAPTER THREE: RESULTS AND DISCUSSION	70
1. THE FIELD OF STUDY PRESENTATION	71
2. RESULTS OF THE DOCUMENTATIONS ABOUT THE BUSINESS INTELLIGENCE SOLUTION IMPLEMENTATION	72
2.1. <i>Presentation of the responsible team</i>	72
2.2. <i>The implementation steps</i>	72
2.2.1. initial consulting and needs assessments	73
2.2.2. Scope definition and planning:	83
2.2.3. The IT infrastructure of the DSIOP	87
2.2.4. Data gathering and preparation	96
2.2.5. BI design and development.....	103
2.2.6. Testing and Quality Assurance	104
2.2.7. Training and knowledge transfer	108
2.2.8. Deployment and transition	110
2.2.9. Post-implementation and support optimization	111
3. RESULTS OF THE INTERVIEW	112
3.1. <i>Project Management and Budgeting</i>	113
3.2. <i>Data Quality and Integration</i>	114
3.3. <i>Data Security</i>	116
3.4. <i>Testing and Performance</i>	117
3.5. <i>Long-term Adaptation</i>	118
3.6. <i>Deployment and Business Continuity</i>	119
3.7. <i>Feedbacks</i>	120
3.8. <i>Continuous Improvement</i>	121
4. OBSERVATION RESULTS	122
5. DISCUSSION.....	122
CONCLUSION.....	124
REFERENCES.....	126
ANNEX.....	129

List of Tables

Table 1: the development of the Algerian banking system before 1990.....	29
Table 2: list of private banks in Algeria	32
Table 3: the historical development of BI	47
Table 4: BI Data Type/Source with examples	49
Table 5: List of interviewees	67
Table 6: Semi-structured interview guide	68
Table 7: results of the meeting.....	74
Table 8: Expertise Assessment	77
Table 9: Technology Stack Assessment	77
Table 10: Solution Offerings Assessment	78
Table 11: Data Governance Policies	81
Table 12: cost-benefits analysis	82
Table 13: scope definition	83
Table 14: timeline planning	84
Table 15: human resources definition	85
Table 16: technical resources definition.....	86
Table 17: the IT infrastructure assessment planning.....	88
Table 18: IT infrastructure analysis	91
Table 19: the upgrade and procurement planning for IT infrastructure	92
Table 20: key components of the integration planning:	93
Table 21: security and compliance assessment.....	95
Table 22: extraction phase	98
Table 23: transformation phase.....	98
Table 24: loading phase	98
Table 25: mapping data fields.....	100
Table 26: testing and quality assurance phase	105
Table 27: deployment phase timeline.....	111

List of Figures

Figure 1: BI integration in the bank's system.....	21
Figure 2: TOE framework	22
Figure 3: an example of the Algerian national banking card	36
Figure 4: example of a visa card.....	36
Figure 5: A MasterCard example of the Ibank	37
Figure 6: American express card example	37
Figure 7: Discover card example	38
Figure 8: an example of an ATM machine of Société Générale bank	39
Figure 9: an example of an EPT machine from EL BARAKA bank.....	40
Figure 10: strategy management.....	41
Figure 11: the triangle of management control.....	42
Figure 12: risk management process.....	44
Figure 13: system modeling of an organization	45
Figure 14: Business Intelligence Data Framework.....	50
Figure 15: the different stages of the BI process	51
Figure 16: an example of a power BI dashboard.....	53
Figure 17: SAP BUSINESS ONE.....	58
Figure 18: a cyclical Business Intelligence implementation process.....	59
Figure 19: the organizational chart of SDG Group.....	60
Figure 20: the organizational chart of the SGA Bank.....	62
Figure 21: the organizational chart of DSIOP	71
Figure 22: The implementation of the BI steps	73
Figure 23: BI data warehouse sources	76
Figure 24: SGA banking system.....	80
Figure 25: cost-benefit analysis	82
Figure 26: integration approach.....	99
Figure 27: BI architecture.....	103
Figure 28: training and knowledge transfer approach.....	109

List of Boxes

Box 1: Project Management and Budgeting.....	113
Box 2: Data Quality and Integration.....	114
Box 3: Missing and Incomplete Data.....	115
Box 4: Security Measurements.....	116
Box 5: Usability and Performance Testing	117
Box 6: Ling-term Adaptation insurance.....	118
Box 7: Disruptions during the deployment	119
Box 8: End-users Feedbacks	120
Box 9: Ongoing Optimization	121

List of Abbreviations and Acronyms

BI	Business Intelligence
BP	Business performance
RM	Risk Management
DM	Data Mining
DSS	Decision support system
TM	Text Mining
WB	Web Mining
OLAP	Online Analytical Processing
ETL	Extract, Transform, and Load
TOE	Technological, Organizational, and environmental framework
BIA	Business Intelligence and Analytics
IT	Information Technology
SMEs	Medium-sized Entreprises
BoE	Bank of England
ECB	European Central Bank
Fed	Federal Reserve
BoJ	Bank of Japan
BoA	Bank of Algeria
CDC	La caisse des dépôts et consignations
BNA	Banque Nationale d'Algerie
BEA	Banque Exterieur d'Algerie
CNEP	Caisse nationale d'epargne et de prévoyance
CPA	Credit populaire d'Algerie
BDL	Banque de developpement local
CAD	Algerian development fund institution
CMC	Money and credit council
DGIG	General Directorate of the inspectorate general
NICTs	New Information and Communication Technologies

IS	Information system
PIN	Personal Identification Number
ATM	Automatic Teller Machine
EPT	Electronic Payment Terminals
ISO	International Organization of Standardization
OS	Operating System
MS	Management System
IBM	International Business Machines corporation
AI	Artificial Intelligence
ERP	Enterprise Resource Planning
CRM	Customer Relationship Management
BDD	Base des donnees

Introduction

The 21st century is undeniably the age of technology. From the devices in our pockets to the vast networks connecting us globally, technology has permeated every facet of our lives. Businesses, in particular, have become increasingly reliant on technological advancements to operate efficiently, compete effectively, and deliver exceptional value to their customers. This constant evolution demands innovative solutions that can not only manage the ever-growing volume of data but also extract meaningful insights to drive informed decision-making.

One of these solutions is the Business Intelligence, which is a suite of technologies and processes designed to transform raw data into actionable knowledge. BI acts as a bridge between the vast amount of information collected by organizations and the ability to interpret that data to gain a strategic advantage. Through data warehousing, analytics tools, and reporting capabilities, BI empowers businesses to identify trends, understand customer behavior, and make data-driven decisions that optimize operations and propel growth.

The banking industry, inherently data-driven, stands to gain significant advantages from the implementation of BI solutions. Banks manage a wealth of customer information, transaction details, and market trends. BI empowers them to leverage this data to gain a deeper understanding of their customer base, personalize financial products and services, and mitigate potential risks. From fraud detection and creditworthiness analysis to targeted marketing campaigns and operational efficiency improvements, BI plays a crucial role in the success of modern banking institutions.

Despite the recognized potential of BI, successfully implementing and utilizing these solutions within the banking industry presents unique challenges. This dissertation aims to address the critical question: “How are BI solutions being implemented and utilized within the banking industry?” To gain a comprehensive understanding, this research delves into three sub-questions that lie down behind this major problematic which are:

- What are the key strategies and processes implemented throughout the entire lifecycle of a BI solution in the banking industry?

This question explores the best practices for deploying BI, from initial planning and data gathering to implementation, user training, and ongoing maintenance.

- How are data quality, security, and integration challenges addressed when implementing BI solutions in the banking industry?

Accurate, secure, and readily accessible data is vital for BI success. This sub-question examines the strategies employed by banks to ensure data quality, robust security measures, and seamless integration of various data sources.

- What measures are taken to ensure the successful adoption, performance, and long-term adaptation of BI solutions within the banking industry?

Beyond implementation, maximizing the value of BI requires user buy-in and ongoing optimization. This sub-question investigates the approaches used by banks to promote user adoption, monitor BI performance, and adapt the system to evolving needs. This dissertation pursues a multi-faceted approach to achieve a comprehensive understanding of Business Intelligence (BI) within the banking industry. The overarching objective is to provide an in-depth examination of how banks implement and utilize BI solutions across their operations. This will involve analyzing the entire lifecycle of a BI solution, from the initial planning stages of data gathering and system selection to implementation, user training, and ongoing optimization. Additionally, the research will delve into the key strategies and best practices employed throughout this lifecycle, focusing on aspects like data collection, user training, and maintenance. Furthermore, a critical aspect of the research will be examining how banks address challenges related to data quality, security, and integration. This involves investigating the strategies used to ensure data accuracy, robust security measures, and seamless integration of various data sources within the BI system. Finally, the dissertation will evaluate the measures taken by banks to promote successful adoption, performance, and long-term adaptation of BI solutions. This objective focuses on identifying approaches used to encourage monitor system performance, and continuously adapt the system to meet the evolving needs of the banking industry. Through achieving these objectives, this research aims to provide valuable insights into the successful implementation and utilization of BI solutions, ultimately empowering banks to leverage data for informed decision-making and a competitive edge.

The path we followed to address the research problem and gain a nuanced understanding of how BI solutions are implemented and utilized within the banking industry led us to adopt a qualitative research approach. This approach is particularly suited for exploring real-world

practices and user experiences surrounding BI implementation. Within this framework, we employed a triangulation approach, which combines multiple data collection methods to strengthen the validity and comprehensiveness of our findings.

In order to process our theme, we have structured our study into three main chapters:

- The first chapter will be divided into two parts: the literature review where we will discuss the researchers finding on the topic we ar handling in our dissertation. After that we are going to transition to the conceptual framework which is divided into two sections. In the first one we are going to understand the concept of bank, where we will give a profile to it by discussing its definition, history, the NITC and the objectives they seek for by adopting new technologies. In the second section, we are going to understand the concept of Business Intelligence, its data sources, its benefits and challenges.
- The second chapter will concern the methodological framework where we are going to explain our research approach, the data that we are going to target, how we are going to collect and process it, as well as the introduction of our sample.
- In the final chapter, we are going to dive deep in the process of implementing the BI solution in our hosting organization, by presenting the results of our empirical study and discuss them giving comments and suggestions about what we think they need to improve in order to reach better results with their BI solution

CHAPTER ONE: THE THEORETICAL FRAMEWORK

The immense amount of data gathered by banks every day from their external and internal sources hold massive potentials for improving their decision-making, performance, risk management, and even improving their daily work life.

This chapter dives into the concept of Business Intelligence (BI) solutions and their exploitation within the banking industry. We begin by a literature review that will explore how BI solutions are currently being utilized by banks, by presenting the key research findings on this topic. Next, we will introduce the conceptual framework that will guide our analysis. This framework will serve as a foundation for understanding the bank as an entity. Then, we will dive into the business intelligence solution.

1. Literature Review

1.1. Business Intelligence in the banking industry:

Before we dive into the details about the adaptation of the Business Intelligence in banks, it is important to understand the bigger picture first and then gradually descend into the specific parts. Therefore, our discussion shall commence with an examination of the previous literature to see what did the previous researchers conducted in this topic.

The bank is an authorized financial institution that acts as an intermediary between the lenders and the borrowers. Banks make money by borrowing the money from the lenders with a certain interest rate, then lend it to the borrowers with a higher interest rate, then profiting off the interest rate spread (JREISAT, 2021). Furthermore, banks are intermediary institutions that support other industries. For that, the banking industry have become an important industry and one of the key drivers of the economy growth. This sector experienced and still experiencing a complete transformation across the globe (Ashraf Bany Mohammad, 2022), due to many factors such as globalization, intense competition, emerging markets, rapid changes, increasing regulations, and most importantly technological innovations. In the recent times, data became a focal point and considered as the fuel of the future since it can be processed efficiently and used effectively in supporting risky occurrences and decisions that can be heavily reflected in the performance of corporates (Al-Okaily, 2022).

The banking industry is known for its data intensity, and for this reason Intelligence applications in banking and finance have been developed and deployed in the recent past and have been

offering business solutions in both front-end and back-end processes in order to create efficiency in their performance (Agarwal, 2019). One of this applications is the business intelligence integration.

Business intelligence is widely acknowledged as one of the most critical technologies that hand the power to the organizations to dive into their business data, comprehend it and gain a competitive advantage, by enhancing their operational efficiency, product development, and strength the relationship with their customers (Al-Okaily, 2022). In the banking industry, BI has a more important role to play for its ability to assist experts and managers in making enhanced, timely, and precised decisions. This contributes in the augmentation of the productivity and profitability of banks while ensuring the compliance with the various regulatory and environmental requirements specific to the banking sector (Nithya, 2021).

1.1.1. Business intelligence application within the bank's system:

Banks have always been at the forefront of using the latest technologies, applications, and tools that can assist them to maintain a competitive advantage in the market. Among these technologies, business intelligence that stands out as a powerful tool that offers the potential to acquire much more and better insights. In fact, business intelligence enables banks to elevate both their operational and managerial understanding of data, analyze it leading more accurate and informed decision-making (Ashraf Bany Mohammad, 2022).

Koteswara Rao and Roshan Kumar, two researchers from the Indian Institute of management published their article “*FRAMEWORK TO INTEGRATE BUSINESS INTELLIGENCE AND KNOWLEDGE MANAGEMENT IN BANKING INDUSTRY*” in the Review of Business and Technology Research journal where they summarized the application of the business intelligence within the bank as the following:

Business performance BP: banks use the business intelligence technology to analyze their historical performance during the past years, and evaluate the performance across its departments to identify areas for improvement, be able to take better decision, and plan for the bank's future.

Risk management RM: in a rapidly changing and uncertain financial environment, banks face an increasing pressure to make informed decisions based on accurate and actionable

information. The business intelligence has an important role to play in the RM within the banking industry for its effective mitigating of potential risks and the ability to provide this accurate and actionable information; by the utilization of data assets, the BI can assess the credit worthiness of customers, to minimize the risk of financial losses. The BI can also evaluate the credit risk of loan applicants using the credit scoring models that analyze various factors such as credit history, income levels, debt-income ratio, employment status... ect, to assign a credit score to each applicant. This score helps to assess the capacity of the borrower to acquire the loan and repay it. Enabling the bank to take an informed the decision to extend the credit to approve the loan.

Fraud detection: the ability to detect frauds is a crucial concern for any business especially financial institutions, for that they employed two approaches to detect fraudulent activities. The first approach concerns the utilization of external data warehouses that may include transaction data from various companies, this external data can lead to identifying fraud patterns using data mining; these patterns are then cross-referenced with the bank's own database to detect any signs of internal fraudulent activities. In the second approach, the fraud detection relies on the banks internal data, without involving external sources.

Marketing: using data mining, the bank's marketing department can dig into customer database; construct reliable profiles of individuals' preferences for products and services to make offerings that match precisely the customer preferences.

The bank's use of the business intelligence technology remains high, especially with the availability of huge data sets on customers. Based on this data availability, the BI can aid the banks in Customer segmentations, Customer Acquisition and Retention, and clients lifetime value (G. Koteswara Rao, 2011).

1.1.2. Business intelligence implementation:

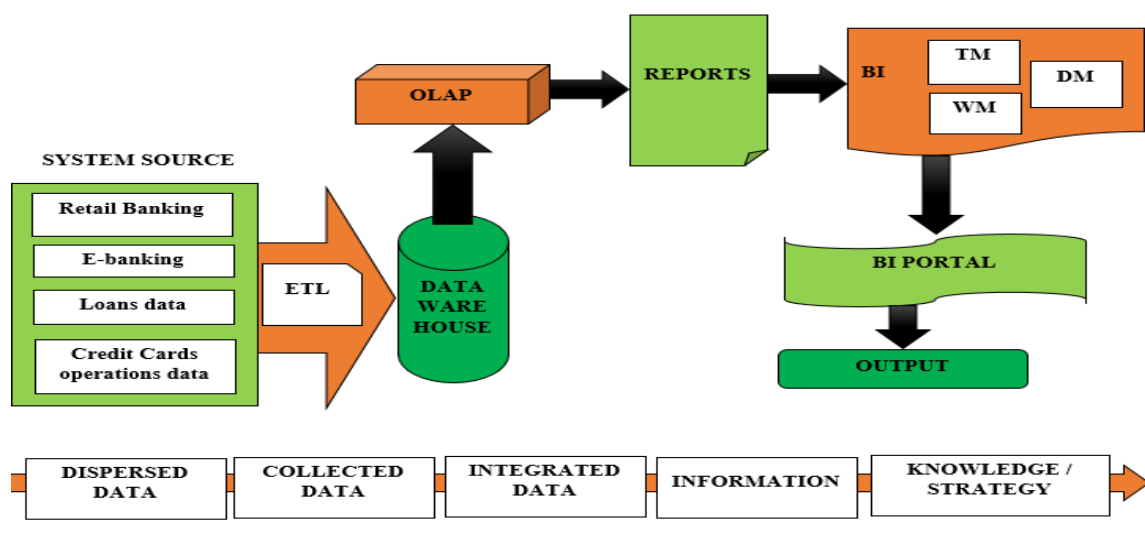
Ole Hanseth and Eric Monteiro published a book in 1998 under the title of "Understanding Information Infrastructure" where they offered valuable insights into the implementation of solutions within IT infrastructure based on ISO standards. The book provided a comprehensive understanding of information infrastructure as a socio-technical system, emphasizing the interplay between technological, organizational, and social elements. The

researchers drew the concepts and frameworks, that the organizations can approach the implementation of IT solutions within their infrastructure in a holistic manner. Firstly, the book emphasized the importance of aligning IT infrastructure initiatives with organizational goals and objectives. This aligns with ISO standards such as ISO/IEC 38500, which focuses on the governance of IT within organizations. This adherence to ISO governance principles, organizations can ensure that the implementation of IT solutions is driven by strategic objectives, effectively managed, and aligned with regulatory requirements. Secondly, the book highlighted the significance of information security within information infrastructure. ISO/IEC 27001 provides a framework for establishing, implementing, maintaining, and continually improving an information security management system (ISMS). the guidelines outlined in ISO/IEC 27001 helps organizations in developing robust security controls to protect sensitive data and mitigate risks associated with the implementation of IT solutions. Additionally, the book emphasized the role of service management in ensuring the effective delivery of IT services. ISO/IEC 20000 sets forth requirements for establishing, implementing, maintaining, and continually improving a service management system (SMS). The incorporation of ISO/IEC 20000 principles can optimize the delivery of IT services, enhance customer satisfaction, and drive operational efficiency. Moreover, the book underscored the importance of quality management in information infrastructure initiatives. ISO 9001 provides a framework for implementing a quality management system (QMS) to ensure that products and services meet customer and regulatory requirements. These principles lead to establishing processes for monitoring and improving the quality of IT solutions implemented within the organizations infrastructure.

In today's banking sector where the financial operations have become more and more complex. The banks deal with tons of data almost every day, from customer transactions to market trends. This data is the top managers' key to solve challenging problems and seize opportunities to succeed in business environment. Banks branches such as risk assessment, sales, electronic banking, customer segmentation and retention are generally the areas where BI concepts, analytics, technologies, and tools including data mining DM, data warehousing, and decision support systems DSS are applied (Moro, Cortez, & Rita, 2015). Business intelligence processes became fundamental in the banking sector of today, for making smarter decisions and improving operations.

Business intelligence is a continuous cycle for managing the information in a strategic manner, organizations like banks use the BI to systematically gather, analyze, and distribute relevant business data to business activities. This cycle consists of two key phases: implementation phase that focuses on identifying and preparing the data using specific tools, utilization phase that focuses on analyzing the data and transforming it into a strategic decision. The bank's domains like credit evaluation, branches performance, e-banking, customer segmentation, and retention present a fertile ground for a wide variety of BI concepts and techniques that could be implemented by data mining DM, text mining TM, web mining WB, data warehouses, decision support systems DSS schemes, cloud computing, and data virtualization (Al-Azmi, 2013), the following figure shows this implementation of the BI concepts and techniques that was found by the researchers :

Figure 1: BI integration in the bank's system



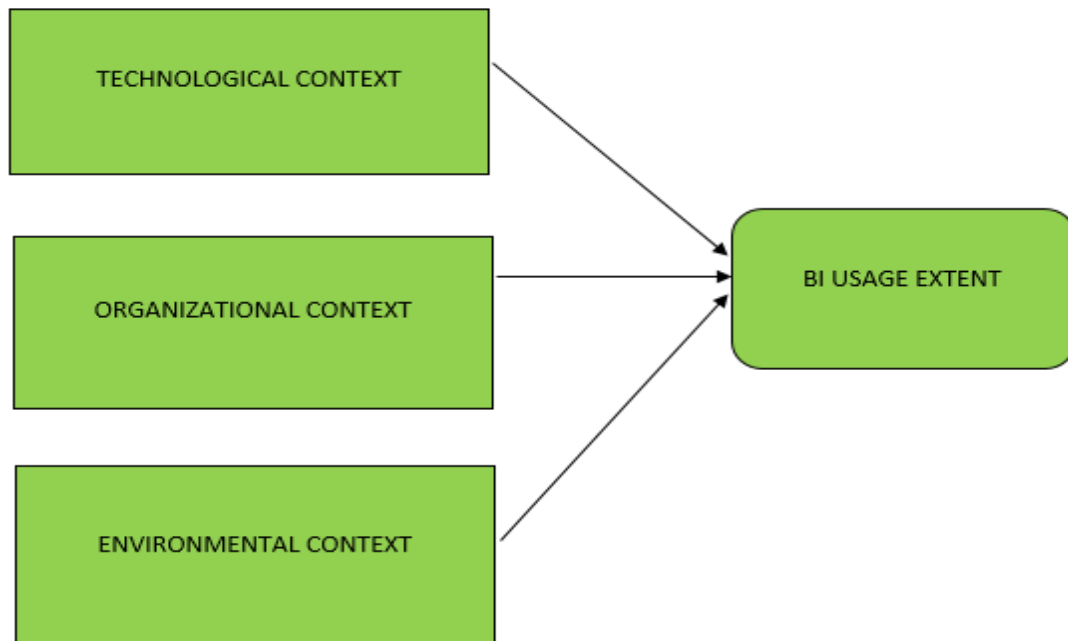
Source: Data, text and web minning for business intelligence by Al-Azami and Abdul-Aziz Rashid (2013)

Business intelligence integration in banks involves extracting, transforming, and loading data from diverse sources, then organizing it into a central data warehouse. This data is integrated into OLAP databases for multidimensional analysis to generate reports. BI solution then is conducted on those reports from DM, TM, and WM to uncover trends and patterns. Finally, the result insights are presented visually through a BI portal for end-user accessibility (Nithya, 2021).

1.1.3. The factors that influence the BI usage in the banking sector :

Bany Mohammad, al-majali, and masa'deh (2022) adopted a theoretical model to explore the impact of three key factors on the BI adaptation and usage in the banking sector, this model is called TOE framework and was presented as shown in the following figure:

Figure 2: TOE framework



Source: Business Intelligence and Analytics (BIA) Usage in the Banking Industry Sector: An Application of the TOE Framework by Bany Mohammad, al-majali, and masa'deh (2022)

According to the figure presented by the researchers, the factors that influence the usage of the business intelligence in the banking industry can be categorized in three main contexts based on the TOE framework:

Technological context:

Data-related infrastructure capabilities: the usage of the BI within the bank is crucially depending on having a robust infrastructure that can effectively manage and analyze the bank's data.

Technology-supporting infrastructure: a compatible IT infrastructure, devices, and systems are necessary to support the BI tools and applications and facilitate their usage.

Data management challenges: assuring the quality, reliability, and currency of the data can be a challenge to the banks, but having these characteristics in the data that will be treated by the BI technology can have a positive impact on the results.

Organizational context:

Top management support: one of the keys that can positively affect the adaptation of the BI in the banking sector is having a strong commitment and backing from the top managers.

Presence of a champion: a successful implementation and utilization of the BI can be influenced effectively by having an individual within the bank who promotes and advocates initiatives for the BI technology.

Talent management challenges: availability of skilled human resources with expertise in the both business and technology aspects can enable a better utilization of the BI capabilities.

Environmental context :

Competitive pressure: intense competition in the banking sector can be a driver for banks to adopt the BI as a method to gain a competitive advantage and improve its performance.

External market influence: the need to follow the evolving customers' needs, offers of new products, and the market dynamics pushes the banks to utilize technologies such as BI to take better decisions.

Regulatory compliance: BI tools assist banks in catching up with the various regulatory requirements, data disclosure norms, and compliance standards, this factors increase the need for the BI usage in the bank.

Bany Mohammad and al-majali with al Okaily (2024) added to their previous study another influential factor that can moderate and influence the usage of the BI within the banking sector, which is the employees' work experience. It has been found in their research that it moderates the relationships between technological and organizational factors and the usage of BIA. Based on these findings they highlighted the need for banking institutions to adopt a holistic approach that aligns advanced technological solutions, a supportive organizational

culture, and adaptability to the external environment to optimize their utilization of BI technology.

1.1.4. The strategic importance of the BI in the banking industry:

In the competitive world of banking, Business Intelligence (BI) acts as a strategic weapon. By analyzing vast amounts of data, BI can grant an advantage to the bank that uses it. Elahieh Radmehr and Mohammad Bazmara (2017) counted in their research some strategic advantages that the BI provides to the banks:

- ◆ BI can help banks develop new products and services that appeal to customers based on the competitors' products that are available in the market.
- ◆ Banks can better predict and manage risks to avoid defaults and losses, which is due to the ability BI technology offers by analyzing data on customer behavior and loan performance.
- ◆ Banks use the BI to identify and target specific groups of customers with the right products and services, that can help banks increase sales and profitability.
- ◆ Banks improve customer satisfaction by using the BI to understand their customers' needs.
- ◆ BI can help banks detect fraudulent activity by analyzing patterns in customer transactions, this can help them prevent losses and protect their customers.
- ◆ BI practices and tools are essential for banks to make informed decisions based on data. They provide the necessary framework and support for accurate decision-making, enabling banks to conduct business successfully and have a competitive advantage in the market (Shollo & Galliers, 2016).

2. Conceptual framework:

2.1. The bank's profile:

A bank is not just an ordinary business; the bank plays a fundamental role in the process of economic evolution and innovation. In this section, we will analyze some factors within the bank to demonstrate a comprehensive understanding of the banks itself and the interplay between bank characteristics and the effectiveness of BI implementation. First, we are going to give a proper definition of the bank, see its traditional, economical and its legal definition according to the Algerian law. Second, we will give an understanding background of the banks structure by discussing the typology of banks. Afterward we will learn more about the bank's system in Algeria by giving it a brief historical development, and then draw a clear image of its structure. Third, we will discuss the business objectives of the banks that will give us a clear comprehension of the goals that banks seek to by implementing the business intelligence solution within its system. Finally, we will overview some factors within the banks system that has a direct relation with the successful implementation of the business intelligence solution.

2.1.1. Definition of the bank:

The bank is a credit institution whose purpose is to provide financial services to individuals as well as to businesses. It facilitates payments for individuals and businesses, advances and receives funds, and manages payment methods. According to Caudmine.G and Montier J, 1999: "Companies or establishments that habitually receive funds from the public in the form of deposits or otherwise, which they use on their behalf in financial transactions, are considered banks. According to J.V. Capul and O. Garnier: The bank is a company of a particular type that receives deposits of money from its clients (businesses or individuals), manages their payment methods (credit cards, checks, etc.), and grants them loans. From the two definitions that we previously mentioned, we observe that the concept of a bank varies, so it would be important to define the bank according to some economic and legal criteria.

The economic definition of the bank: Werner (2016), defined banks economically as businesses or establishments that regularly receive funds from the public in the form of deposits, which they use on their own account for lending or financial operations. Banks are institutions that manage their customers' accounts in their liabilities. These accounts can be used by check or transfer within the limits of the available funds. Banks are service providers, ensuring payments and transfers of funds. They also distribute loans. The bank acts as an intermediary between suppliers and demanders of capital through two distinct processes:

- a) Bank Intermediation: By inserting its balance sheet between suppliers and demanders of capital.
- b) Bank disintermediation: By directly connecting suppliers and demanders of capital in a capital market (especially financial markets).

The legal definition of the bank: the definition of the bank according to the Algerian law has evolved over time in Algeria, reflecting the changing in the economic landscape of it.

- 1- According to the Law 86-12 of August 19, 1986: bank is defined as any credit institution that carries out, on its own behalf and as a habitual profession, mainly the following operations:
 - Collecting funds from third parties in the form of deposits, regardless of their duration or form.
 - Granting credit, regardless of its duration.
 - Carrying out foreign exchange and foreign trade operations in compliance with the legislation and regulations in force.
 - Ensuring the management of means of payment, carrying out the placement, subscription, purchase, management, custody, and sale of securities and all financial products.
 - Providing advice, assistance, and, in general, any service designed to facilitate the activity of its customers.
- 2- According to the law of January 12, 1988: the bank is a commercial legal entity with capital, subject to the principle of financial autonomy and accounting balance.

- 3- According to the Law 90-10 of April 1990: with the transition of the Algerian economy, from a planned economy to a market economy, the definition of the bank also evolved to legal entities that carry out, as their main and habitual profession, the operations described in articles 110 to 113 of Law No. 90-10 of April 1990 relating to money and credit. This operations include receiving funds from the public, credit operations, and providing customers with means of payment and managing them.

2.1.2. The bank's typology:

A typology is a framework that classifies entities based on common characteristics; this system was designed to effectively describe complex structure of organizations. Typologies have become popular tools across disciplines, including social sciences, anthropology, biology, and business, for designing meaningful classifications that draw patterns among entities by the creation of meaningful classification system to help identifying patterns of similar or different characteristics among them (Doty & Glick, 1994). This provides an understanding categorizing of items into clear types and categories in order to better analyze and comprehend them (Edwards, 2021). In studies like the study we are conducting, typology has proven particularly useful tool to classify the several organizational forms of the banks, that are structured and operated in different ways, Belaid, Mc (2015) counted four types of banks as the following:

Central bank: a public financial institution entrusted by the state to conduct the monetary policy of a country or economic zone. It is granted a high degree of independence to carry out its missions. The central bank plays mainly this three following roles:

- Issuing fiduciary currency and thus contribute to setting interest rates.
- Supervising the functioning of financial markets and ensure compliance with the risk regulations (solvency ratio) of financial institutions (especially deposit banks).
- Act as a lender of last resort in the event of systemic crises.

Central banks play a crucial role in a country's economic stability. Their decisions have a direct impact on economic growth, inflation, employment, and the well-being of citizens. This banks do not all have the same powers and responsibilities, Some central banks share their powers with other institutions, and their organization and structure can vary from

country to another. Example: European Central Bank (ECB), Federal Reserve (Fed), Bank of England (BoE), Bank of Japan (BoJ), and the bank of Algeria.

Public banks: financial institutions owned by the state or public entities, this means the government has significant control over the bank's operations and decision-making. The primary focus of the public banks is not about maximizing profits but rather fulfilling broader social or economic objectives set by the government including supporting specific sectors (like agriculture), Supporting small and medium-sized enterprises (SMEs), Fostering sustainable development, or providing financial stability during economic downturns.... Example: State Bank of India, Bank of China, CDC in France, BNA and BEA in Algeria...etc.

Commercial banks: private financial institutions owned by shareholders who are external to the bank's customer base and invest in the bank and expect to receive a return on their investment. The primary focus of the commercial banks is to generate and maximize profits by offering a range of financial services and charging interest on loans, fees for services, and managing investments. Commercial banks can be listed on the stock market; this allows them to raise capital by selling shares to the public and provide shareholders with an opportunity to trade their shares. A commercial bank can be an international, national, or regional bank. Example: Wells Fargo & Company bank in the USA, HSBC Holdings plc in the UK, BNP Paribas and société générale in Algeria...etc.

Cooperative banks: financial institutions that is collectively owned and democratically governed, the owner of this banks are also their customers. Cooperative banks operate with a democratic structure. Members elect the bank's leadership under the principle of “one person, one vote”, and participate in decision-making processes. Banks like this often have a decentralized management approach; this gives them the advantage of better understanding the needs and expectations of their customers. They are key players in sustainable development and social responsibility, such as the fight for employment and against social exclusion. Example: National Credit Union Administration (NCUA) in the USA, Triodos Bank in the Netherlands, CNEP and BDL in ...etc.

2.1.3. The structure of the bank's system in Algeria:

Benjamin Stora published a book titled "Algeria, 1830-2000: A Short History" where he gave a detailed historical background of the Algerian banking system before 1990, in the period from 1990 until 2003, and after 2003. Using his book, we can summarize the history of the Algerian banking system as the following:

Before 1990: we can summarize the main historical development in the Algerian banking System during this period in the table below:

Table 1: the development of the Algerian banking system before 1990

The period	The main historical events
1962-1966	This period saw the establishment of key financial institutions in Algeria : • the Central Bank of Algeria (December 13, 1962) • Issuance of the Algerian Dinar (April 10, 1964) • Creation of new financing institutions: Algerian Development Fund (CAD), National Savings and Provident Fund (CNEP)
1966-1970	In this period the Algerian banking system witnessed the nationalization of foreign banks and the establishment of new national commercial banks : • Banque Nationale d'Algérie (BNA) • Crédit Populaire d'Algérie (CPA) • Banque Extérieure d'Algérie (BEA) Each bank was assigned to serve a specific sector of the economy
1971-1985	This period was characterized by the reorganization of financial structures and the reform of financial mechanisms : • Transformation of CAD into the "Banque Algérienne de Développement" (BAD) in 1972 • Restructuring of BNA and CPA to create: Banque de l'Agriculture et du Développement Rural (BADR) and Banque de Développement Local (BDL)

1986-1990	Law No. 86-12 of August 19, 1986 was issued to define a new institutional and functional framework for banking activity: • Implementation of a National Credit Plan to align with the National Development Plan. • Classification of banking institutions into : 1- Banking institutions : ○ Central Bank ○ Credit institutions (public banks and specialized credit institutions) 2- Administrative institutions : ○ National Credit Council ○ Banking Control Commission
-----------	--

Source: elaborated by us

From 1990 until 2003: in this period the law 90-10 of 1990 was issued to revolutionize the Algerian banking system by defining the Bank of Algeria as the sole monetary authority, severing its dependence on the government and granting it the freedom to manage monetary policy. This independency was aiming to promote a stable and healthy financial environment for the economic growth. This law also introduced two crucial structures within the Bank of Algeria: the Monetary and Credit Council (CMC) that acted as a dual body, functioning both as the Bank's board of directors and as the central monetary authority. It held the power to issue regulations and make critical decisions regarding the entire Algerian banking system. This includes setting interest rates, establishing reserve requirements for banks, and determining the overall direction of monetary policy. Alongside the CMC, the Banking Commission that played a vital role in ensuring the smooth operation of the financial sector. It acted as a supervisor of banks and financial institutions to guarantee adherence to the established regulations. The Commission has the authority to investigate potential breaches, and if necessary, impose sanctions to maintain financial stability and protect consumers (Stora, 2004).

After 2003: In this period the ordinance, 03-11 on Money and Credit was issued in August 26, 2003 that significantly modified the Law 90-10. This ordinance transformed the Algerian banking system by introducing transformations that aimed to strengthen it. This ordinance introduced a series of changes, including increased regulatory control and adherence to Basel I prudential principles by giving stricter definitions of a bank's own funds, calculation

methods for capital adequacy ratios, and limitations on risk exposure to individual borrowers. Furthermore, the ordinance mandated stricter provisioning for potential loan defaults and established minimum capital requirements for banks and financial institutions. Beside defining detailed regulations concerning external borrowing limits and foreign exchange positions by the ordinance 03-11, and to ensure the adherence to these regulations, two bodies were established as the primary bodies responsible for prudential control in Algeria: the Banking Commission composed of legal and financial experts was responsible for monitoring bank compliance and imposing disciplinary actions for any violations. In addition, the General Directorate of the Inspectorate General (DGIG) conducted on both on-site and off-site inspections to verify banks' adherence to regulations and prudential ratios (Stora, 2004).

The structure of the Algerian banking system:

Ishaq Hacini and Khadra Dahou (2018) elicited the structure of the Algerian banking system, as they detailed in its structure that is currently composed of the following institutions :

The bank of Algeria: was established in December 13, 1962 as the central bank of Algeria, and appointed as a bank responsible for issuing the national currency, regulating the banking sector, and managing foreign exchange reserves. The Bank of Algeria is also responsible for promoting economic development and financial stability in Algeria. The Bank of Algeria is governed by a board of directors, which is chaired by the governor of the bank. The board of directors is responsible for setting the bank's policies and overseeing its operations. The governor of the bank is appointed by the president of Algeria. The Bank of Algeria has a number of departments, including the monetary policy department, which is responsible for setting and implementing the bank's monetary policy. The banking supervision department, which is responsible for supervising the activities of banks and other financial institutions in Algeria, and the foreign exchange department which is responsible for managing the country's foreign exchange reserves. The central bank of Algeria also known as the bank of Algeria is responsible for maintaining the stability of the Algerian dinar, promoting economic growth, and protecting the financial system. It also plays an important role in the Algerian economy by promoting financial inclusion and reducing poverty in Algeria.

Public banks: in Algeria there are six public, including the bank of Algeria (BoA), the Popular Credit of Algeria (CPA), the National Bank of Algeria (BNA), the External Bank of Algeria (BEA), the Local Development Bank (BDL), the Rural Development Bank (BADR), and the National Savings and Provident Fund Bank (CNEP). These banks were all established before 1990, and were not subject to any regulations at the time. However, the promulgation of the law on money and credit in 1990 required these banks to obtain a license from the Monetary and Credit Council. This requirement was introduced in order to ensure that these banks were operating in a prudent manner, also helped to level the playing field between public and private banks.

Private banks: the law of April 1990 allowed the creation of banks with national and foreign private capital, based on information that we gathered from the official website of the central bank of Algeria (THE BANK OF ALGERIA) we could illustrate the private banks that exist within the Algerian territory using updates from the central bank's official website in the table below:

Table 2: list of private banks in Algeria

The bank	The date of approval
Arab Banking Corporation Algeria	September 24 th , 1998
Natixis	October 27 th , 1999
Société Générale Algerie	November 04 th , 1999
City Bank Algeria	May 18 th , 1998
Arab Bank PLC Algeria	October 15 th , 2001
B.N.P Paribas El Djazair	Janaury 31 st , 2001
Trust Bank Algeria	December 30 th , 2002
Gulf Bank Algeria	December 15 th , 2003
The Housing Bank For Trade And Finance- Algeria	October 08 th , 2003
Fransbank El Djazair	September 07 th , 2006
Credit Agricole Corporate And Investment Bank- Algeria	May 09 th , 2007
Al Salam Bank Algeria	September 10 th , 2008
H.S.B.C Algeria	June 17 th , 2008

Source: elaborated by us using information from the official website of the central bank of Algeria BoA

2.1.4. The adaptation of New Information and Communication Technologies “NICTs” within the banking sector:

In the recent years, with the uncountable technological solutions inventions the market of today has evolved from traditional function system to developed enterprises seeking to satisfy their customers evolved needs with the quality services. The banking sector as any business was forced to adopt their business models to change how they interact with customers, manage their middle and back-office operations, be competitive and be ready for the future (Timo Cziesla, 2014).

A digital transformation can be defined as the process that aims to improve an entity by adopting fundamental changed in its structure through combining information, information technology, communications, and connectivity technolog (Vial, 2021). Angus W.H. Yip and Nancy M.P. Bocken (2018) proposed a business model archetypes for a sustainable digital transformation in the banking industry, this model includes a broad concepts:

Computerization and automation of the sector: before the 1970s era, traditional banking system was mainly a repetitive and manual document processing, but due to the development of new technologies such as computers and software, systems capable of performing millions of operations in a day have been adopted in the banks function systems. Information system (IS) is a complex network of structured relationships involving people, machines, and procedures that aim to generate orderly flows of relevant information from different sources to serve as a basis for decisions. Interconnected for the purpose of acquiring, storing, structuring, managing, moving, controlling, displaying, exchanging (transmitting or receiving) data in the form of text, images, sounds and/or, involving hardware or software (Nidal A. Al-Dmour, 2023). Keri E. Pearlson, Carol S. Saunders, Dennis F. Galletta (2024) in their book recently published titled “ *Managing and using information systems: a strategic approach*” discussed in a part of their book the functions of the information system department, that involves the process of collecting data, storing it, Processing and Analyzing it, and finally the Diffusion of the final processed data:

Data collection: the IS gathers data from various sources, and utilizes different methods for data entry, including forms, web interfaces, sensors, and more. There are two sources that banks gather information from:

- Internal sources: Set of documents, reports, notes, etc., issued by the different departments of a bank which constitute an important stock of available information, such as customer transactions, production data, etc
- External sources: Set of information from the bank's direct environment: customers, suppliers, administration, etc.

Data storage and organization: this operation consists of storing the collected data in a database, organized in a structured and accessible way for the purpose of its manual or computer processing. The entry can be direct, or deferred on an intermediate medium.

Data analysis: the IS department uses different methods to organize and understand the stored information, by transforming the data into useful information and presenting the results in a clear way. This operation's purpose is to find useful insights that can be useful for the bank.

Reporting: after processing the data, the IS department distributes the processed and analyzed information to different users within the various department of the bank, including the top management in a form or reports, dashboards, alerts, etc to help them take better decisions for the future of the bank.

The information system department in the bank or any organization represents a major investment in today's business environment, a poorly chosen IS can be an obstacle to achieving business goals if it's not well aligned with the strategy and system of the organization (Keri E. Pearlson, 2024). The IS supports the organization's operations with three key objectives. Firstly, by serving as a control center through tracking activities and recording data to ensure accuracy, identify inefficiencies, and maintain compliance. Secondly, assuring the coordination by facilitating communication and information flow between departments. Finally, empowering decision-making by analyzing vast amounts of data to uncover trends, assess risks, and present insights that guide informed choices and strategic direction (Adilson Carlos Yoshikuni, 2023).

The new technologies integrated in the bank's system: on a complex ecosystem landscape of integrated technologies, the banking industry evolved from paper ledgers and limited branch hours to a revolutionized way to manage its clients finances, according to Fotis Kitsios (2021) this revolution can be summarized as the following :

E banking: The Internet marks a particular stage in the evolution of remote banking services. It facilitated the emergence of entirely virtual banks with no physical branches, which have, in turn, encouraged more traditional banks to study the advantages of the Internet, in order to strengthen their competitiveness against online branchless institutions by offering online banking services such as managing accounts, transfer funds, and pay bills electronically, etc. The Internet is accessible to a vast clientele, with a very affordable cost of equipment, ease of use, a multiplication of access possibilities (telephone, cable, and web-phone), as well as a strong standardization of Internet technologies offer an international framework for use.

Electronic money: it can be defined as a set of technologies, procedures, and equipment that encompasses a variety of payment methods. This payment can be done using cards that the banks offer for their customers and can be grouped in three levels:

- Level 1 “Identification”: the card is used to identify the client to the bank by a PIN, chip or biometric data.
- Level 2 “payment”: the card is used to transfer funds from the clients account to others whether online or in person.
- Level 3 “credit”: The card can be used to borrow money from the customer's credit line.

Bankcards: Bankcards are a mass payment method and have been the most highly rated product in recent years. They have a range that includes four distinct levels by usage possibilities:

Badge cards: these cards are used for identification (level 1) purposes and access to buildings or other restricted areas. They typically do not have payment functionality.

National cards: also known as level 2 cards, they are issued by banks and financial Institutions to be used for payments within a specific country with additional features such as ATM withdrawal and online payments and lower fees. They can be personal or professional and offer two options: fast debit where the cardholder's account is debited immediately upon receipt of the transaction, within a similar timeframe to that of a check

cashing or deferred debit where the cardholder's account is debited monthly, on a fixed date, with a delay that can be as long as four (4) to five (5) weeks.

Figure 3: an example of the Algerian national banking card



Source: the official website of the BNA

International cards: defined by level three (3) of interbank agreements, are used for international payments. International bankcards reflect the legacy of the pre-interbank situation when each bank had its own set of rules and regulations for international payments by being grouped into two networks:

Visa cards (blue card network) :

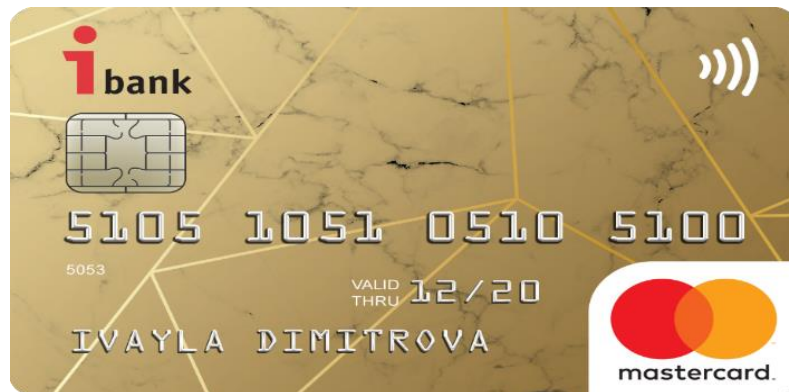
Figure 4: example of a visa card



Source: the official website of the BNP PARIBAS bank

MasterCard (mutualist network) :

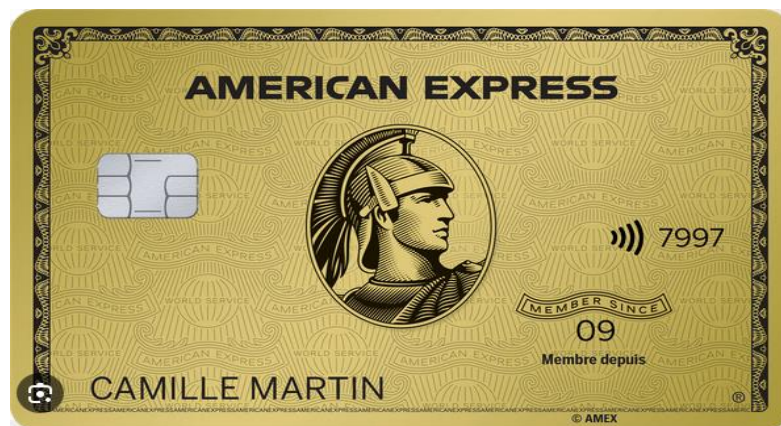
Figure 5: A MasterCard example of the Ibank



Source: the official website of Ibank

Additional to these two main networks for international bankcards, Visa and MasterCard, there are now also a number of other networks, such as American Express and Discover. These networks have their own set of rules and regulations (Ivan LUCHIAN, 2017).

Figure 6: American express card example



Source: the official website of American express

Figure 7: Discover card example



Source: the official website of Discover

These cards offer common services and guarantees that go well beyond the advantages of the national card, such as:

- Insurance against loss or theft of the card
- Travel accident insurance if the expenses have been paid for by card
- Disability-death insurance that covers the cardholder

Figure 8: an example of an ATM machine of Société Générale bank



Source: the official website of Société Générale bank

EPTs: Electronic Payment Terminals, also known as TPE (Terminal de Paiement Electronique), is a device that allows the process of payments to be done by the card in three ways. Firstly, online where the device is connected to a central server each time the card is used. Secondly, offline where the checks are managed by the device itself before validating a transaction. Finally, Semi-online where the device manages the parameters that allow it to process a transaction based on the amount, either validating the transaction or requesting its validation by connecting to the central server. EPT is a Machine with a keyboard, screen, and software with memory that offers various, including:

- Electronic verification of cards
- Automatic authorization of transactions
- Transmission of completed transactions

Figure 9: an example of an EPT machine from EL BARAKA bank



Source: the official website of EL BARAKA bank

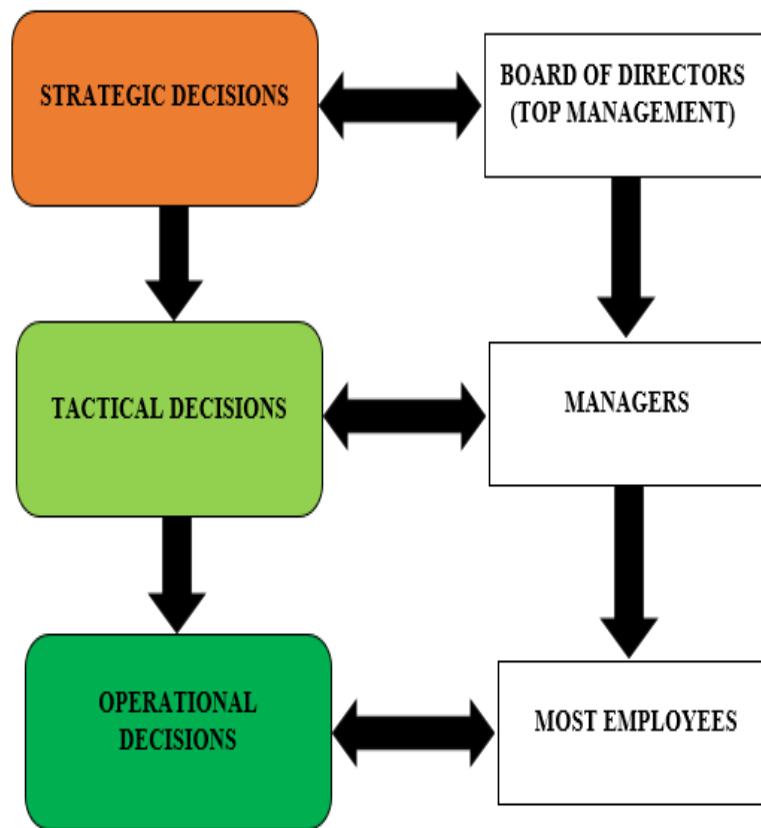
2.1.5. The banks' objectives by adopting technological solutions:

Banks are more than just places to store money or get a loan; they are entities that have an important impact on any countries' economy. Like any other business, they have goals and objectives they seek to achieve with their everyday operations, but in today's rapidly evolving financial market banks face unlimited challenges and opportunities as they seek to achieve them. For this reason, banks are increasingly turning into innovative strategies and technologies to reach their efficiency and achieve their goals (Tu DQ. Le, 2020). We can give more details about some of these objectives as the following:

Enhancing decision-making: decision-making is a complex and multifaceted process that involves selecting a solution from several possible alternatives (Elbanna, 2006). Henry Mintzberg (1973) in his work "*The Nature of Managerial Work*" identified several contingency factors that influence decision-making, which are the age and the size of the organization, the technology and the strategy, the culture inside the organization, and the environment where the company is active. New days companies are must decide between two decision-making structures, the first is a centralized decision-making structure that offers streamlined processes and faster decisions, but can stifle creativity and employee morale. The second is a decentralized decision-making structure that empowers lower levels and fosters innovation, but risks inconsistencies and errors (Elbanna, 2006).

Igor Asnoff (1957) in his work "*Strategies for Diversification*" developed a model that distinguishes three types of decisions based on their importance; the following figure illustrates this model:

Figure 10: strategy management



Source: Igor Asnoff (1957) strategies for diversification

Technology is transforming how banks make decisions. The vast amounts of customers data can be used by advanced analytics tools like BI uncover hidden patterns and risks that human intuition might miss. This uncover can help the top management to make faster and more informed choices that will affect the bank in short and long term (Sauro Mocetti, 2016).

Improving the performance: The concept of performance is one of the challenges of a management controller because its assessment constitutes the essential objectives entrusted to him to ensure the sustainability of the company in the face of highly active competition. The meaning of performance is rather vague to define, according to Daniel Katz and Robert. Kahn (1966) in their book “*The Social Psychology of Organizations*” the organizational performance is the ability of an organization to achieve its goals while also maintaining its internal stability and adapting it to the external environment. They proposed that performance could be assessed through four criteria: growth, survival, adaptability, and employee satisfaction. Their work laid the groundwork for a more holistic understanding of

organizational performance that considers not just economic outcomes but also social and psychological factors.

In the mid-20th century, Peter Ducker a pioneer in management theory emphasized the importance of efficiency and effectiveness in achieving organizational goals. He argued that organizations should focus on doing the right things (effectiveness) and doing them well (efficiency). Insofar the organizational performance is based on two inseparable but extremely distinct notions: the value-cost pair, the works of Ducker started bridging the gap between cost control and value creation. Further, Michael Porter in his work on Value Chain Analysis (1985) laid significant groundwork for understanding the relationship between this two notions and solidified the importance of analyzing both aspects for optimal performance. Based on the work of these management thinkers, we can define Performance in a company as everything, and only everything, that contributes to improving the value-cost ratio. It is also: Everything, and only everything, that contributes to achieving strategic objectives. Performance is also part of the framework for optimizing the "objectives-means-results" that was popularized by Peter Ducker (1954), which can be schematized as follows:

Figure 11: the triangle of management control



Source: Peter Ducker (1954) "The Practice of Management"

According to Peter Ducker, the notion effectiveness is the ability of a company to achieve its economic or other objectives that it has set in advance. It can be quantifiable and measurable (example: the goal of profit, growth) but can also sometimes be measured only in a

qualitative way (success or failure of a product launch, for example). On the other hand, the notion efficiency refers to maximize the quantity obtained from a given quantity of resources or minimizes the quantity of resources consumed for a given production. In the banking industry, measuring the exact organizational performance is a complex process, Capturing factors like customer satisfaction, innovation, and long-term impacts alongside short-term numbers is a challenge (Szilard Farkasdi, 2021). That is the reason why banks adopt modern technological solutions that will help them on the short and long term to enhance their performance by enhancing Efficiency and Cost Reduction. Introducing the automatization to the bank's internal system like data entry automation, loan processing automation, robotic processing automatization...etc. Time and costs can be reduced by freeing up the employees for more strategic work (BYKANOVA N.I, 2020). The adaptation of technologies that can connect different departments and systems within the bank, creating smoother workflows and faster turnaround times., such as enterprise resource planning ERP, application programming interface API, etc. These technologies have a crucial positive impact on the efficiency of the bank (Ali Ahmadzadeh, 2021). Another kind of technologies were adopted by banks to optimize their internal processes and improve their decision making which are data analytics like machine learning ML, Business intelligence BI like Microsoft Power BI for data visualization, etc (Qaisar Ali, 2020).

Increasing security and risk management: according to ISO 31000:2009 named as risk management, and published by the International Organization for Standardization, risks are the effect of uncertainty on objectives. On the other hand, the risk management is coordinated activities that work in coherency to direct, control and organize these risks. The process of a risk management is a systematic application of management policies, procedures and practices to tasks regarding managing the risks of an organization. ISO 31000 elaborated a framework for designing, implementing, monitoring, reviewing and continually improving risk management process throughout the organization, the following schema can illustrate the process of risk management following the framework elaborated by ISO 31000:

Figure 12: risk management process



Source: ISO 31000:2009

Banks operate in a very complicated environment, where they face a multitude of risks that can threaten their financial stability and reputation, from borrowers failing to repay loans, to unexpected swings in markets. They must also ensure they have enough cash on hand, avoid internal stumbles, comply with regulations, and protect their reputation (Nyakarimi, 2020). Avoiding these risks is impossible, but banks embrace new technologies to minimize their effect like powerful data analysis tools that can handle the massive amounts of information flowing through a bank, from transactions to customer profiles. This allows them to uncover hidden risks and patterns that might have been missed before, for example: machine learning and BI. Banks also adopt technologies like cloud computing for flexible and cost-effective resources to scale their risk management up or down as needed. Additionally, cyber security measures protect sensitive customer data and guard against cyber-attacks (Maoyong Cheng, 2020).

2.2. The Business Intelligence profile:

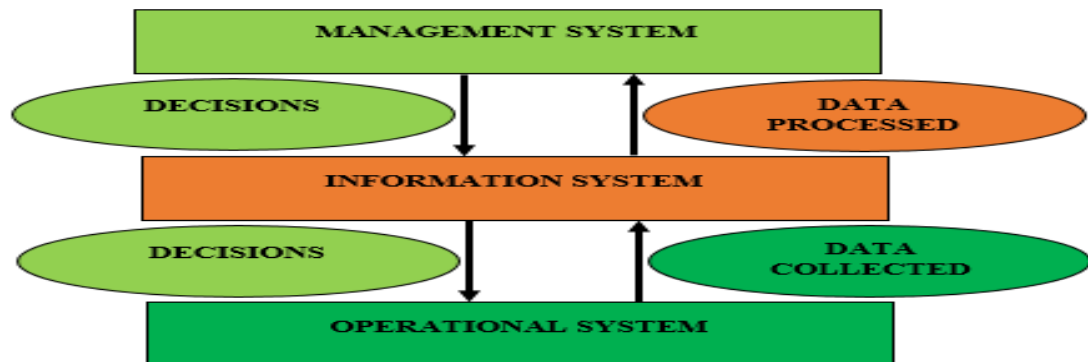
Before we dive into the concept of business intelligence, we need first to build an understanding background about the system modeling of any organization. According to

Ibrahim Hussien Musa Magboul (2016) the system modeling of an organization can be decomposed into three subsystems:

- The operating system (OS): it represents the manufacturing company's production line, this productive activities consists of transforming Primary flows (materials, finance, personnel...) to meet the needs of customers.
- The management system (MS): it includes all the management individuals who perform the tasks of regulation, steering and adaptation of the organization to its environment.
- The information system (IS): it allows to collect, store, process and restore the different data from all the departments of the organization in order to allow the MS to perform its functions while ensuring its coupling with the OS.

The three subsystems are interdependent and work together to achieve the organization's goals. The operational system is directly linked to the information system, as the IS collects data from the OS, processes it, then reports it to the management system. The MS used the data provided by the IS to take strategic decisions that will affect the whole organization. The following figure will illustrate the relation between the subsystems of the organization:

Figure 13: system modeling of an organization



Source: elaborated by us

2.2.1. Definition of the Business Intelligence:

Hans Peter Luhn (1958) published his paper titled "*A Business Intelligence System*", where he explored the use of technology to analyze and present data for business insights. This was a significant step towards formalizing the concept of Business Intelligence.

Business intelligence is an umbrella term that includes structures, tools, databases, applications, and methodologies to analyze data by converting raw data into meaningful and information to support business managers' decisions (Turban, Sharda, & Delen, 2011).

Business intelligence (BI) systems act as a central point for organizational information. They gather data from various sources within the company (internal data) and from external environments (competitive information). BI systems then go beyond simply storing this data; they employ analytical tools to transform it into usable insights. Implicit in this definition is the idea that Business intelligence (BI) systems function as a critical tool for contemporary organizations, enabling improved decision-making processes. These systems achieve this by providing actionable information to managers at the opportune moment and presented in a visualized format. This ensures that decision-makers have access to timely and pertinent data, leading to enhanced quality of their choices (Negash, 2004). According to Langseth and Vivatrat (2003), the essential components of a proactive BI are:

- Real time data warehousing
- Data mining
- Seamless follow-through workflow
- Geographic information systems (Appendix I)
- Data visualization (Appendix II)

2.2.2. Historical development of Business Intelligence:

Purnomo, Firdaus, Sutiksno, Putra, & Hasanah (2021) drew a mapping of the Business Intelligence from a bibliometric review, where they illustrated the development of the business intelligence during the decades, we can be summarized this historical development in the following table:

Table 3: the historical development of BI

The period	The development
1865	• First appearance of the BI concept: using data for informed decision-making. • Richard Millar Devens in his work “Cyclopedia of Commercial and Business Anecdotes” where he described how a banker, Sir Henry Furnese, gained an advantage by gathering and acting on information before his competitors.
1950-1980	This period was known for the significant technological inventions: • 1950: the development of electronic computers, these machines paved the way for data storage and analysis that lays the groundwork for BI. • 1956: IBM’s inventing the hard disk drive for storing vast amount of data, this invention made a significant leap in data analysis by making it more feasible. • 1960: the appearance of DSS, BI tools in data analysis provided capabilities to managers to make data-driven decisions.
1980-2000	In this period, the Business Intelligence gained a revolution. • 1980 : the BI became recognized by the development of data warehousing technologies • 1990-2000: BI tools became more user-friendly with features like reporting, dashboards, and data visualization. Also the appearance of online analytical processing OLAP capabilities that allow for multidimensional data analysis for deeper insights
2000 onwards	This period witnessed the emerge of the self-service BI. BI tools became more accessible, that empowered business users to analyze data without relying on the IT department.

Present day	Business Intelligence technology continues to evolve alongside advancements in technology. Technologies like Cloud computing, big data analytics, and AI are all shaping the future of BI.
-------------	--

Source: elaborated by us

2.2.3. Data framework for BI:

BI systems rely on analysts working with two main data types, structured and semi-structured data (Negash, 2004).

STRUCTURED DATA: this term is used for is used for all data that fit neatly into relational or flat files, that means that all the data are organized in a fixed format and follows a defined scheme that clearly describes what each piece of data represents and how it relates to other pieces. Each data point has a predefined field and format, for example: customer name as text, purchase amount as a number. This makes structured data easy to search, analyze, and manipulate using standard database tools and queries.

SEMI-STRUCTURED DATA: this term is used for all data that does not fit neatly into relational or flat files; it often includes tags or markers that provide some level of organization, but not a fixed format for every data point. Examples: Emails (with sender, recipient, subject, body), social media posts (with text, images, hashtags), sensor logs (with timestamps, readings).

Semi-structured data represents a challenge for analysts, it's hard to search and analyze this data efficiently, and managing it takes a lot of time. Business intelligence (BI) systems are the key that unlocks the value behind this semi-structured data for businesses. BI tools can analyze this data, find hidden patterns and trends, and even combine it with structured data for a complete picture of the company (Gerald Onwujekwe, 2020).

Structured and semi-structured data types can be further segmented by looking at the internal and external data sources of the organization. These two dimensions – data type and data source can be illustrated in following table:

Table 04

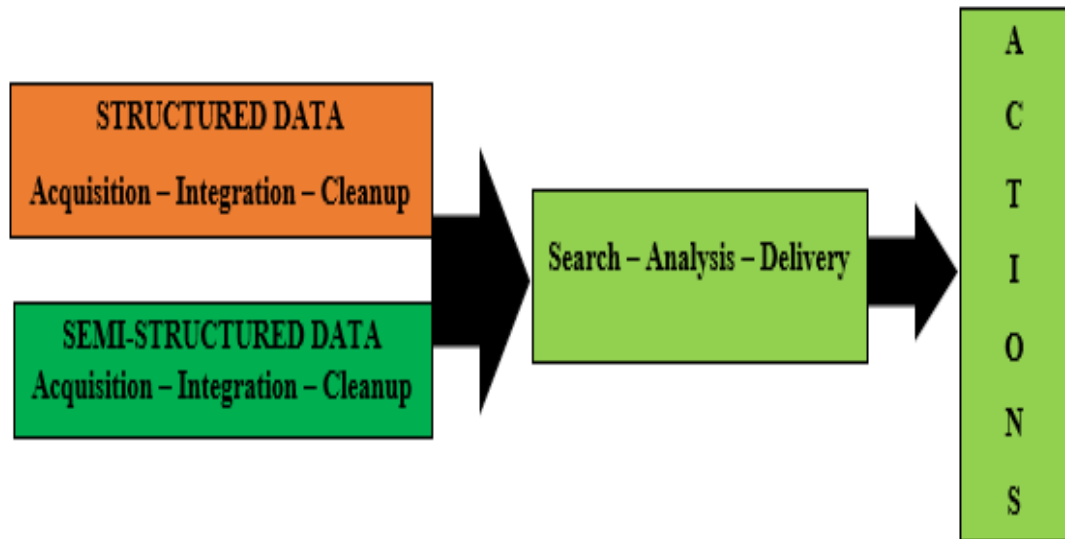
Table 4: BI Data Type/Source with examples

Type \ Source	INTERNAL	EXTERNAL
	INTERNAL	EXTERNAL
STRUCTURED DATA	ERP	CRM
SEMI-STRUCTURED DATA	BUSINESS PROCESSES	SOCIAL MEDIA

Source: Business Intelligence by Solomon Negash (2004)

The creation of a useful information using Business intelligence from the structured and semi-structured data follows a framework. This framework design shows that both types of data are equally important for taking action by planners and decision makers. The following figure shows that framework used by BI for both types:

Figure 14: Business Intelligence Data Framework

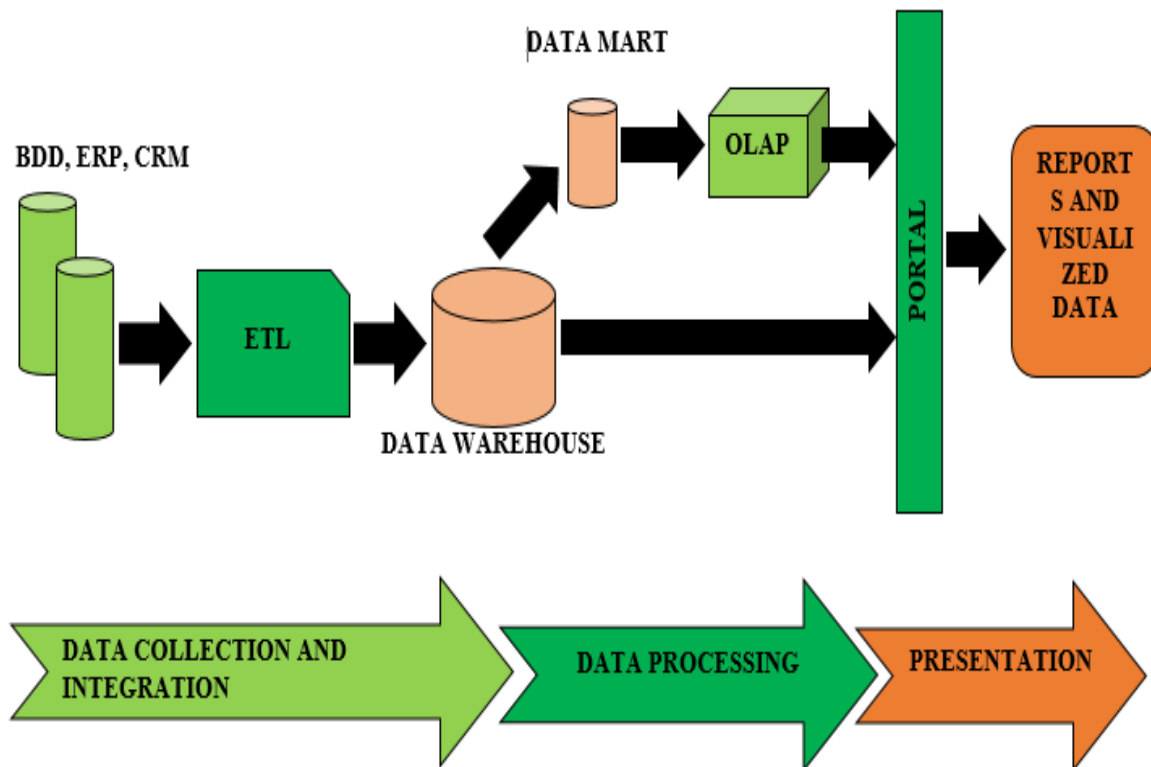


Source: A Framework for Capturing and Analyzing Unstructured and Semi-structured Data for a Knowledge Management System by Gerald Onwujekwe, Kweku-Muata Osei-Bryson, Nnatubemugo Ngwum (2020)

2.2.4. Business intelligence process stages:

The BI process ensures four functions: data collection, integration, dissemination, and restitution (Shariat, 2007). These functions can be presented according to the following architecture:

Figure 15: the different stages of the BI process



Source: Conceptualizing Business Intelligence Architecture by Mohammad Shariat and Roscoe Hightowe (2007)

Data collection process: this phase is a function performed by a family of tools called ETL (Extract-Transform-Load). This family of tools is responsible for retrieving all the necessary data from the different sources. These application data are therefore extracted, transformed and loaded into a data warehouse. That means the data is cleaned, consolidated and extracted from the production systems and adapted for decision-making purposes.

Joshua C. Nwokeji and Richard Matovu (2021) discussed The ETL process steps as the following:

Extraction: The first step is to extract the data from the various sources. This can be done using a variety of methods, such as database queries, file transfers, and web scraping.

Transformation: The next step is to transform the data into a format that can be used by the data warehouse. This may involve converting the data into a different format, such as from CSV to JSON, or it may involve creating new variables or features.

Loading: The final step is to load the transformed data into the data warehouse. This can be done using a variety of methods, such as bulk loading, incremental loading, and real-time loading.

Data storage process: in this phase the data gets centralized and structured, once the data is cleaned and consolidated via the ETL tool, it is stored in specialized databases: the Data warehouse and the Data mart :

The Data warehouse: is a central repository of data that is used for decision-making. It is typically used to store large volumes of historical data (Rifaie, Kianmehr, Alhajj, & Ridley, 2008).

The Data mart: is a subset of a data warehouse that is tailored to the needs of a specific business unit or department. It is typically used to store smaller volumes of data that is more frequently updated (McDonald, Rajagopalan, Waizenegger, & Pardo, 2007).

The data storage phase is an important part of the BI process. It ensures that the data is stored in a way that is optimized for decision-making.

The data storage phase is an important part of the BI process. It ensures that the data is stored in a way that is optimized for decision-making.

Distribution process: this phase is about making the data available to users in a way that is secure and easy to use, due to the cross-functionality and volume of data managed; it is not desirable for users to have direct access to the data warehouse. It is necessary to manage data access rights as well as the provision of thematic schemas. The distribution component thus makes the data available to users, according to the rights and schemas corresponding to their profiles. The distribution component takes the form of a BI WEB portal integrated into the corporate portal. The distribution phase can be implemented in a variety of ways, including: Web portals, Mobile apps, Emails, Cloud-based platforms...etc.

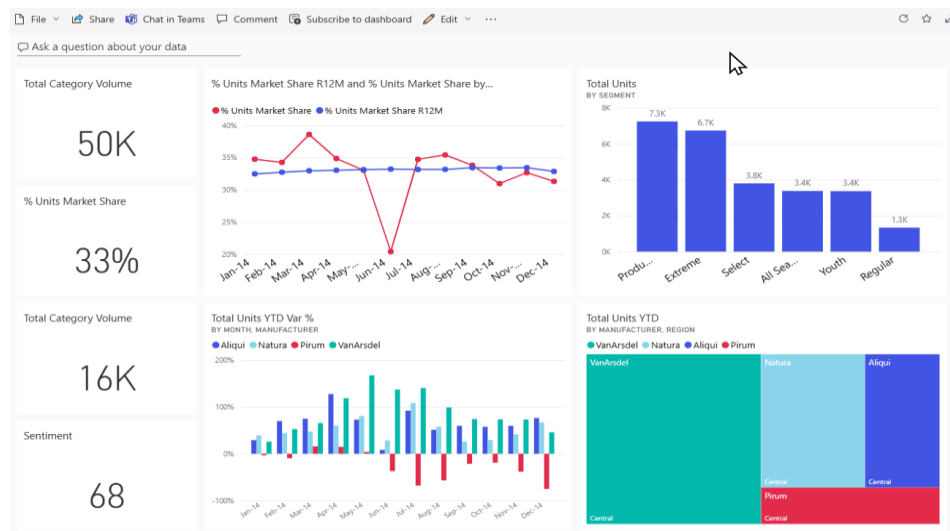
Exploitation process: this phase is about **using the data to make decisions**. Once the data is stored, cleaned, consolidated, and accessible, it can then be used according to needs. Different types of exploitation tools will be considered.

Reporting: it is the periodic presentation of reports on the activities and results of an organization, a work unit or a person responsible for a function, intended to inform those

responsible for supervising them internally or externally, or simply those concerned by these activities or results. These reporting tools are not, strictly speaking, decision-making aids, but when used appropriately, they can provide a valuable overview. Reports are then created using reporting tools that allow them to be given a predetermined format. The queries are created during the preparation of the reports, which will then be automatically distributed periodically or punctually on demand.

Dashboards: is a set of a small number of indicators designed to allow managers to become aware of the state and evolution of the systems they manage and to identify the trends that will influence them over a horizon consistent with the nature of their functions. A dashboard is a particular form of report presenting several indicators and is often personalized, meaning that each actor consults a dashboard that concerns their activity. It is a key steering tool in a decision-making suite because it provides easily accessible synthetic information on the evolution of a process.

Figure 16: an example of a power BI dashboard



Source: the official website of Microsoft

2.2.5. Benefits and challenges of Business Intelligence:

The authors Hicham El Bousty, Salah-ddine krit, Mohamed Elaskri, Hassan Dani, Khaoula Karimi, Kaoutar Bendaoud, and Mustapha Kabrane (2018) in the Fourth International Conference on Engineering & MIS investigated the benefits and the challenges of the Business intelligence in the era of Big Data, their investigation can be summarized as the following:

The benefits of BI: In the age of big data, where information explodes in volume and complexity, business intelligence (BI) emerges as a critical asset. BI acts as a translator, transforming vast amounts of structured and semi-structured data into actionable insights. This empowers businesses to make data-driven decisions that optimize resource allocation, strengthen marketing campaigns, and streamline operations. Furthermore, BI automates tasks like data analysis and reporting, freeing up valuable employee time for strategic pursuits. Most importantly, BI unlocks a competitive advantage by identifying hidden trends and patterns within the data. This foresight allows businesses to stay ahead in the market and make informed decisions that lead them towards success.

The challenges that face the BI solution: Big Data presents significant challenges for business intelligence (BI), the volume and complexity of data can be a challenge for traditional BI tools to store, process, and analyze it efficiently. Extracting meaningful information from diverse data formats, structured and semi-structured, requires advanced techniques and personnel skills. Additionally, ensuring data quality within massive datasets is crucial, but becomes increasingly time-consuming and resource-intensive. Furthermore, the rapid evolution of big data necessitates continuous adaptation of BI infrastructure and employee skillsets to stay relevant and effectively handle this massive information influx. These challenges can significantly affect the BI's ability to unlock the full potential of big data and translate it into actionable insights for businesses.

CHAPTER TWO: DATA AND METHODOLOGICAL FRAMEWORK

After having presented the preceding research conducted within our topic in the theoretical section of the first chapter, and identifying key concepts pertaining to banking and Business Intelligence solutions. We proceed to the second chapter, where we will provide an overview of the hosting organizations, then present the methodological approach that we followed to collect and analyze our data to look for a solid answer to our problematic.

1. Presentation of the hosting organizations

1.1. SDG GROUP enterprise identity

SARL SDG “Strategy, Decision, Governance” Consulting Algeria is an Algerian company affiliated with the International SDG Group, specialized in information systems development, Founded in 2013. Their current areas of expertise include SAP ERP transaction management, BI analytics, CPM, as well as training and support. SDG has become a center of excellence in conducting projects for modeling, implementation, consulting, and support in the implementation of information systems.

1.2. Global presence

SDG Group has firmly established itself as an international powerhouse in data governance, business analytics, and ERP consulting services. The company operates through a network of offices strategically positioned in key markets and economic hubs. In the North African and Middle Eastern regions, you will find them in Algiers, Cairo, and Dubai. They have a strong European foothold with locations in London, Milton Keynes, Lisbon, Madrid, Barcelona, and Logroño. Across the Atlantic, SDG Group maintains a presence in the United States through offices in New Jersey and Pennsylvania. Their Italian outposts are situated in major cities like Milan, Rome, Verona, and Florence. This widespread geographic distribution allows SDG Group to build close relationships with clients worldwide, deeply understanding their unique challenges and cultural contexts.

1.3. Value proposition

SDG Group offers a range of services to help companies make better decisions and improve how they work. They help organizations use data to understand their performance and become more efficient. This includes giving advice on strategy, helping with financial planning, and

using advanced tools like predictive modeling and machine learning to uncover useful insights from data.

SDG Group offers a comprehensive portfolio of IT services designed to empower organizations in the digital transformation. This portfolio includes:

ERP SAP: SAP represents a suite of Enterprise Resource Planning (ERP) solutions that enable businesses to manage their operations in a better way. These solutions place great emphasis on data and analytics to provide actionable insights to businesses. This information can be valuable in nearly every sector for gaining better visibility into operations and supply chains, helping organizations reduce inefficiency and improve productivity.

Sdg group focuses on two ERP solutions provided by SAP. These are known as SAP B1 and SAP S/4 HANA. Both solutions integrate various functions that can be useful for automating processes, reducing costs, and optimizing operations. Additionally, both utilize SAP HANA as the foundation for in-memory database technology.

SAP S/4HANA is a comprehensive Enterprise Resource Planning (ERP) system with integrated intelligent technologies, including AI, machine learning, and advanced analytics. It helps businesses adopt new business models, quickly manage business changes, orchestrate internal and external resources, and harness the predictive power of AI. Benefit from tight native integration between processes, industry depth, and a consistent in-memory data model.

SAP BUSINESS ONE: SAP Business One is designed for small and medium-sized enterprises, offering real-time access to crucial information through a unified system. Its modular structure divides functionalities into distinct modules, addressing various management needs. With a user-friendly interface serving as a central access point, SAP Business One integrates seamlessly with internal and external data sources. It extends accessibility to mobile devices such as iPhones and iPads and facilitates analytical processes with standardized interfaces.

Figure 17: SAP BUSINESS ONE



Source: internal document

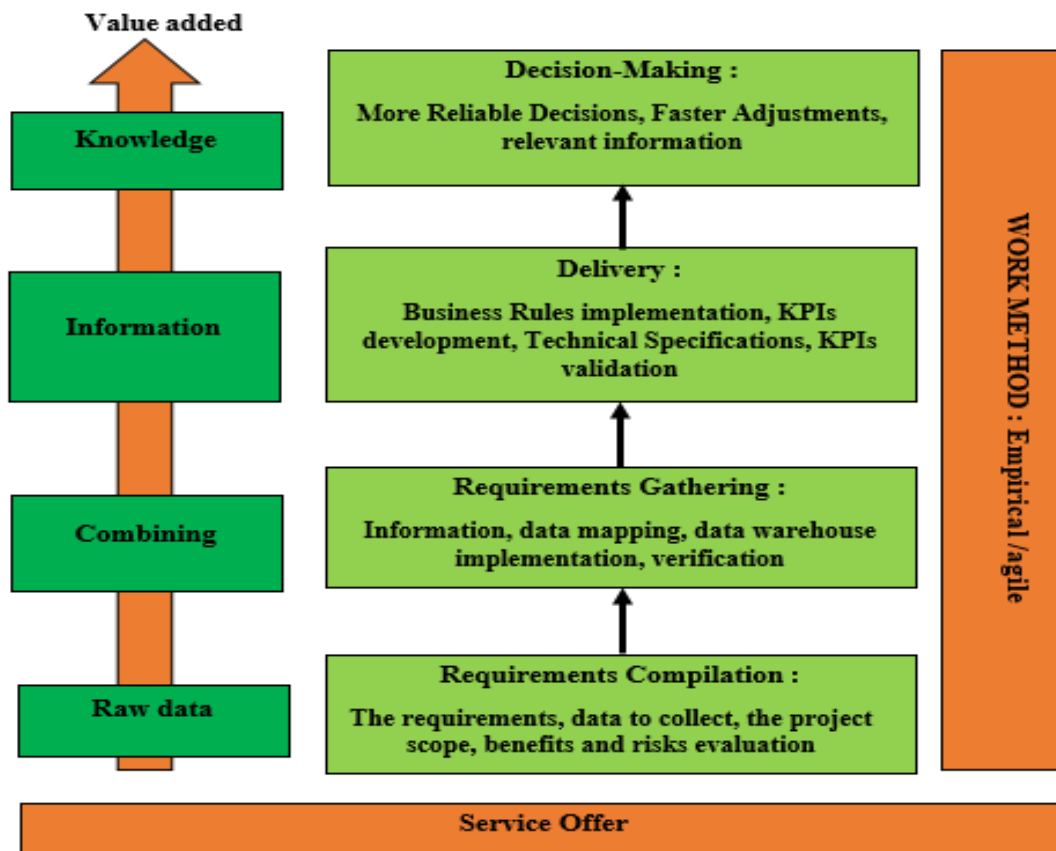
SERVICE SUPPORT: The Support SDG service aims to improve data processing efficiency by benefiting from quick responses provided to inquiries by a support team, as well as the necessary developments for the perfect operation of the information system. Interventions within the support framework are divided based on the technology used as well as the nature of the request. SDG offers its clientele a support service that covers technologies of Business Intelligence, ERP and databases.

Training: CFSI-SDG Group Algeria has made personalized training the cornerstone of its activity. To achieve this, they develop training solutions that offer a specific and customized pedagogical approach, in-person, on-site, and through e-learning. In order to deliver its training programs, CFSI-SDG relies on trainers who are experts in their fields, aiming to leverage their experiences and provide skills that meet the professional needs and concerns of the learners.

Business Intelligence: BI integrates business analysis, data exploration, data visualization, tools, data infrastructure, and established methodologies to facilitate organizations in making informed, data-centric decisions. A distinguishing feature of modern lies in achieving a comprehensive understanding of organizational data, which is then utilized to initiate transformative measures, address inefficiencies, and promptly adapt to changes in market dynamics or offerings.

A Business Intelligence process commences with defining business needs and the data required to address them. Subsequently, raw data is collected from various sources and undergoes consolidation within a data warehouse. This consolidation includes data transformation and integration to ensure consistency. Following this, technical specifications for the data warehouse are established alongside the validation of key performance indicators (KPIs) used for success measurement. Finally, the prepared data is disseminated through reports and dashboards, facilitating the extraction of valuable insights. These insights empower stakeholders to make informed decisions, potentially leading to faster adjustments and improved decision-making efficacy. The following figure shows the cyclical business intelligence (BI) process that the SDG group follows to deliver their final product to their client focused on data-driven decision-making.

Figure 18: a cyclical Business Intelligence implementation process



Source: internal document

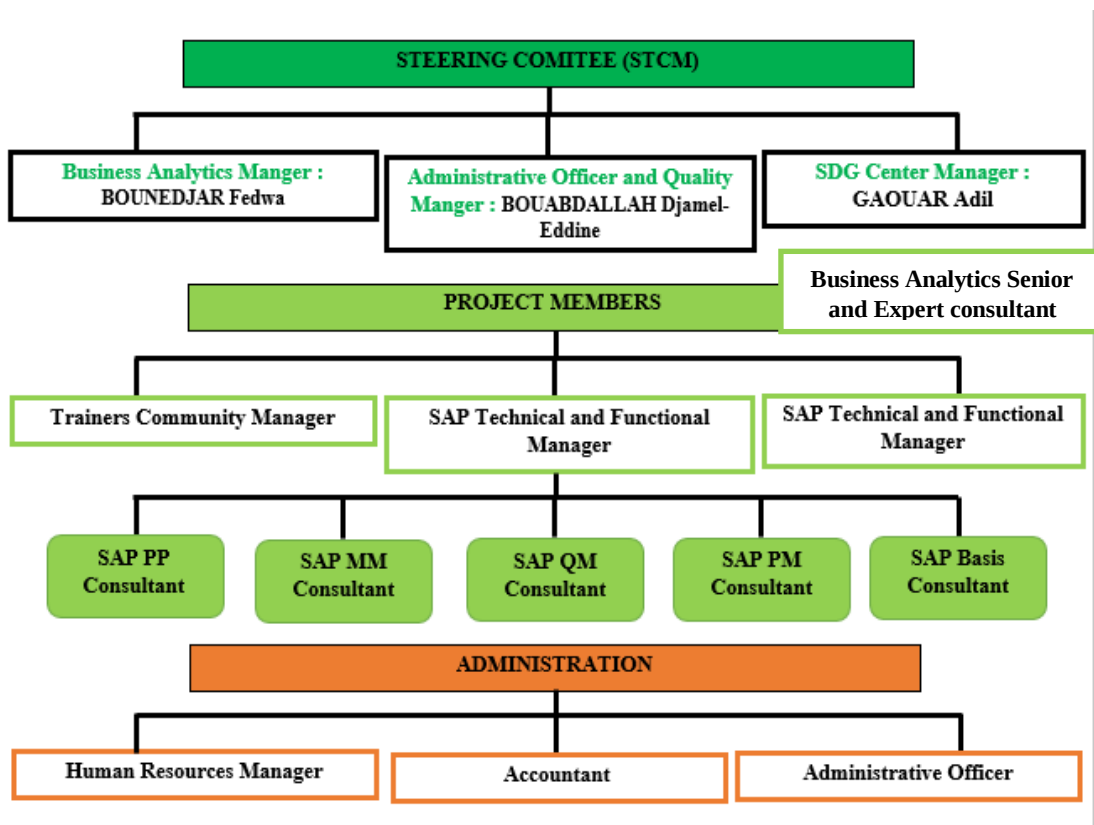
1.4. the technological partners of SDG Group

SDG Group is a technology-independent consultancy bureau, meaning they select the right tool or solution based on the specific needs of each client. However, SDG group collaborates with some prominent technology partners.

In the realm of data management, some of the partners include SAP, SQL Server, and IBM. For advanced analytics, partners include Alteryx, Tableau, and Spotfire. Notably, they also collaborate with cloud service providers such as Amazon Web Services (AWS). SDG group continuously research and develop their partnerships to identify the best solutions for their clients.

1.5. The organizational chart of SDG group

Figure 19: the organizational chart of SDG Group



Source: internal document

1.6. The Algerian clients portfolio of the SDG group

SDG group has a consolidated client base across various sectors in Algeria, which attests to their execution quality. The documents provided to us by the organization show some of the key sectors where they have Algerian clients mentioned are:

Services, Construction, Logistics and Distribution: SDG group has provided SAP ERP services like diagnostics, implementation, data migration, and support to clients in this sectors; such as SARL GESCO, TECHNO CAST Group,...etc.

Manufacturing, Automotive, and Consumer Goods Industry: the bureau has offered Strategy and Consulting services like strategy, support, information management, performance management, and change management to clients like Beko, Cevital, Ramy,...etc.

Health & Sciences, Metal and Oil & Gas: the IT organization provided clients like Sonatrach, RENAULT, propharmal spa,...etc. with training and certification services, including SAP training, IT training, and information systems training.

Financial Services: SDG group delivered Business Analytics solutions that includes dashboards, reporting, advanced analytics, Big Data, and Insights to many banks; such as PNB Paribas, GULF BANK Algeria, and SGA

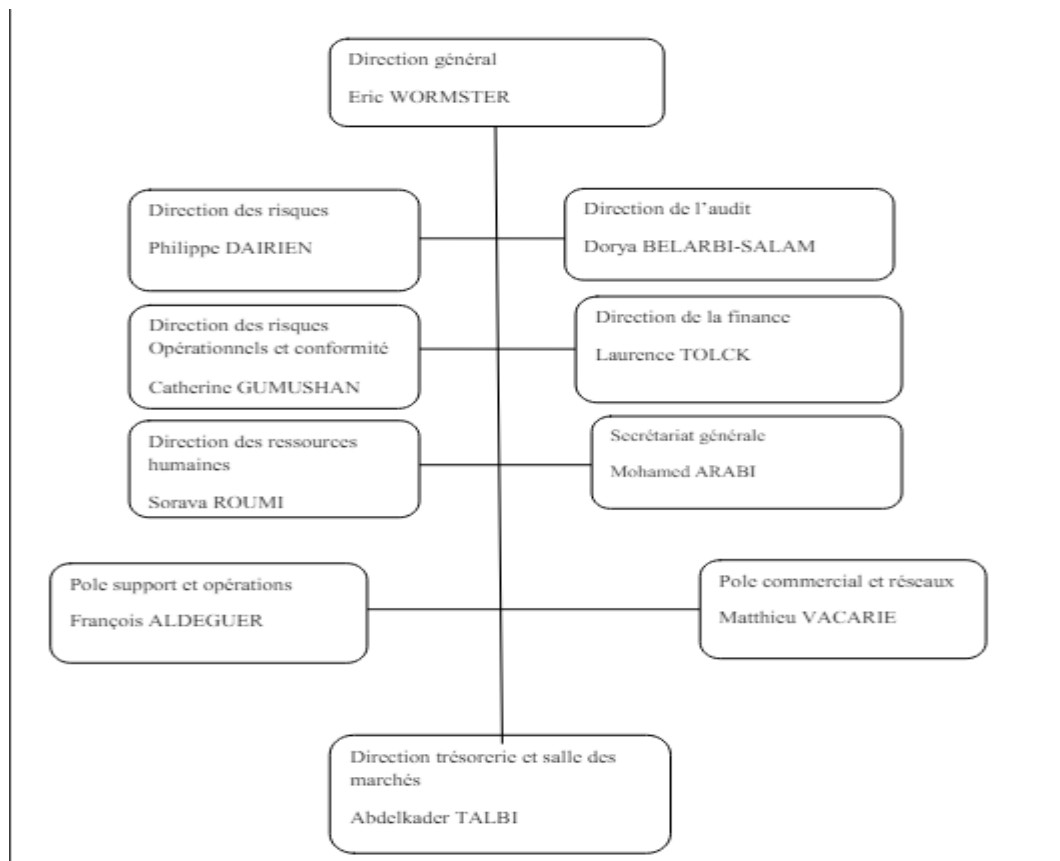
During our pursuit to address our research problematic, “How are Business Intelligence (BI) solutions implemented and utilized in the banking industry?” we undertook an internship within both the SDG Group and the head office of SGA bank to collect systematically the data needed for our study.

1.7. SOCETE GENERALE ALGERIE BANK presentation

SGA is a leading private bank in Algeria, Its presence in Algeria dates back to 1987 when it established a liaison office, in 2000, SGA transformed into a operational bank, demonstrating its commitment to the Algerian market. This bank operates as a subsidiary fully owned by the esteemed Société Générale Group also known in English speaking countries as SocGen. The bank complies with the rigorous regulations established by the central bank of Algeria, and it contributes with a capital exceeding 10 billion DZA.

The network of SGA is continuously expanding. According to the statistics of 2020 shared by the bank itself in their official website, SGA currently own 104 branches throughout 33 Wilayas in the national territory and 12 Business Centers dedicated to Enterprise Customer Activity. The bank offers a diverse array of financial services; such as loans, mortgages, credit cards, cash management, trade finance,...etc., to over 263 000 individual, commercial and business clients. The following figure illustrates the organizational chart of the SGA bank where we conducted our research:

Figure 20: the organizational chart of the SGA Bank



Source: elaborated by us

2. The methodological approach

The objective of our study is to draw a clear image on the processes of implementing and utilizing the Business Intelligence within the banking sector, for this reason our study is not going to test hypotheses or prove theories. It is going to construct knowledge through research and experience. For this reason, our research will draw its foundations from an

epistemological framework of a constructivist paradigm. This paradigm is known to follow an inductive reasoning which will lead us, from the data and information that we provided in the previous chapter as well as our experience in the internship, to draw a conclusion gathering all the acquired knowledge and responding to the problem through a qualitative study.

To conduct our research we have adopted the triangular approach, this approach involves using multiple qualitative data collection methods in a single research project. According to A Bans-Akutey and BM Tiimub (2021), the triangulation approach offers a robust method for knowledge production. By employing a combination of data collection techniques, researchers can achieve a more comprehensive understanding of the phenomenon under study. This multifaceted approach mitigates potential biases inherent in any single method and strengthens the validity of the research findings. Additionally, triangulation allows for data corroboration, where findings from one method are supported or challenged by evidence from another. Ultimately, this combined analysis leads to a richer and more detailed interpretation of the research question.

To gain a well-rounded understanding of how Business Intelligence (BI) solutions are implemented and utilized within the banking industry, we employed a **triangular approach** in the form of a combination between a qualitative observation, documentary research, and an interview.

3. The data to collect and the methods of collection

This study is going to target data related to Business Intelligence implementation process and its utilization within the banking industry. We are going to examine internal reports and documents from both the SDG group and SGA bank detailing the bank's BI implementation strategy, user guides for BI tools. We are also going to look deeper in the BI selection, deployment, and maintenance by gathering data from the key personnel from the IT department of the SGA bank as well as personnel from the SDG group who were involved in the BI implementation process. Observing how various departments within the bank interact with and leverage BI dashboards, reports, and analytics can further enrich our understanding of the BI solution utilization, and present the impact of BI on specific areas; such as decision-making, risk management, performance,... etc. This will eventually

provide us with a comprehensive picture of the BI solutions implementation and utilization within the bank's operations.

The triangular approach that we adopted allows us to provide data from a variety of perspectives in order to give our research question a valid answer. As such, the data collection methods that we have selected are:

3.1. The observation

According to Malgorzata Ciesielska (2017), to conduct a scientific research, observing the subject of study is a common method for gathering data. There are two primary ways to conduct observation: participatory and non-participatory. Participatory observation involves the researcher becoming integrated within the group they are studying for a period. This allows them to gain a deeper understanding of the group's internal dynamics and perspectives from a firsthand perspective.

In contrast, non-participatory observation keeps the researcher separate from the group. They act as a neutral observer, taking detailed notes and recording their observations without influencing the natural behavior of the group being studied.

The observation has accompanied us throughout our internship and our visits in the different organisms related to our study. Our observation has been non-participatory which allowed us to collect a number of information that has been reinforced during the interviews.

3.2. The documentary study

The documentary study, also known as documentary research or documentary observation, is an indirect observation of previous works. This approach consists of gathering substantial documentation with the purpose of obtaining a maximum amount of useful information about the field and subject studied (Ahmed, 2010). In order to insure a quality of content, four main criteria should be taken into consideration (Coxon, 2005) :

- The authenticity of the documents;
- The credibility of the documents;
- The representativeness of the documents;

- The meaning derived from the documents.

The documentary research has the advantage of availability of data, it also saves time and money, it helps avoid bias statements, etc. On the other hand, it is known for its data potentially being limited, inaccurate, incomplete or outdated.

Our documentary collection started since the choice of this theme. We gathered as much documents and information as possible from our hosting organizations to better understand and master our topic.

3.3. The interview

As one type of investigation, it is an exchange during which the interlocutor gives his perceptions, interpretations and experiences while the researcher orients the conversation through his questions towards his research goals (Sandy Q. Qu, 2011)

Coxon and Bergman (2005) pointed out that there are three fundamental types of interviews in research :

- Structured interviews are extremely rigid research tools where questions are prepared in advance in a specific order to which the interviewer must follow. Their goal is to maintain uniformity throughout the interview session.
- Semi-structured interviews are more flexible even if the conversation is guided. The interviewer is free to add or omit questions or ask them in different orders. The goal is to make the interviewee more comfortable to speak openly in order to generate as much information as possible. The interviewer only refocuses the conversation in case it starts to go out of topic.
- Unstructured interviews lean more towards a normal conversation with the main objective in mind. The interviewer does not have any guidelines to follow and can approach the interviewee from any ethical manner that would guarantee genuine truthful answers.

We have decided to focus on the semi-structured interview in our data collection process. We designed an interview guide with ten questions that would provide us the necessary information to verify the data we already acquired from the observation and documentary

study. We interviewed some of the members of our sample face to face within a duration of 15 minutes to each interviewee.

4. Data analysis tool:

The research approach and the data collection methods allowed us to choose the right tool to use to analyze this data, which is content analysis, this tool is composed of three parts (Wong, 2008) :

- Pre-analysis;
- Material exploration;
- Processing and interpretation.

In the pre-analysis part, we are going to assemble all of our data from the observation, documentation visited and the interviews. Then we are going to explore it and adapt the information gathered to our problem processing it accordingly. The final output will be objectively analyzed using Excel program and interpreted it to provide answers for our study.

5. Interview guide

5.1. Context

In the context of preparing my final project, which focuses on the implementation and utilization of the Business Intelligence solution implemented by the Head Office of the SGA bank, I appreciate you taking the time to meet with me and respond to this interview questions.

5.2. Presentation

This research phase is a part of the preparation process that will allow us to gain a good understanding of the technical phases and elements followed and used by both personals from the bureau of SDG that was asked for consultation by the hosting bank to implement the solution, then present the results in a form of a diagram to draw a better picture of the results that we found using your answers.

The examiner:

Hadil MENASRIA, a second-year Master's student in Strategic Management and Information Systems at the National Superior school of Management (ENSM) in Kolea.

The examinee:

Due to the fact that the Business Intelligence solution is integrated within the information system of the bank, we focused in this section on the technical aspects of the information that we are seeking. Therefore, we made every effort to interview the IT professionals working on the implementation project, as well as the IT managers overseeing the project from either the bank or the office side. We also interviewed bank users who utilize the solution's insights, whose profiles are presented in the following table:

Table 5: List of interviewees

NAME	Role	Interview method
Mme TADRIST Dahbia	The chief of the BI project from the SGA bank	Face to face
Mr. SEBBACHE Seif-Eddine	A developer within the bank who's currently working on the BI project in the bank	Face to face
Mr. CHEBBAB Abdesslem	A developer within the bank who's currently working on the BI project in the bank	Face to face
Mme BOUNEDJAR Fedwa	The chief of the BI project from the SDG group	Face to face
Mr. RAHAL Arslane	A developer within the SDG Group who worked on the implementation of the BI solution in the bank	Face to face

Source: elaborated by us

Table 6: Semi-structured interview guide

INTERVIEW GUIDE
Project Management and Budgeting
what strategy did you use to manage the project timeline and budgeting when dealing with unforeseen technical complexities? Quelle stratégie avez-vous utilisée pour gérer le calendrier du projet et le budget lors de la survenue de complexités techniques imprévues?
Data Quality and Integration
how did you ensure the quality and consistency of data collection from disparate sources? Comment avez-vous assuré la qualité et la cohérence de la collecte de données à partir de sources disparates?
what process did you implement to handle missing or incomplete data sets? Quel processus avez-vous mis en place pour gérer les ensembles de données manquants ou incomplets?
Data Security
What are the security measurements that were put in place to safeguard sensitive data during the design and development process? Quelles mesures de sécurité ont été mises en place pour protéger les données sensibles pendant le processus de conception et de développement?
Testing and Performance
How did you ensure that the BI solution is tested for not only functionality but also for usability and performance? Comment avez-vous assuré que la solution BI a été testée non seulement pour sa fonctionnalité, mais aussi pour sa convivialité et ses performances?
Long-term Adaptation
what is the strategy you conducted to ensure long-term adaptation of the BI solution? Quelle stratégie avez-vous menée pour garantir l'adaptation à long terme de la solution BI?
Deployment and Business Continuity

What steps did you take to minimize disruption to ongoing business operations during the deployment phase? Quelles mesures avez-vous prises pour minimiser les perturbations des opérations commerciales en cours pendant la phase de déploiement?
Feedbacks
How did you gather feedback from end-users after the BI solution has been deployed? Comment avez-vous recueilli les retours des utilisateurs finaux après le déploiement de la solution BI?
Continuous Improvement
What processes did you implement to monitor the performance of the BI solution and identify areas for ongoing optimization? Quels processus avez-vous mis en place pour surveiller les performances de la solution BI et identifier les domaines nécessitant une optimisation continue?

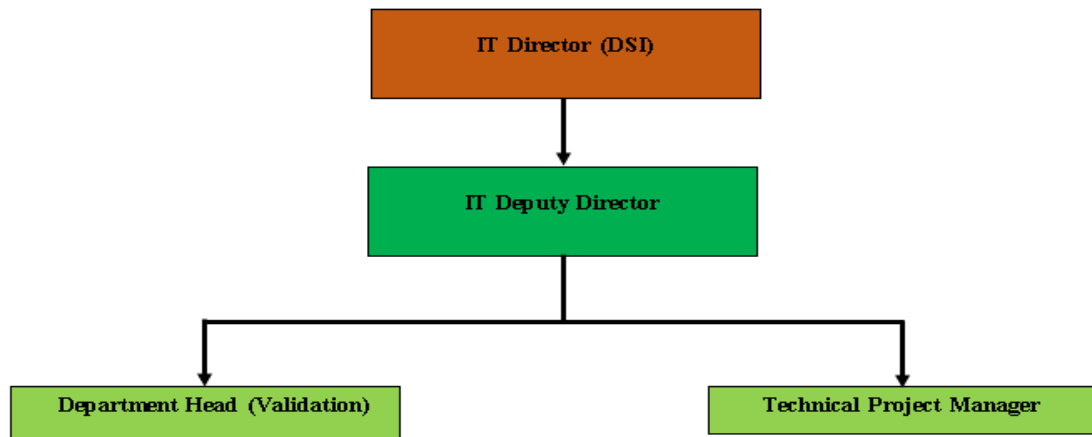
Source: elaborated by us

CHAPTER THREE: RESULTS AND DISCUSSION

1. The field of study presentation

Our work took place within the IT department that belongs to the head office of the SGA situated in Bir Khadem, Algiers, also called DSIOP that refers to “Direction Des Systèmes d’Information et des Opérations”, the following figure represents the organizational chart of this department :

Figure 21: the organizational chart of DSIOP



Source: internal document

The DSIOP has a clear structured hierarchy designed to efficiently manage and execute technological initiatives crucial to the bank's operations. Leading this department is the Director of IT, who is responsible for overarching strategic direction and decision-making. The Director is assisted by the Deputy Director of IT, who contributes to the department's leadership and management. Under this leadership, the department has specialized teams, each team is assigned for a specific task. These teams are led by key personnel, such as the department head, who is responsible for overseeing the quality assurance processes and validation. They are also led by the technical project manager who is responsible on driving the implementation of critical technological projects.

2. Results of the documentations about the Business Intelligence solution implementation

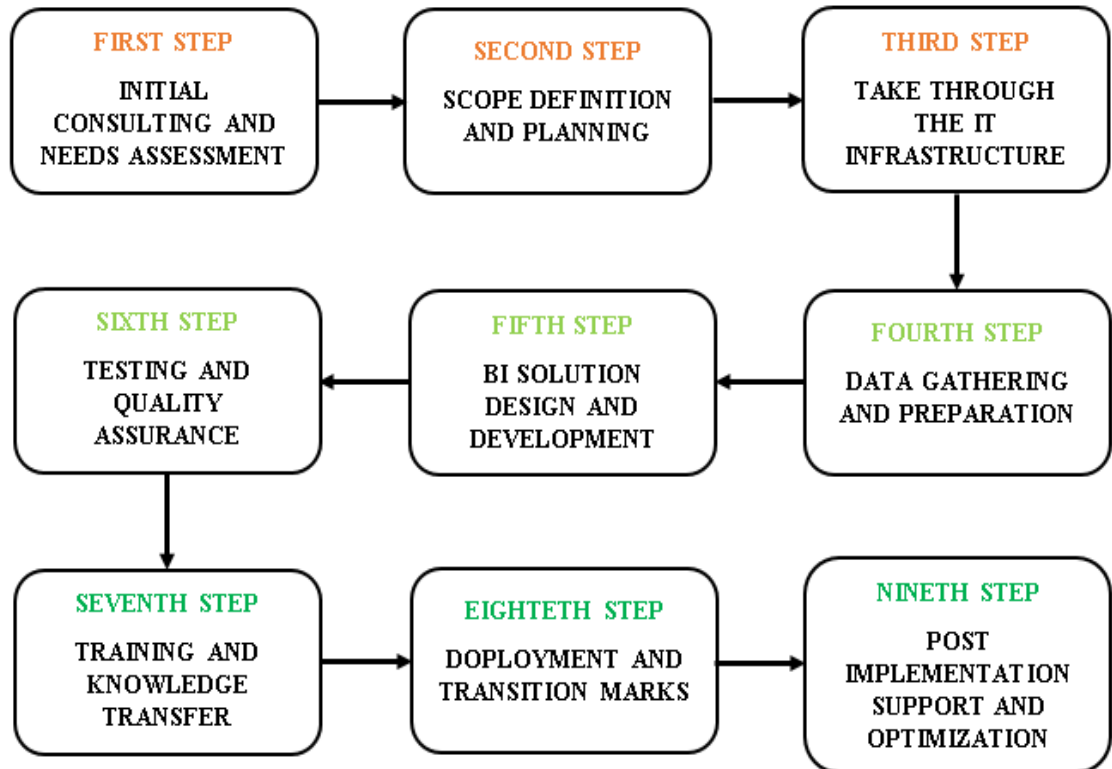
2.1. Presentation of the responsible team

A dedicated team comprising both internal experts from the bank and external consultants from SDG Group led the implementation of the Business Intelligence (BI) solution within SGA bank. Mme. TADRIST Dahbia, the Chief of the BI project, who brought extensive experience and strategic vision to the project, guided the initiative from SGA. Mr. SEBBACHE Seif-Eddine and mr. CHEBBAB Abdesslem assisted her through the implementation, who both are skilled developers within the bank and played crucial roles in the technical implementation and customization of the BI solution. Collaborating closely with the internal team was the SDG Group, represented by mme. BOUNEDJAR Fedwa, the Chief of the BI project, who provided invaluable expertise and guidance throughout the implementation process. Supporting her was mr. RAHAL Arslane, a developer within the SDG Group, who leveraged his experience to ensure the integration and optimization of the BI solution within DSIOP infrastructure. This interdisciplinary team worked together to deliver a robust and tailored BI solution that met the bank's specific requirements and objectives.

2.2. The implementation steps

SGA bank undertook on the implementation of a Business Intelligence (BI) solution within the IT infrastructure to eliminate challenges that some departments within the bank system were facing. The implementation process followed a series of carefully planned steps by a dedicated team to ensure the successful integration and optimization of the BI solution. The following figure illustrates the steps that were followed to integrate the BI solution within the IT infrastructure of the bank:

Figure 22: The implementation of the BI steps



Source: internal document

2.2.1. initial consulting and needs assessments

The first step of the BI solution implementation within the SGA system involved initial consulting and needs assessment. During this crucial phase, the project team lead by mme TADRIST Dahbia engaged in comprehensive discussions with stakeholders to understand the bank's business objectives, challenges, and data requirements. This comprehensive understanding was built through interviews, workshops, and data analysis, when the team identified the specific needs and draw points within the organization to lay the foundation for the following phases of the implementation.

After the definition of the key objectives, the responsible on the implementation project from the SDG Group mme. BOUNEDJAR Fedwa collaborated with mme. TADRIST to understand the bank's challenges and goals for the project to transcribe requirements document, also known as "cahier des charges" in French.

Initial consulting: the DSIOP of the bank recognized the need for the BI solution within the IT infrastructure of the bank to address challenges within the system. These challenges were as the following:

- Data fragmentation
- Manual reporting processes
- Limited customer understanding
- Ineffective risk management

The chief of the BI project mme. TADRIST, after she convened the stakeholders of the bank and discussed the BI solution project, the results of this meeting were as follows:

Table 7: results of the meeting

OBJECTIVES	EXPECTATIONS AND ADDITIONAL BENEFITS
Enabling real-time insights	Providing actionable insights into business performance (strategic planning)
Streamline reporting processes (automatization+data visualization)	Data-driven decisions using relevant dashboards aligned with the objectives of each department and competitive advantage
Strengthen risk management (detecting irregular clients)	Seamless integration of the BI solution within the infrastructure of the DSIOP

Source: elaborated by us

The consultation meeting between the team that was assigned for the BI project within DSIOP of the bank, with the SDG Group team responsible on the implementation project, which was led by mme. BOUNEDJAR. This meeting was set to understand the bank's needs from the BI solution, and provide insights on the BI solution that the SDG Group offers from SAP, as well as the expertise of this group to address those needs. The results of this meeting were issued in the requirements document.

1. Needs assessment:

The requirements of the Business Intelligence solution were identified by the collaboration of the chief of the project with the various departments' managers within the SGA.

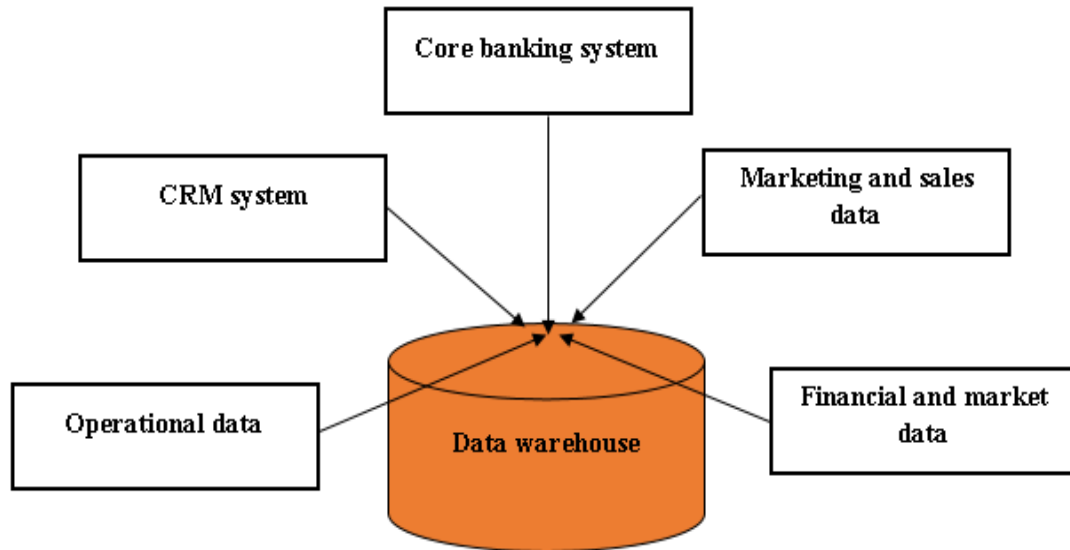
Retail banking department deals with individual customers and their accounts, loans, and transactions. The data that this department gathers can be treated by the BI solution to provide insights on irregular clients, by detecting anomalies or fraudulent activities. Those insights can help risk management department improve their practices to eliminate the risk of fraud.

The financial and accounting departments are responsible on overseeing the financial planning, budgeting, accounting, and reporting activities. The implementation of the BI solution can help these departments in improving the budgeting accuracy, and streamlining the financial reports that they submit later to the central bank.

Definition of data sources: the Business Intelligence (BI) solution implementation within the bank's system required access to a diverse range of data sources to achieve the objectives they pursue by this implementation effectively, and address the challenges that SGA bank faced during their daily work operations. The main issues that the bank struggles from are internal problems that involve integrating data from the bank's internal systems; this includes the Core Banking System that furnishes a crucial transactional data encompassing customer accounts and various financial transactions. This data forms the foundation for analyzing customer behavior, identifying patterns, and optimizing banking operations. Moreover, the Customer Relationship Management (CRM) System provides additional insights on customers; including demographics, contact details, interaction history, preferences, and transactional information. The integration of the CRM within the data sources for the BI solution can centralize customer information, providing a unified view of customer profiles, behaviors, and activities across multiple touch points. This centralized data facilitates comprehensive customer analysis, segmentation, and personalized targeting, enabling the bank to track irregular clients to eliminate the risk of fraud. Additional to these main data sources, integrating Marketing and Sales Data, Financial Market Data, and Operational Data into the (BI) solution will also leverage it into achieving the objectives

they were designed for by this solution. The following figures illustrates the data sources integrated into the data warehouse designed for the BI solution:

Figure 23: BI data warehouse sources



Source: internal document

Reporting and analytics processes: SGA system relied on manual and fragmented processes for data extraction, analysis, and reporting. Manual data extraction involved intensive efforts to retrieve data from various systems like the Core Banking System and CRM System, often requiring data to be exported into spreadsheets or databases for manipulation. Besides the manual extraction of data, the bank also used Excel for the analysis, calculations and basic visualization often comprising basic charts and tables. Additional, the bank primarily used static reports generated periodically, offering historical data but lacking real-time insights or interactivity. The bank also conducted Ad-hoc reporting to addressed specific queries and generated on request but required manual data retrieval and analysis. Additionally, analytics efforts were fragmented, with departments using disparate tools; such as SQL to extract data directly from databases for analysis, SPSS and SAS for statistical analysis, and excel for data analysis visualization, these efforts often

lead to inconsistencies and duplication of efforts. These manual, fragmented processes were functional but limited in their ability to provide timely, accurate, and actionable insights.

Capabilities assessment: after identifying the objectives that the bank is seeking for by integrating the BI solution within their IT system, Mme BOUNEDJAR Fedwa evaluated SDG Group's BI capabilities, including expertise, technology stack, and solution offerings. This assessment helped determine the extent to which SDG Group can meet the bank's requirements and whether any customization or additional development may be necessary. The following tables were conducted by the group to evaluate their capabilities to meet with the banks expectation:

Table 8: Expertise Assessment

Consultant ID	Name	Expertise Area	Experience Years
1	BOUNEDJAR Fedwa	Real-time Analytics	4
2	RAHAL Arslane	Reporting Automation	3
1	BOUNEDJAR Fedwa	Data Visualization	3
2	RAHAL Arslane	Data Visualization	3

Source: internal document

Table 9: Technology Stack Assessment

Platform ID	Platform name	Scalability	Performance	Integration
1	SAP BO	High	Excellent	Yes
2	SAP BW	High	Good	Yes
3	Tableau	High	Excellent	Yes

Source: internal document

Table 10: Solution Offerings Assessment

Solution ID	Solution name	Description
1	Real-time Analytics	Provides real-time insights from data streams
2	Reporting Automation	Automates report generation and distribution
3	Data Visualization	Offers interactive dashboards and visualizations

Source: internal document

Alignment and Agreement: Upon the completion of the needs assessment, mme. TADRIST Dahbia undertook the responsibility of presenting the findings and recommendations to senior management within SGA. This presentation was crafted to secure buy-in and alignment on the proposed BI initiative. Concurrently, mme. BOUNEDJAR Fedwa actively participated in meetings with SGA management, to address any inquiries or apprehensions that arise, ensuring that SDG Group's proposed approach seamlessly aligns with the bank's strategic objectives, and adheres to constraints.

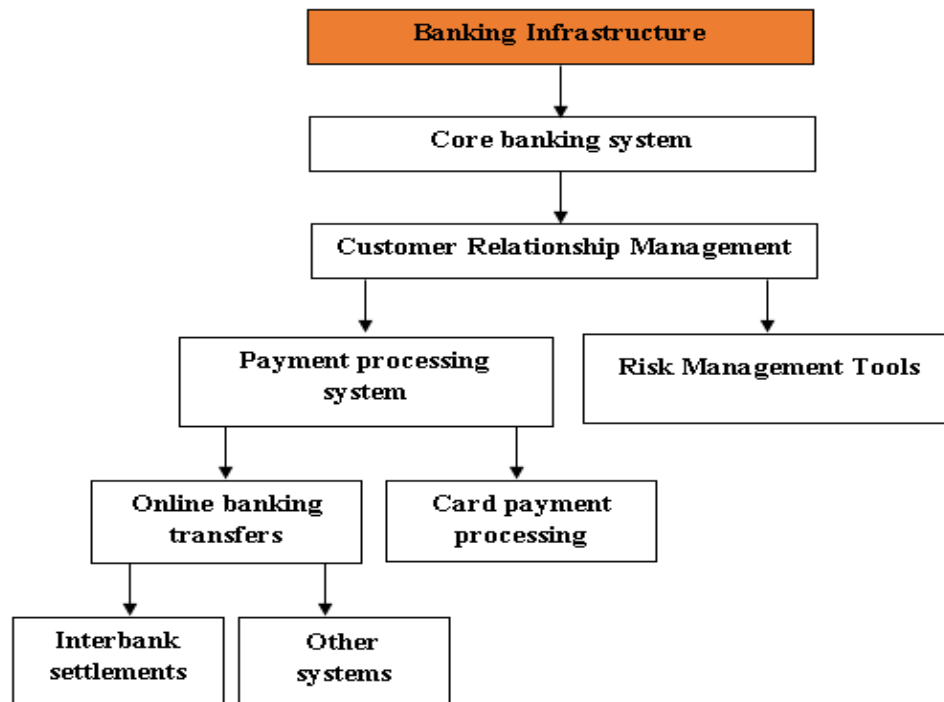
The alignment between the SGA and the SDG involved ensuring that the proposed solution aligns closely with the bank's strategic objectives, operational requirements, and organizational culture.

The strategic alignment: the BI solution must be aligned with SGA overall strategic goals and objectives. This involved the long-term vision of the bank, which is "To be the leading financial institution in Algeria, renowned for innovation, customer-centricity, and sustainable growth. We aspire to empower individuals, businesses, and communities to thrive by providing innovative financial solutions, fostering digital transformation, and delivering exceptional customer experiences. Our commitment to excellence, integrity, and social responsibility drives us to continuously enhance our offerings, expand our reach, and contribute positively to the socio-economic development of Algeria." As well as the competitive landscape of the Algerian banking industry; which is characterized by intense competition, regulatory constraints, and evolving customer preferences. Banks in Algeria

are increasingly focusing on digitalization, innovation, and customer experience enhancement to differentiate themselves and gain a competitive edge in the market.

Operational Alignment: This alignment ensured minimal disruption to day-to-day operations, and maximizes the utility of the BI solution across various departments within the bank's existing operational processes, systems, and workflows. The operational processes of the SGA are designed to ensure seamless and efficient delivery of banking services while prioritizing customer satisfaction and regulatory compliance. Customer onboarding is managed, involving comprehensive KYC procedures and document verification to establish accounts securely and in accordance with regulatory requirements. Once accounts are opened, the transaction processing system ensures swift and accurate execution of financial transactions, including deposits, withdrawals, fund transfers, and loan payments, enabling customers to manage their finances with ease. The loan origination process is characterized by thorough credit assessment and risk evaluation, leveraging credit scoring models and approval workflows to facilitate responsible lending practices. Moreover, the customer service operations are dedicated to providing personalized assistance and resolving inquiries or complaints promptly through various communication channels, fostering trust and loyalty among valued customers. These operational processes collectively contribute to the SGA commitment to delivering exceptional banking experiences and maintaining the highest standards of service excellence. The following figure represents the interconnected systems and platforms within SGA banking infrastructure:

Figure 24: SGA banking system



Source: internal document

Technical Alignment: the BI solution must align with the IT infrastructure of the SGA, data governance policies, and security requirements. This alignment ensures compatibility with existing hardware and software systems, adherence to data privacy regulations, and robust cyber security measures to protect sensitive information. The IT infrastructure of the DSIOP comprises various hardware, software, networks, and systems that support the banking operations; this includes data Centers quipped with servers, storage systems, and networking equipment to host core banking applications and databases. Networking Infrastructure that includes routers, switches, and firewalls to enable connectivity between branches, offices, and data centers. This prioritize reliability, performance, and security in network design and implementation. End-User Devices that includes desktop computers, laptops, tablets, and mobile devices equipped with software applications and security tools to facilitate the day-to-day employees work activities. Additionally, SGA leverage cloud-computing services for scalability, flexibility, and cost-effectiveness. The SGA designed data governance policies to ensure the responsible management and use of data assets across

the organization. The following table provides a concise overview of each aspect of these policies, outlining the specific measures and processes implemented to ensure responsible management and use of data assets:

Table 11: Data Governance Policies

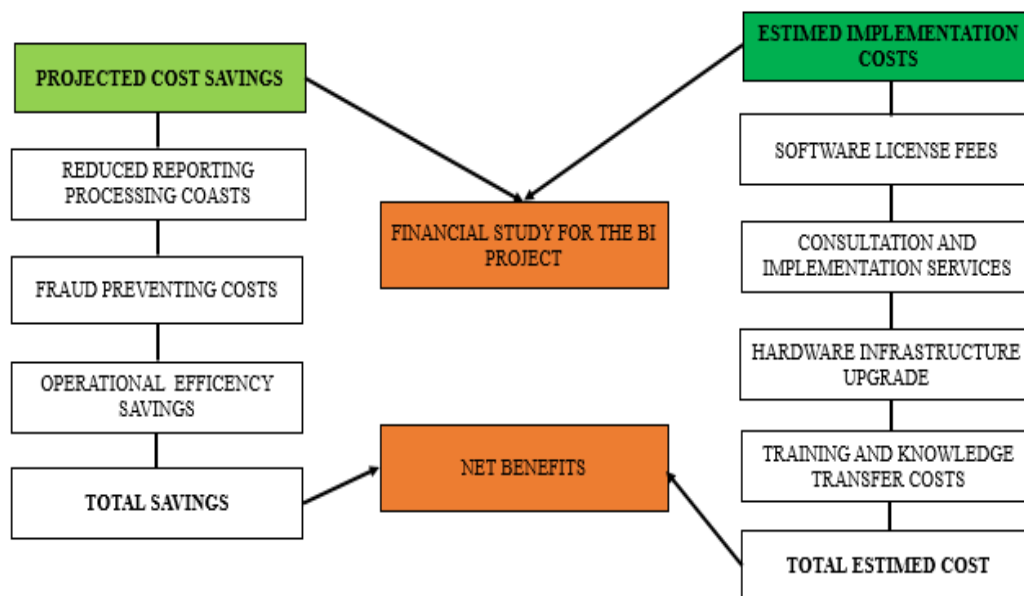
Key aspect	Description
Data Quality Management	Processes for maintaining data accuracy, completeness, consistency, and timeliness. Includes data validation, cleansing, and enrichment techniques.
Data Security	Enforcement of strict access controls, encryption mechanisms, and data masking techniques to protect sensitive information from unauthorized access, disclosure, and alteration. Adherence to industry standards and regulatory requirements for data security and privacy.
Data Retention and Archiving	Policies for data retention and archiving based on regulatory requirements, business needs, and risk considerations. Procedures for secure storage, retrieval, and disposal of data assets.
Data Ownership and Stewardship	Assignment of clear roles and responsibilities for data ownership and stewardship within the organization. Empowerment of data stewards to oversee data assets, enforce data policies, and resolve data-related issues.
Data Integration and Interoperability	Establishment of standards and guidelines for data integration, interoperability, and metadata management. Facilitation of data exchange between systems and ensuring consistency and coherence across data sources.

Source: internal document

Financial Alignment: This alignment involved conducting cost-benefit analyses, estimating implementation costs, and projecting the potential business value and cost

savings derived from the BI initiative. The following diagram represents the financial study the project team conducted to estimate the total benefit from the implementation project:

Figure 25: cost-benefit analysis



Source: internal document

The analysis of the cost-benefits that runs out of the Business Intelligence implementation project demonstrated that the project involved significant costs; the following table shows the results of the analysis conducted by the team:

Table 12: cost-benefits analysis

Category	Details	Amount (DZD)
Estimated Implementation Cost	Software License Fees	10,000,000
	Consulting and Implementation Services	5,000,000
	Hardware Infrastructure Upgrades	3,000,000
	Training and Knowledge Transfer	2,000,000
Total Estimated Implementation Costs		20,000,000
Projected Cost Savings	Reduced Reporting Processing Costs yearly	7,000,000
	Fraud Prevention Savings yearly	5,000,000

	Operational Efficiency Savings	4,000,000
	Total Projected Cost Savings yearly	16,000,000
Net benefits	Total Projected Cost Savings - Total Estimated Implementation Costs	-4,000,000

Source: internal document

2.2.2. Scope definition and planning:

The insights that were gathered from the initial consulting phase moved the BI project forward to define the scope and plan the implementation of the BI solution. This phase involved defining the project's scope, establishing clear objectives, setting timelines, and allocating resources. The specific modules to be implemented are SAP Business Objects Web Intelligence for ad-hoc reporting and SAP Business Objects Explorer for data exploration.

Objectives: the clear definition of the objectives articulates a detailing on the specific functionalities of SAP BO to be implemented, and the key deliverables pursued by SGA bank. The primary objectives of the BI project are summarized in the following table:

Table 13: scope definition

Objective	Component	Action
Enabling Real-Time Insights	Implement real-time data integration	Integrate data from core banking systems, CRM systems, operational data, financial data,
	Develop interactive dashboards and visualizations	Create dashboards and visualizations that display real-time KPIs (SAP BO Explorer)
Streamline Reporting Processes	Automate data extraction and report generation	Develop automated processes for data extraction and report generation to replace manual efforts.
	Create a centralized reporting system	Build a centralized system with customizable and interactive reports for various stakeholders, including the central bank

Strengthen Risk Management	Implement advanced analytics	Use advanced analytics tools to detect and monitor irregular client activities (SAP BO Predictive Analytics, SAP BO Web Intelligence)
	Develop predictive models	Create predictive models to identify potential fraud and compliance risks in real-time.

Source: elaborated by us

Planning: the BI project as any project needs to establish a clear timeline for each phase, allocating human and technical resources efficiently, and defining the financial investment required for achieving the goals desired from the BI solution. The planning for the SDG BI project by the SDG group was as the following:

Table 14: timeline planning

Phase	Timeline (months)	Activities and Deliverables
Initiation and Planning	1-2	Conduct detailed needs assessment and initial consulting
		Finalize project scope, objectives, and deliverables
		Establish project team and allocate resources
Design and Development	3-6	Define data architecture and integration strategies
		Develop SAP BO modules and customize according to requirements
		Design and build data warehouse and ETL processes

Testing and Quality assurance	7-8	Perform unit, integration, and user acceptance testing
		Validate data accuracy and integrity
		Ensure compliance with data governance and security policies
Deployment and Training	9-10	Deploy BI solution to production environment
		Conduct comprehensive training sessions for end-users
		Develop user manuals and support documentation
Go-Live and Post-Implementation Support	11-12	Monitor system performance and resolve post-deployment issues
		Provide ongoing support and optimization
		Gather feedback and make necessary adjustments

Source: internal document

After defining the timeline of each step, the planning also touches the resources needed for this project. SDG group defined the human and technical resources for the BI solution implementation as the following:

Table 15: human resources definition

Name	Role
TADRIST Dahbia	Chief of the BI project at SGA, overseeing project management and stakeholder engagement.
SEBBACHE Seif-Eddine and CHEBBAB Abdesslem	Developers within the bank, responsible for technical development and integration.

BOUNEDJAR Fedwa	Chief of the BI project from SDG Group, providing expertise in SAP BO and project coordination.
RAHAL Arslane	Developer within SDG Group, responsible for customizing and implementing SAP BO modules

Source: internal document

Table 16: technical resources definition

Category	Component	Specifications	Purpose
Hardware	Servers	Multi-core processors	Host SAP BO applications, manage data processing tasks
		Minimum 128 GB RAM, scalable	
		Minimum 2 TB SSD storage	
	Storage Systems	Network-attached storage (NAS)	Store large volumes of historical data, reports, dashboards, and BI data
		Minimum 10 TB capacity, expandable	
		High-speed storage with IOPS suitable for heavy read/write ops	
		RAID configurations for data redundancy and protection	
	Networking Equipment	High-speed networking equipment (routers, switches, firewalls), Gigabit Ethernet or higher bandwidth	Ensure reliable and secure connectivity between BI components and end-users

Software	SAP BO licenses	Web Intelligence	Creating ad-hoc reports and dashboards
		Explorer	Data exploration and visualization
		Predictive analytics	Building predictive models and advanced analytics
	Data integration tool	SAP Data Services	Extract, transform, and load data from various sources
	Database management Systems	Oracle Database	Manage underlying data repositories, ensure data integrity, availability, and performance
		Microsoft SQL Server	
		SAP HANA	

Source: internal document

2.2.3. The IT infrastructure of the DSIOP

This phase focused on evaluating the existing IT infrastructure to ensure compatibility and readiness for the BI solution, by identifying any gaps or potential challenges that needed to be addressed to facilitate the integration of this solution. The following table outlines the approach conducted to this assessment by touching the essential aspects of it, including the

specific objectives, assigned roles, and the expected outcomes, to ensure a structured and detailed approach to preparing for the BI solution implementation:

Table 17: the IT infrastructure assessment planning

Activity	Objective	Role and responsibility	Expected outcome
Current Infrastructure Review	Gain a comprehensive understanding of the existing IT infrastructure	Mme TADRIST Dhahbia: Oversee process Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: Conduct inventory and review Mme BOUNEDJAR Fedwa and Mr. RAHAL Arslane: Provide SAP BO expertise	Detailed inventory of current hardware, software, and network capabilities
Infrastructure Gap Analysis	Identify gaps between current capabilities and SAP BO requirements	Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: Conduct gap analysis Mme BOUNEDJAR Fedwa and Mr. RAHAL Arslane: Compare with SAP BO requirements	Highlight deficiencies and areas needing upgrades.
Integration Planning	Ensure seamless integration of the BI solution with existing systems	Mme TADRIST Dhahbia: Oversee integration planning Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: Map integration points Mme BOUNEDJAR Fedwa and Mr. RAHAL Arslane: Develop testing plans	Integration plan detailing data migration, synchronization, and system interoperability

Security and Compliance Assessment	Ensure adherence to security and regulatory requirements	Mme TADRIST Dhahbia: Oversee security assessment Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: Assess security measures Mme BOUNEDJAR Fedwa and Mr. RAHAL Arslane: Ensure compliance.	Enhanced security measures and compliance with data governance policies documentation of compliance with industry standards and regulatory requirements
------------------------------------	--	---	--

Source: elaborated by us

The existing IT infrastructure of SGA: An effective implementation of the new Business Intelligence (BI) solution at SGA, it is crucial to first understand the existing IT infrastructure that supports the banking operations. This IT infrastructure encompasses a range of components, including data centers, core banking systems, customer relationship management (CRM) systems, payment-processing systems, and a hybrid cloud environment. The IT infrastructure at the DSIOP was as the following:

- Data centers:

Primary Data Center: Located in Algiers, equipped with high-availability servers, advanced storage solutions, and backup systems.

Disaster Recovery Data Center: Located in Oran, a copy of the primary data center's capabilities for redundancy and disaster recovery purposes.

- Networking infrastructure:

Wide Area Network (WAN): Connecting all branches and offices nationwide, ensuring secure and reliable communication.

Local Area Networks (LANs): Within each branch and office, providing high-speed connectivity for internal operations.

Firewalls and Security Appliances: Ensuring network security and data protection across all locations.

Virtual Private Network (VPN): Facilitating secure remote access for employees working offsite.

- Core systems:

Core Banking System (CBS): The backbone of the banking operations, handling transactions, account management, and customer data. Deployed on high-performance servers with a failover setup.

Customer Relationship Management (CRM) System: Manages customer interactions, preferences, and history, integrated with the core banking system.

Payment Processing Systems: Facilitating electronic payments, card transactions, online banking, and interbank settlements.

- End-user devices:

Desktop Computers: Deployed at branches and head offices for administrative tasks and customer service.

Laptops and Tablets: Provided to managers and mobile staff for flexibility and mobility.

Mobile Devices: Issued to key personnel for on-the-go access to critical applications and communication tools.

- Software and applications:

Operating Systems: Primarily Windows and Linux for servers, with Windows and macOS for end-user devices.

Database Management Systems: Oracle and SQL Server, supporting core banking applications and data warehousing.

Enterprise Applications: Including Microsoft Office Suite, email clients, and specialized banking software.

- Cloud services:

Hybrid Cloud Environment: Leveraging both private and public clouds for scalability, flexibility, and cost-efficiency.

- Security infrastructure:

Access Control Systems: Role-based access control (RBAC) ensuring only authorized personnel access sensitive information.

Encryption: Data encryption at rest and in transit to protect sensitive data.

Data Masking: Applied to sensitive data fields to prevent unauthorized access.

Security Information and Event Management (SIEM): Systems for monitoring and managing security events and incidents.

Infrastructure gap analysis: the analysis of SGA IT infrastructure has revealed several critical gaps that needed to be addressed to facilitate the successful implementation of the Business Intelligence (BI) solution. The following table summarizes the potential gaps that needed to be addressed in order to align the new BI solution with the existing infrastructure:

Table 18: IT infrastructure analysis

Gap area	Current state	Identified gap
Real-Time Data Integration	Systems operate in silos with limited real-time data integration capabilities	Absence of automated data extraction and reporting mechanisms
Automated Reporting	Manual data extraction and manipulation using Excel and ad-hoc tools	Absence of automated data extraction and reporting mechanisms
Advanced Analytics and Risk Management	Limited use of advanced analytics tools for risk management	Need for sophisticated analytics tools and predictive models for real-time monitoring and risk identification
Data Quality and Consistency	Inconsistent data quality management practices across systems	Lack of a centralized data quality management framework

Data Security and Governance	Existing data security measures need enhancement to align with BI requirements	Insufficient data governance framework for managing data ownership, stewardship, and regulatory compliance
Scalability and Flexibility	Existing infrastructure may not support the required scalability and flexibility	Need for enhanced cloud infrastructure for scalable and flexible BI solution deployment

Source: internal document

The identification of in the IT infrastructure by the SDG group team to ensure the successful implementation of the Business Intelligence (BI) solution led to a necessary upgrade and procurement, that involves detailed planning and acquisition of necessary hardware, software, and services to bridge these gaps. The primary focus areas include enhancing real-time data integration, automating reporting processes, and strengthening risk management capabilities. The following table illustrates the upgrade and procurement-planning phase:

Table 19: the upgrade and procurement planning for IT infrastructure

Component	Upgrade Plan	Specification
Servers	Procure high-performance servers	Intel Xeon processors, 128GB RAM, 2TB SSD
Storage Systems	Expand storage capacity with SAN and NAS solutions	SAN with 50TB capacity, RAID 10 configuration
Networking Equipment	Upgrade to advanced routers, switches, and firewalls	Cisco Nexus switches, Fortinet firewalls
SAP BO	Acquire licenses for SAP BO Web Intelligence and SAP BO Explorer	SAP BO licenses
Data Integration Tools	Implement SAP Data Services	SAP Data Services licenses

Advanced Analytics Tools	Acquire SAP Predictive Analytics	SAP Predictive Analytics licenses
Cloud Infrastructure	Utilize SAP HANA Enterprise Cloud for non-sensitive applications, data backups, and disaster recovery	SAP HANA Enterprise Cloud services
Data Quality Frameworks	Establish standardized processes for data validation, cleansing, and enrichment	Data quality management tools
Data Security Measures	Strengthen access controls, encryption, and data masking techniques	Security software and protocols
Data Governance Policies	Develop and enforce data ownership, stewardship, retention, and archiving policies	Data governance policies

Source: internal document

Following the successful upgrade and procurement of necessary hardware and software, the next critical step in our BI implementation project at SGA was the integration-planning phase. The primary objective of this phase was the insurance that the newly acquired hardware, software, and cloud services are integrated into the existing IT infrastructure efficiently and effectively. The integration-planning phase can be illustrated as the following:

Table 20: key components of the integration planning:

Component		Integration details
System Compatibility and Configuration	Servers and Storage	High-performance servers with Intel Xeon processors, 128GB RAM, and 2TB SSD to host the BI applications. The SAN with 50TB capacity will be integrated into the storage network

		for data redundancy and high availability
	Networking Equipment	Install Cisco Nexus switches, Implement VLANs and QoS (Quality of Service) settings to prioritize BI-related traffic, data flow between different systems
Software Installation and Configuration	SAP BO	Activate licenses, connect to core banking and CRM systems
	Data Integration Tools	Set up ETL (Extract, Transform, and Load) processes to cleanse and standardize data before loading into the BI
	Advanced Analytics Tools	Configure predictive models and algorithms, detection of irregular client activities and potential fraud
Cloud Services Integration	SAP HANA Enterprise Cloud	Secure connections, establish data backup and disaster recovery processes
Data Governance and Security Implementation	Data Quality Management	data quality dashboards to monitor and report on data quality metrics
	Data security	Configure role-based access controls (RBAC), encrypt sensitive data both in transit and at rest.

Source: internal document

Following the integration-planning phase, the next critical step in the IT infrastructure take through of the BI implementation project at SGA involved a thorough Security and

Compliance Assessment. This phase ensured that the BI solution adheres to all security protocols and regulatory requirements, maintaining the integrity and confidentiality of the bank's data. The following table resumes the gaps identified, and the enhancement proposed by the SDG group team:

Table 21: security and compliance assessment

Aspect	The current state	Gap	Enhancement proposition
Data Protection Measures	Data encryption and masking, ACLs, RBAC	Need for enhanced encryption techniques and updated ACLs	Implement advanced encryption techniques, update and audit ACLs regularly
Access Controls	User roles and permissions	Lack of multi-factor authentication (MFA)	Implement multi-factor authentication (MFA) for accessing BI tools and sensitive data
Encryption Standards	AES-256 for data at rest, TLS for data in transit	Need for review and update of encryption protocols	Ensure all encryption protocols meet current industry standards, enhance encryption for both data at rest and in transit
Compliance with Regulations	Compliance with local data protection laws and GDPR	Regular updates and reviews needed to keep up with regulatory changes	Regularly review and update compliance policies, ensure adherence to GDPR, Algeria's data protection laws, and other relevant regulations
Network Infrastructure	Protected by firewalls, IDS/IPS, and secure VPNs	Advanced threat detection systems needed,	Implement advanced threat detection systems, conduct regular security audits

		regular security audits	
End-User Devices	Equipped with antivirus software and endpoint protection	Need for regular security patches and updates, strict BYOD policies	Roll out security patches and updates regularly, enforce strict BYOD (Bring Your Own Device) policies
Cloud Services	Used for non-sensitive applications and data backups	Secure cloud practices needed, regular audits	Implement secure cloud practices, conduct regular audits, ensure adherence to the shared responsibility model

Source: internal document

2.2.4. Data gathering and preparation

With the IT infrastructure assessment completed, the project transitioned to the critical phase of data gathering and preparation. This step involved identifying and collecting relevant data from various sources across the bank. The project team worked on extracting, cleaning, and transforming the data to ensure its accuracy, completeness, and consistency. This preparation of data aimed to lay a solid foundation for deriving actionable insights with the BI solution.

Data inventory and assessment: the BI project team began with the identification of the data sources. The core banking system, which is the primary banking system at the SGA. A system that handles transactions, account management, and customer records was identified as essential for capturing the most critical financial data. Then, the CRM system within SGA bank, which storing customer information, interactions, preferences, and historical data, were also crucial for understanding customer behavior and improving service delivery. The team also identified payment-processing systems that handle electronic payments, including card transactions, online banking transfers, and interbank settlements, essential for analyzing transaction patterns and volumes. Additionally, they also incorporated financial market data feeds, that provides real-time market data such as exchange rates, interest rates, and stock prices, which is vital for financial analysis and decision-making. Lastly, operational data

systems were also included for covering branch operations, transaction processing, customer service interactions, and employee productivity metrics.

The data gathered from these sources needed to be assessment from the aspect of quality, the project team utilized data profiling tools to analyze data for quality issues, such as missing values, duplicates, and consistency across systems. This assessment revealed inconsistencies in data formats, incomplete records, and outdated information, necessitating a thorough cleansing process to ensure data accuracy and reliability.

Data cleansing and validation:

- Data Cleansing:

Duplicate Removal: this step aimed to identify and remove duplicate records, especially in customer databases, to ensure unique and accurate customer information.

Error Correction: this step addressed common errors such as misspellings, incorrect data entries, and inconsistent formatting.

Standardization: standardized data formats (date formats, currency symbols) to ensure consistency across systems.

- Validation:

Validation Rules: the team implemented validation rules to check data accuracy, by ensuring that account numbers are valid and match with customer records.

Automated Checks: the objective of this step is the automatic validation processes to continuously monitor data quality and alert us to any issues.

Data integration planning:

ETL tools: the data integration process needed an ETL tool; the SDG Group selected SAP Data Services as the ETL (Extract, Transform, and Load) tool. This tool automates the extraction of data from various source systems, transforms it into a consistent and unified format, and loads it into the data warehouse efficiently.

The implementation steps using SAP Data Services: the following tables illustrate the data extraction, transformation and loading phases by this tool:

Table 22: extraction phase

Source system	Data element	Extraction Method
Core banking system	Transactions, Accounts	JDBC/ODBC Connector
CRM System	Customer Interactions	API/Web Services
Payment Processing System	Payment Transactions	File-based (CSV/JSON)
Financial Market Data Feeds	Market Data	API/Web Services
Operational Data Systems	Service Tickets, Activities	Direct Database Access

Source: internal document

Table 23: transformation phase

Transformation task	description
Data Standardization	Convert data into common formats
Data Cleansing	Remove duplicates, fix inconsistencies
Data Enrichment	Add missing information, integrate external data
Data Aggregation	Summarize data for reporting

Source: internal sources

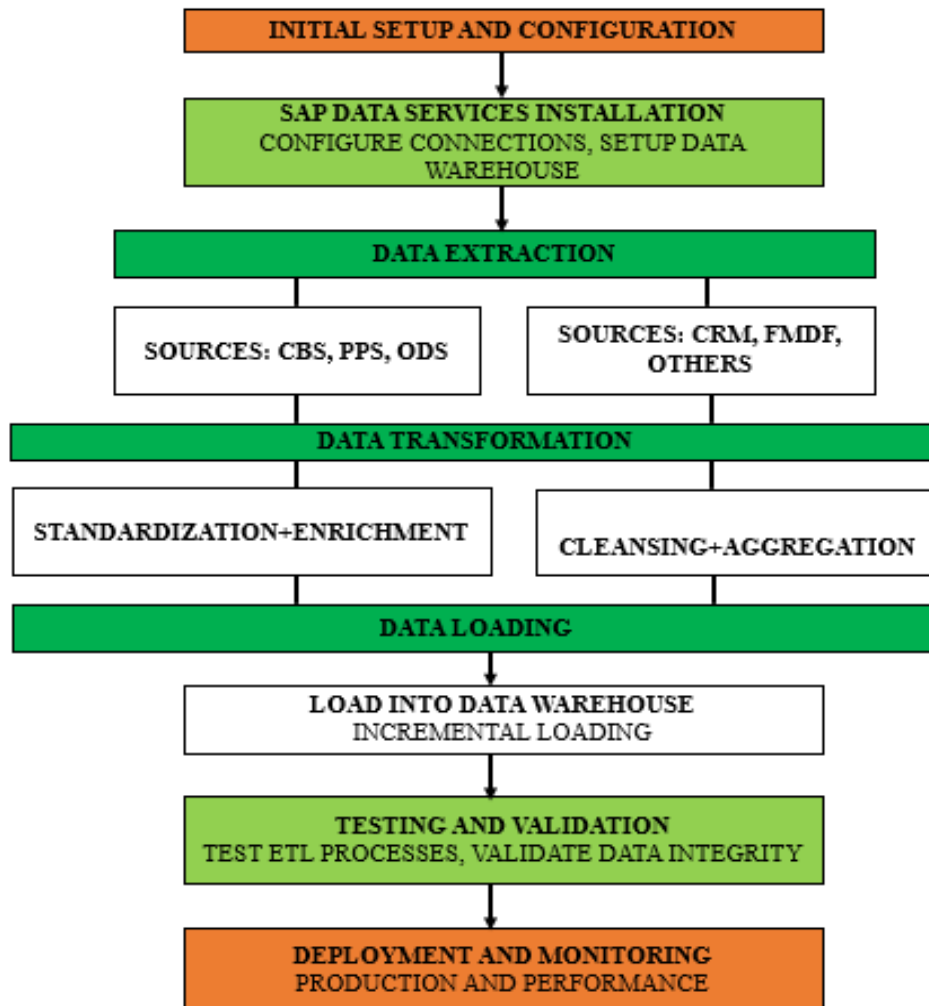
Table 24: loading phase

Data warehouse table	Source Data Element	Load Frequency
Customers	Customer Profiles, Accounts	Daily
Payments	Payment Transactions	Real-time
Market Data	Exchange Rates, Stock Prices	Real-time
Operations	Branch Transactions	Daily
Customer Service	Service Tickets	Daily
Employee Activities	Employee Interactions	Daily

Source: internal document

Integration approach: the objective of this step is the efficient implementation of data integration process using SAP Data Services to support the BI solution. The integration approach for implementing SAP Data Services involved a systematic and comprehensive process to ensure seamless data integration. The following figure illustrates the approach process followed by the project team to integrate thee ETL SAP Data services:

Figure 26: integration approach



Source: elaborated by us

ETL design: this activity aimed to mapping data fields from the source systems to the target data warehouse. This process ensured that each data element from the core banking systems, CRM systems, payment processing systems, financial market data feeds, and operational

data systems was accurately transformed and loaded into the data warehouse. The mapping was as the following:

Table 25: mapping data fields

Source system	Source field	Data warehouse table	Target field
CBS	Transaction ID	Transactions	Trans ID
	Account Number	Transactions	Account ID
	Transaction Amount	Transactions	Trans Num
	Transaction Date	Transactions	Trans Date
	Account Holder	accounts	Holder Name
	Account Balance	accounts	Balance
	Loan ID	Loans	Loan ID
	Loan Amount	Loans	Loan Amount
	Loan Start Date	Loans	Start Date
	Loan End Date	Loans	End Date
	Interest Rate	Loans	Interest Rate
	Payment Due Date	Loan Payments	Due Date
	Payment Amount	Loan Payments	Payment Amount
	Payment Status	Loan Payments	Payment Status
	Branch Code	Branches	Branch Code
	Branch Location	Branches	Branch Location
CRM	Customer ID	Customers	Customer ID
	First Name	Customers	First Name
	Last Name	Customers	Last Name

	Contact Number	Customers	Contact Name
	Email	Customers	Email
	Address	Customers	Address
	Interaction ID	Customer Interactions	Interaction ID
	Interaction Type	Customer Interactions	Interaction Type
	Interaction Date	Customer Interactions	Interaction Date
	Interaction Outcome	Customer interaction	Interaction Outcome
Payment Processing Systems	Payment ID	Payments	Payment ID
	Card Number	Payments	Card Number
	Payment Amount	Payments	Payment Amount
	Payment Date	Payments	Payment Date
	Merchant ID	Payments	Merchant ID
	Payment Status	Payments	Payment Status
Financial Market Data Feeds	Exchange Rate	Market Data	Exchange Rate
	Interest Rate	Market Data	Interest Rate
	Stock Price	Market Data	Stock Price
	Market Date	Market Data	Market Date
Operational Data Systems	Branch Code	Operations	Branch Code
	Transaction Volume	Operations	Transaction Volume
	Service Tickets ID	Customer Service	Ticket ID
	Service Tickets Date	Customer Service	Ticket Date

	Service Tickets Status	Customer Service	Ticket Status
	Employee ID	Employee Activities	Employee ID
	Activity Type	Employee Activities	Activity Type
	Activity Date	Employee Activities	Activity Date

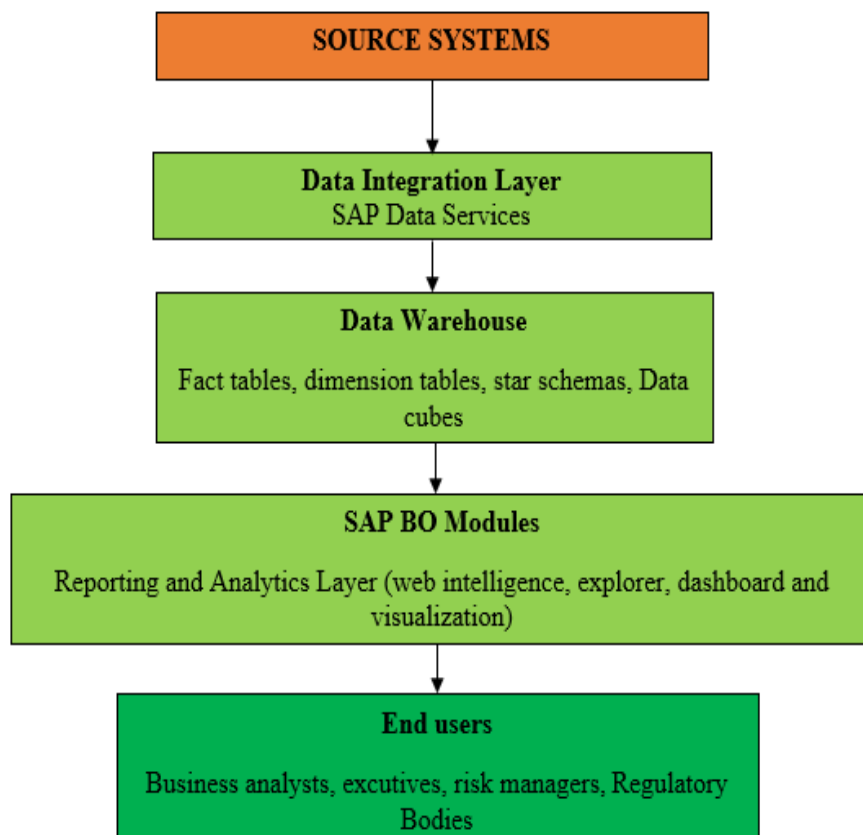
Source: internal document

The definition of the required fields from the sources system led to implementing a series of transformation rules to ensure data consistency and usability across the integrated data warehouse, these transformation rules addressed key aspects from Currency Conversion, Data Aggregation and Normalization. The primary objective of currency conversion was to standardize financial figures across various transactions and systems using different currencies. This involved applying real-time exchange rate data from financial market data feeds during the ETL process to convert all transaction amounts into a single base currency, such as Algerian Dinar (DZD). For instance, a transaction recorded in USD in the core banking system would be converted to DZD using the current exchange rate and stored accordingly in the data warehouse. Data aggregation aimed to summarize and consolidate detailed data, enhancing higher-level insights and improving query performance. This process involved aggregating transactional data into summary tables, such as daily, weekly, or monthly transaction volumes, and total deposits and withdrawals by branch or customer segment. For example, daily transaction volumes for each branch would be summarized and stored in a summary table, allowing quick analysis of branch performance over time. Lastly, normalization was crucial to standardize data formats and structures across different source systems, ensuring consistency and eliminating redundancy. This process included converting data into a common format, such as standardizing date formats and aligning data types. For instance, different systems might store customer birthdates in various formats (e.g., DD-MM-YYYY, MM/DD/YYYY), but during ETL, these dates would be normalized to a single format (e.g., YYYY-MM-DD) across all records in the data warehouse.

2.2.5. BI design and development

The preparation of the data led to proceeding to the next phase, which is the design and development of the BI solution. During this stage, the project team collaborated to design the architecture, user interface, and functionality of the BI solution. The team revisited the requirements gathered during the initial consulting and needs assessment phase to ensure they were comprehensive and accurate. They confirmed the scope of functionalities to be implemented, such as SAP BO Web Intelligence for ad-hoc reporting and SAP BO Explorer for data exploration. The design of the BI architecture was aiming to ensure the seamless integration of the SAP BO solution within the SGA IT infrastructure while meeting the project's goals. The following diagram represents the structured approach for the BI architecture design:

Figure 27: BI architecture



Source: internal document

The Source Systems such as core banking, CRM, payment processing, financial market data feeds, and operational data systems provide the raw data for integration. The Data Integration Layer using SAP Data Services automates the extraction, transformation, and loading (ETL) process, ensuring data quality and consistency. The transformed data is stored in the Data Warehouse; structured with fact tables, dimension tables, star schemas, and data cubes to facilitate efficient querying and reporting. The SAP BO Modules layer includes tools like SAP BO Web Intelligence and Explorer, offering interactive dashboards and reports. Finally, End Users such as business analysts, executives, risk managers, and regulatory bodies access these insights to make informed decisions and ensure regulatory compliance.

2.2.6. Testing and Quality Assurance

The shaping of the BI solution led the project to the testing and assuring the quality to ensure the reliability, performance, and usability of the BI solution. This phase involved testing across various scenarios, environments, and user roles to identify and address any defects, inconsistencies, or usability issues.

During the Testing and Quality Assurance (QA) phase, the project team at SGA Bank collaborating with the SDG group team conducted several critical activities to ensure the reliability and effectiveness of the BI solution. These activities can be summarized in the following table:

Table 26: testing and quality assurance phase

activity	Description	Identified issue	Resolution
Unit testing	Each component of the BI solution, such as ETL processes, data warehouse structures, and SAP BO reports, was tested individually. Developers created test cases for different scenarios to ensure that each function and process worked correctly and as expected	None identified	N/A
Integrating testing	The team conducted integration testing to ensure that all components worked together as smooth as it supposed to. This involved verifying that data flowed correctly from source systems through the data integration layer to the data warehouse and then to the reporting and analytics tools	None identified	N/A

System testing	Comprehensive testing of the entire BI system was conducted to ensure that it met all specified requirements. This phase-included performance testing to check the system's response times and scalability under various loads and stress conditions.	System slowdown under high load conditions	Optimized database queries and enhanced server resources to improve performance under heavy loads
Data validation	The accuracy and consistency of data in the data warehouse were validated. The team conducted data reconciliation between source systems and the data warehouse to ensure no data loss or corruption during ETL processes. Sample reports and dashboards were generated to verify that data aggregation and transformation rules were correctly implemented	Data discrepancies between source systems and data warehouse	Implemented additional validation checks and corrected transformation logic to ensure data accuracy
User acceptance testing UAT	End users, including business analysts, executives, and risk managers, were involved in UAT to validate that the BI solution met their needs. Real-life scenarios and use cases were tested to ensure that the system was user-friendly and	User interface (UI) inconsistencies and missing features	Redesigned UI elements for better usability and added requested features based

	that reports and dashboards provided actionable insights. Feedback from users was gathered to identify any issues or additional requirements that needed to be addressed		on user feedback
Security Testing	Security measures were tested to ensure data protection and compliance with regulatory standards. This included testing data encryption, access controls, and secure data transfer protocols.	Unauthorized access to certain reports	Strengthened access control measures and conducted additional security reviews to prevent unauthorized access.
Bug fixing and optimization	Any issues or bugs identified during the testing phases were documented and addressed promptly. The team optimized the system for better performance and reliability based on the test results and user feedback	Various minor bugs affecting data display and report generation	Fixed bugs and optimized code for better performance and reliability

Source: elaborated by us

The testing led to identify issues that would affect the utilization of the SAP BO; the project team as the following resolved these issues:

Issue 01: performance testing revealed that the BI system experienced significant slowdowns when processing large volumes of data, especially during peak transaction periods. The team optimized database queries to reduce processing times and enhanced server resources by upgrading to hardware that is more powerful and increasing memory

allocation. Load balancing techniques were also implemented to distribute the workload more evenly across servers.

Issue 02: data validation tests uncovered discrepancies such as missing transaction records and mismatched customer data between the core banking system and the data warehouse. The team implemented additional validation checks during the ETL process to ensure data integrity. They also corrected transformation logic and conducted thorough data reconciliation to verify that all data was captured and transformed accurately.

Issue 03: end users reported that some UI elements in the SAP BO dashboards were not intuitive and certain requested features were missing. The development members redesigned UI elements to improve usability and added the requested features based on user feedback. Additional training sessions were conducted to familiarize users with the new interface and functionalities.

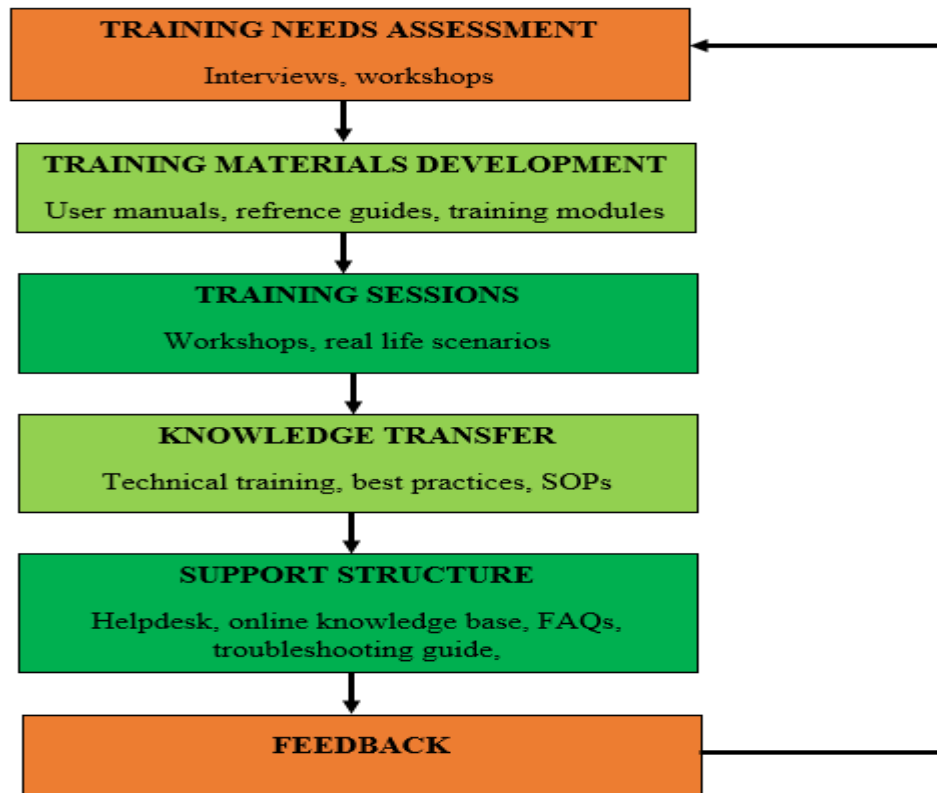
Issue 04: security testing revealed that some reports were accessible to users without the necessary permissions, posing a risk of data breaches. The team strengthened access control measures by implementing stricter role-based access controls (RBAC) and conducting additional security reviews. They ensured that only authorized personnel could access sensitive reports and conducted regular audits to monitor access rights.

Issue 05: bugs were identified that caused incorrect data display in some reports and errors during report generation. The team fixed these bugs by reviewing and correcting the underlying code. They also optimized the system for better performance and reliability, ensuring smooth operation and accurate reporting.

2.2.7. Training and knowledge transfer

This phase designates the near completion of the BI project within the SGA bank, but the effective leverage of this new technology needs the empowerment of users with the skills and capabilities required. This phase plays an important role in the utilization of the Business Intelligence solution within the SGA bank. It focused on developing comprehensive training materials and conducting hands-on workshops to familiarize users with the features, functionalities, and best practices of the BI solution. The following diagram represents the approach followed by the project team to provide users with the knowledge they need for using the BI technology:

Figure 28: training and knowledge transfer approach



Source: internal document

The knowledge transfer and training process for the SAP BO implementation at SGA Bank was designed to ensure all stakeholders could effectively utilize the new BI tools. The process began with a comprehensive training needs assessment to identify specific requirements for different user groups, including business analysts, executives, IT staff, and end-users. This assessment is done by conducting interviews and surveys with these potential users to understand their current skill levels and define their training needs. This assessment led to create comprehensive training materials tailored to the needs of each user group; such as user manuals, quick reference guides. These training manuals covered different topics; such as basic navigation and use of SAP BO tools, generating and customizing reports using Web Intelligence, using interactive dashboards and SAP BO Explorer, data analysis and visualization techniques specific to SGA Bank's data...etc. The definition of the material needed for the training led to commencing the training sessions, these sessions were conducted in various formats; including instructor-led workshops, virtual sessions, and one-on-one coaching, incorporating practical exercises and real-life

scenarios from the bank's operations. The IT staff received specialized technical training on system architecture, ETL processes, and data warehouse management, along with best practices and standard operating procedures. The training sessions were conducted besides building a support system for the users; this system contained a helpdesk, an online knowledge base, and a troubleshooting base. The continuous feedback was collected from training participants to identify additional training needs, leading to follow-up sessions and updates to training materials and support resources, ensuring the successful adoption and utilization of SAP BO at SGA Bank.

2.2.8. Deployment and transition

The implementation process reached the culmination by proceeding with the deployment and transition phase of the BI solution. The project team coordinated closely with stakeholders to ensure a smooth transition, providing ongoing support and guidance to address any issues or concerns that arose during the deployment. This phase was critical to ensure the smooth transition from the development and testing environment to an operational production environment.

The deployment and transition phase of the BI project at SGA Bank was executed with detailed planning and intentions to ensure the seamless transition from the old system to the new BI solution. The deployment strategy began with a phased approach, starting with a pilot deployment to a small group of users to test the system's functionality and gather feedback. The successful pilot carried out a full deployment ensuring that the system was rolled out organization-wide.

The successful full deployment led the team to the cutover planning, where they initially conducted comprehensive pre-cutover activities; including securing complete backups of existing data and performing a final round of system testing to confirm stability. Then, they executed a communication plan to inform all stakeholders about the cutover schedule and their specific roles. During the data migration phase, data was extracted from core banking systems, CRM, payment-processing systems, and other sources, transformed to fit the new SAP BO environment, and loaded into the data warehouse. Data validation checks ensured accuracy and completeness. The actual cutover execution involved scheduled system downtime, final data migration, system configuration, and user access setup. A parallel run

allowed both the old and new systems to operate simultaneously, enabling thorough monitoring and issue resolution. The successful dual operation was followed by a final approval from the project sponsors for the official go-live. The transition concluded with immediate post-go-live support from a hyper care team, continuous system monitoring, performance optimization, and ongoing user training and support to ensure all staff were proficient with the new system. The timeline of the deployment phase was as the following:

Table 27: deployment phase timeline

Activity	Description	Timeline
Final system check	Performance validation, security audits, data validation	Week 1
User readiness assessment	Final training sessions, distribute documentation	Week 1
Deployment strategy	Plan phased rollout and cutover	Week 2
Internal communication	Inform stakeholders about deployment	Week 2
System migration	Migrate data, apply configuration settings	Week 3
Production go-live	Monitor system, issue tracking	Week 4
Post-Deployment Review	Performance review, collect user feedback	Week 5
Handover and Documentation	Transition to operations, complete documentation	Week 6

Source: internal document

2.2.9. Post-implementation and support optimization

The successful deployment of the BI solution at the SGA bank shifted the project to the last phase of the implementation, which is the post-implementation and support optimization. This phase involved providing ongoing support to users, monitoring system performance, and identifying opportunities for optimization and enhancement. It was critical for the team to ensure the long-term success and sustainability of the new SAP Business one system, that led them after putting the solution in production to immediately put in place a hyper care support team combining expertise from the SDG group and members from the SGA bank to

gain those expertise; this team provided intensive support by closely monitoring the system to quickly identify and resolve any issues. This helped minimize disruptions to business operations and ensure system performance met expectations. Performance monitoring tool called SAP solution manager was implemented to continuously assess the system's efficiency, allowing the team to identify weak gaps and optimize performance by add touches to database queries and adjusting server configurations. The team also conducted regular feedback sessions with end-users to gather experiences and identify usability issues or functional gaps, with a prompt resolution process to improve user satisfaction. They also conducted continuous training sessions to address skill gaps and ensure users were comfortable with the new system, as well as updated training materials based on user feedback and system updates.

The team also focused on periodic system enhancements, adding new features and improving existing functionalities based on evolving business needs. They also established an ongoing data quality management practices to maintain accurate, consistent, and reliable data in the data warehouse. The optimization of reports and dashboards was carried out to ensure their performance and relevance, delivering actionable insights to business users. Reinforcing data governance practices maintained data integrity and compliance with internal policies and regulatory requirements. The team at the end created a comprehensive documentation of all processes and best practices, with knowledge transfer sessions ensuring the in-house IT team could take over day-to-day support and minor enhancements.

3. Results of the interview

As part of our comprehensive review of the BI implementation project at SGA Bank, we conducted a series of interviews with the key team members involved in the project. These interviews aimed to gather insights into the challenges faced, the strategies employed, and the overall experience of transitioning to the new SAP BO environment. We sought to answer fundamental questions that would provide a deeper understanding of the project's impact, the effectiveness of the solutions implemented, and areas for future improvement. The results of the interview were as the following:

3.1. Project Management and Budgeting

Box 1: Project Management and Budgeting

What strategy did you use to manage the project timeline and budgeting when dealing with unforeseen technical complexities?

Mme. TADRIST: *“We would leverage a phased approach to the project. By breaking down the project into smaller, well-defined phases, we can identify and address technical complexities early on. Additionally, we would build in buffer time and budget contingencies to account for unforeseen circumstances.”*

Mme. BOUNEDJAR: *“Unforeseen technical complexities were navigated by leveraging our pre-planned phased approach with buffer zones. This gave us the space to isolate the issue and adjust the timeline within a specific phase, protecting the overall project timeframe and budget. Crucially, open communication and collaboration with the SGA Bank team proved invaluable. By working together, we could brainstorm solutions and minimize the impact on the project's timeline and resources.”*

Source: elaborated by us

Commentary: TADRIST and BOUNEDJAR emphasized the importance of using a phased approach to manage the project timeline and budget when dealing with unforeseen technical complexities. TADRIST highlighted that they broke down the project into smaller, well-defined phases to identify and address technical issues early, along with incorporating the extra time added to the project schedule beyond the estimated duration for each task or phase and budget contingencies. Similarly, BOUNEDJAR advocated for a pre-planned phased approach with buffer zones, allowing the team to isolate and resolve issues within specific phases, thus protecting the overall project timeline and budget. She also stressed the significance of open communication and collaboration with the SGA Bank team, which facilitated brainstorming solutions and minimizing impacts on the project's timeline and resources. This strategy of phased implementation, combined with buffer contingencies and strong communication, enabled the team to manage unforeseen technical complexities effectively, ensuring the project's success while maintaining control over timelines and budgets.

3.2. Data Quality and Integration

Box 2: Data Quality and Integration

How did you ensure the quality and consistency of data collection from disparate sources?

Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: *“We employed automated ETL processes with built-in data validation and cleansing mechanisms. These processes were designed to handle different data formats and structures, standardizing them before loading into the data warehouse. We used tools for real-time data ingestion, which helped us catch and correct errors promptly. Regular synchronization schedules were also set up to maintain data consistency across all sources.”*

Mr. RAHAL Arslane: *From the SDG group’s perspective, we emphasized during the implementation the importance of continuous monitoring and validation of data flows. We set up automated alerts and reports to identify and rectify any data quality issues promptly. We created dashboards that provided real-time insights into data quality metrics. This proactive approach enabled us to address potential issues before they could impact the overall data integrity of the BI solution.”*

Source: elaborated by us

Commentary: the response of SEBBACHE, CHEBBAB and RAHAL highlighted a comprehensive strategy for ensuring data quality and consistency from disparate sources, while seif-eddine and abdesslem who are part of the BI project from the SGA bank part focused both on leveraging automated ETL processes with built-in data validation and on cleansing mechanisms. This approach included standardizing different data formats and structures before loading them into the data warehouse. From the other hand, Arslane, who is a part of the BI project from the SDG Group, emphasized the importance of continuous monitoring and validation of data flows from the SDG group's perspective. Automated alerts and reports were set up to identify and rectify any data quality issues promptly. This proactive approach allowed the team to address potential issues before they could affect the overall data integrity of the BI solution.

Box 3: Missing and Incomplete Data

What process did you implement to handle missing or incomplete data sets?

Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: *"We incorporated automated ETL routines that included data imputation techniques and flagging mechanisms. These routines would identify missing or incomplete data and either fill in gaps using predefined logic or flag records for manual review. This ensured that our data warehouse maintained a high level of integrity and completeness."*

Mr. RAHAL Arslane: *"We adopted a dual approach of automated and manual interventions for handling missing data. Automated ETL processes were equipped with logic to fill gaps where possible, using historical data patterns or related data points. We reviewed flagged data of complex cases and made necessary corrections. This hybrid approach ensured high data quality and accuracy in our BI system."*

Source: elaborated by us

Commentary: both responses demonstrated the importance of combining automated tools with manual oversight to handle data gaps comprehensively, ensuring that the BI solution delivers accurate and reliable. The use of automated ETL routines identified missing or incomplete data. Once they are identified, the missing or incomplete gaps get filled using predefined logic or flagged the records for manual review. The SDG group member also discussed adopting a dual approach that combined automated and manual interventions for handling missing data. Automated ETL processes were equipped with logic to fill gaps where possible, utilizing historical data patterns or related data points. Flagged data from complicated cases was reviewed manually and necessary corrections were made. This hybrid approach ensured high data quality and accuracy in the BI system, allowing the team to manage missing data effectively and maintain the overall data integrity.

3.3. Data Security

Box 4: Security Measurements

What are the security measurements that were put in place to safeguard sensitive data during the design and development process?

Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem:: *“Data security was a top priority, and we utilized advanced encryption techniques, along with secure access protocols, ensuring that only authorized personnel could access sensitive data.”*

Mr. RAHAL Arslane: *“We adopted a multi-layered security approach, including data encryption; secure access management, and regular security assessments. Additionally, we implemented continuous monitoring to detect and respond to any potential security threats in real time.”*

Source: elaborated by us

Commentary: the interviewees emphasized the use of advanced encryption techniques and secure access protocols. These measures ensured that sensitive data was protected from unauthorized access, with encryption serving to safeguard data both at rest and in transit. Secure access protocols restricted data access to authorized personnel only, thus minimizing the risk of data breaches and ensuring data confidentiality and integrity. Rahal highlighted a multi-layered security approach, which provided multiple lines of defense against potential threats. Additionally, continuous monitoring was implemented to detect and respond to security threats in real-time, thereby enhancing the system's ability to mitigate risks promptly.

3.4. Testing and Performance

Box 5: Usability and Performance Testing

How did you ensure that the BI solution is tested for not only functionality but also for usability and performance?

Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: *“We utilized automated testing tools to conduct functional tests, ensuring that all components operated correctly. Usability testing sessions were organized with end-users to gather feedback on the interface and overall user experience. For performance testing, we simulated high-traffic scenarios to evaluate system stability and performance under stress”*

Mr. RAHAL Arslane: *“To ensure comprehensive testing, we employed a combination of automated and manual testing methods. Functional testing validated each feature, while usability testing gathered user feedback through hands-on sessions. Performance testing involved stress and load testing using tools like Apache JMeter, allowing us to optimize system performance and ensure it could handle high volumes of data and user interactions.”*

Source: elaborated by us

Commentary: the insights provided by the interviewees illustrate a thorough and multi-faceted approach to testing the BI solution for functionality, usability, and performance. The two interviewees from the bank focused on the use of automated testing tools to ensure the functionality of all components. This automated approach allowed them to verify systematically that each part of the BI system operated correctly. Additionally, they organized usability testing sessions with end-users, which provided direct feedback on the interface and overall user experience. This hands-on approach ensured that the system was not only functional but also user-friendly. Performance testing involved simulating high-traffic scenarios to assess system stability and performance under stress, ensuring the system could maintain its integrity and responsiveness during peak usage times. Overall, the team’s strategy ensured that the BI solution was tested rigorously not just for technical functionality but also for user satisfaction and performance under various conditions. This comprehensive

testing process contributed to the development of a robust, user-friendly, and high-performing BI system.

3.5. Long-term Adaptation

Box 6: Long-term Adaptation insurance

What is the strategy you conducted to ensure long-term adaptation of the BI solution?

Mme. TADRIST Dahbia: *“We focused on creating a scalable and flexible BI architecture that could adapt to future changes and growth. This involved using modular design principles and ensuring that the system could integrate new data sources and technologies easily. Regular training and workshops for staff were conducted to keep them updated on new features and best practices.”*

Mme. BOUNEDJAR Fedwa: *“We ensured long-term adaptation by designing the BI solution with scalability and flexibility as core principles. This included the use of modular components and cloud-based solutions to accommodate future growth. We also established a continuous training and support program to ensure that users could effectively utilize the system as it evolved.”*

Source: elaborated by us

Commentary: the project chiefs reveal a strategic focus on scalability, flexibility, and continuous training to ensure the long-term adaptation of the BI solution. TADRIST Dahbia emphasized the importance of creating a scalable and flexible BI architecture. By using modular design principles, the system was designed to be easily expandable and adaptable to future changes and growth. Additionally, regular training sessions and workshops were conducted to keep the staff updated on new features and best practices, ensuring that users remained proficient and could fully leverage the evolving capabilities of the system. BOUNEDJAR Fedwa also highlighted the significance of designing the BI solution with scalability and flexibility as core principles. She mentioned the use of modular components and cloud-based solutions, which provided the system with the ability to accommodate future growth and technological advancements. The establishment of a continuous training and support program was another critical aspect of their strategy. This program ensured that

users were trained consistently and supported, enabling them to effectively utilize the system and adapt to any changes or new functionalities introduced over time.

3.6. Deployment and Business Continuity

Box 7: Disruptions during the deployment

What steps did you take to minimize disruption to ongoing business operations during the deployment phase?

Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: *“To minimize disruption, we scheduled the deployment activities during non-business hours and weekends. We also conducted several dry runs and pilot deployments to identify potential issues and ensure a smooth transition. Close coordination with the business units was maintained to address any concerns promptly.”*

Mr. RAHAL Arslane: *“We utilized a phased deployment approach to gradually transition to the new system, allowing for real-time adjustments and minimizing disruptions. Critical business functions were prioritized to ensure they were operational during the transition. We also had a dedicated support team on standby to address any issues immediately.”*

Source: elaborated by us

Commentary: Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem focused on scheduling deployment activities during non-business hours and weekends. This approach was aimed at minimizing the impact on daily business operations. They also emphasized the importance of conducting several dry runs and pilot deployments. These preparatory steps allowed the team to identify and resolve potential issues ahead of the actual deployment, ensuring a smoother transition. Furthermore, close coordination with business units was maintained to address promptly any concerns, demonstrating a proactive and collaborative approach to managing the deployment process. Rahal’s response from the other hand assured that by the slow transitioning to the new system; the team could make real-time adjustments, reducing the risk of major disruptions, as well as the prioritizing of the critical business functions ensured that essential operations remained uninterrupted during the transition.

3.7. Feedbacks

Box 8: End-users Feedbacks

How did you gather feedback from end-users after the BI solution has been deployed?
Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: <i>“Post-deployment, we conducted user satisfaction surveys and focus group discussions to gather feedback from the end-users. We also monitored support tickets and helpdesk interactions to identify common issues and areas for improvement. This feedback was crucial for making iterative enhancements to the BI solution.”</i> Mr. RAHAL Arslane: <i>“We set up multiple channels for gathering user feedback, including online surveys, feedback forms, and face-to-face interviews. Regular check-ins with user groups helped us understand their experiences and gather actionable insights. We also analyzed system logs and performance data to identify any underlying issues that users might not have explicitly reported.”</i>

Source: elaborated by us

Commentary: the team applied a thorough and user-centric approach, where Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem emphasized using user satisfaction surveys and focus group discussions. These methods allowed for direct user feedback on their experiences with the BI solution. Monitoring support tickets and helpdesk interactions was also a key strategy, enabling the team to identify and address common issues quickly. Mr. RAHAL Arslane from the other side outlined this comprehensive strategy, which ensured that feedback was gathered from a wide range of users, providing a holistic view of user experiences. Regular check-ins with user groups further enriched this process, allowing for more detailed and actionable insights. Additionally, analyzing system logs and performance data provided an objective measure of system performance and user interaction patterns, helping to identify any underlying issues that users might not have explicitly reported.

3.8. Continuous Improvement

Box 9: Ongoing Optimization

What processes did you implement to monitor the performance of the BI solution and identify areas for ongoing optimization?

Mr. SEBBACHE Seif-Eddine and Mr. CHEBBAB Abdesslem: *“To monitor performance, we used real-time monitoring tools and dashboards that provided insights into system usage and performance metrics. Automated alerts were set up to notify us of any anomalies or performance issues. We also conducted regular performance reviews and optimization workshops to ensure the system operated efficiently.”*

Mr. RAHAL Arslane: *“We implemented continuous performance monitoring using SAP BO Monitoring. This tool provided detailed analytics on system performance, allowing us to identify and address issues proactively. We also conducted regular performance audits and used the findings to optimize system configurations and improve performance.”*

Source: elaborated by us

Commentary: the approaches taken by Mr. SEBBACHE Seif-Eddine, Mr. CHEBBAB Abdesslem, and Mr. RAHAL Arslane to monitor and optimize the performance of the BI solution demonstrate a strong focus on maintaining system efficiency and reliability. The first interviewees employed real-time monitoring tools and dashboards to gain insights into system usage and performance metrics. These tools allowed for the immediate detection of anomalies or performance issues through automated alerts, ensuring prompt responses to any potential problems. Their strategy also included regular performance reviews and optimization workshops, which facilitated continuous improvement and ensured the system operated efficiently. Mr. RAHAL Arslane emphasized the use of SAP BO Monitoring for continuous performance monitoring. This tool provided detailed analytics on system performance, which enabled the team to identify and address issues proactively. Regular performance audits were also part of his strategy, with the findings used to optimize system configurations and enhance overall performance. This comprehensive monitoring process ensured that the BI solution remained robust and responsive to user needs.

4. Observation results

During my internship at SGA Bank, I attended a meeting with the BI project team and observed several critical issues with the BI solution. The BI system is not functioning as intended, primarily due to data-related problems. One major issue is poor data documentation. There is insufficient documentation on data sources, definitions, and transformation rules, which is causing significant confusion and errors among the team. Additionally, inaccurate data entry is a main problem. Data entered into the source systems is often inaccurate or incomplete due to human error, leading to unreliable reports and analytics. As a result, the BI solution is currently only capable of generating reports for the production department, limiting its overall effectiveness and the bank's ability to leverage the BI system for broader decision-making purposes.

5. Discussion

The implementation of the BI solution at SGA Bank followed a structured approach, including phases such as Scope Definition, Data Integration, System Configuration, Testing, Deployment, and Post-Implementation Support. The interviews with key stakeholders, including project leaders and developers, provided insights into strategies used to manage timelines, ensure data quality, and maintain system security. Observations from the field revealed that the BI solution, while functional for report generation, faced challenges in broader data utilization due to issues like poor data documentation and inaccurate data entry.

The phased approach to project management, highlighted by Mme. TADRIST and Mme. BOUNEDJAR, proved effective in managing timelines and budgets amidst technical complexities. However, the post-implementation observation indicated that despite rigorous planning, the BI system struggled with data integration issues not directly related to the implementation process. These included poor data documentation and inaccurate data entry, which affected the system's overall functionality beyond basic reporting tasks.

Security measures, as discussed by Mr. SEBBACHE and Mr. RAHAL, were comprehensive, employing encryption and secure access protocols. This multi-layered security approach ensured the protection of sensitive data throughout the design and development phases, reinforcing the system's reliability and integrity.

The testing phase, involving automated tools and user feedback sessions, was crucial in validating functionality, usability, and performance. However, the need for continuous user training and system optimization became evident, emphasizing the importance of an adaptive and evolving BI environment.

The findings align with existing literature on BI implementation, which underscores the importance of a phased approach and continuous stakeholder engagement. According to David and Valérie (2008), modular and scalable system design is critical for long-term adaptability, a principle mirrored in the strategies employed by SGA Bank's BI team. Furthermore, the challenges observed in data quality reflect common issues in BI projects, where data governance and documentation are pivotal for success (Meziane, 2012).

Several limitations were identified during the BI implementation at SGA Bank. The issues with data quality and documentation, while not directly tied to the implementation process, significantly impacted the system's effectiveness. Additionally, the limited scope of the system's current usage for report generation highlights a gap in achieving the broader objectives of comprehensive data analytics and decision support.

The implications of these findings suggest that while the implementation strategy was sound, there is a critical need for enhanced data governance practices. This includes improving data documentation standards and accuracy of data entry to fully leverage the BI system's capabilities. Moreover, continuous training and user engagement are essential to ensure the system's adaptability and long-term success.

Future efforts should focus on addressing the data quality issues through robust data governance frameworks. This includes detailed documentation, regular data audits, and improved data entry protocols. Additionally, expanding the system's functionalities beyond report generation to more advanced analytics will require ongoing user training and iterative system enhancements.

Conclusion

This dissertation employed a qualitative research approach to investigate the implementation and utilization of Business Intelligence (BI) solutions within the banking industry. Through semi-structured interviews with key stakeholders and detailed observations, we aimed to understand the strategies, challenges, and best practices involved in deploying BI systems in a banking context.

The primary objective of this study was to explore how BI solutions are implemented and leveraged to enhance decision-making processes within banks. Our research focused on key areas such as data quality, security, integration challenges, and user adoption strategies.

The findings of this study underscore the critical role of BI in transforming raw data into actionable insights, thereby enhancing the strategic and operational capabilities of banks. The phased approach to BI implementation at SGA Bank—comprising stages such as Scope Definition, Data Integration, System Configuration, Testing, Deployment, and Post-Implementation Support—proved effective in managing project timelines and ensuring robust security measures. However, challenges related to data quality, particularly poor data documentation and inaccurate data entry, emerged as significant impediments to maximizing the system's potential.

Utilizing a structured framework, this research assessed the performance of the BI system across several dimensions: system functionality, data quality, user training, and ongoing optimization. The results revealed a satisfactory overall performance but highlighted critical areas for improvement. Specifically, enhancing data governance practices, improving data documentation standards, and ensuring continuous user training were identified as essential steps to fully leverage the BI solution's capabilities.

The practical implications of this research are significant. The insights gained provide a solid foundation for banks aiming to implement or refine their BI systems. Recommendations include adopting robust data governance frameworks, conducting regular data audits, and implementing comprehensive user training programs to foster continuous improvement and adaptability of the BI environment.

However, this study has certain limitations. The findings are based on internal evaluations and might benefit from external validation or benchmarking against industry standards. Additionally, combining qualitative insights with quantitative data could provide a more comprehensive view of BI system performance.

Future research could expand the scope of this study to include other banking institutions or industries, employing mixed-method approaches to gain deeper insights into BI implementation and its impact on organizational performance.

In summary, this dissertation highlights the importance of effective BI implementation in the banking industry and demonstrates the critical role of data governance and user engagement in achieving success. The results provide valuable guidance for banks seeking to enhance their decision-making capabilities through advanced data analytics, ultimately contributing to improved operational efficiency and competitive advantage in the rapidly evolving financial landscape.

References

Articles

- Adilson Carlos Yoshikuni, R. D.-d.-L. (2023). Role of Emerging Technologies in Accounting Information Systems for Achieving Strategic Flexibility through Decision-Making Performance: An Exploratory Study Based on North American and South American Firms. *Global Journal of Flexible Systems management* , 199–218.
- Ahmed, J. U. (2010). Documentary Research Method: New Dimensions. *Journal of Management & Social Science*, 1-14.
- Al-Azmi, A.-A. R. (2013). Data, text and web mining for business intelligence. *International Journal of Data Mining & Knowledge Management Process*, 1-20.
- Ali Ahmadzadeh, A. S. (2021). Studying the critical success factors of ERP in the banking sector: a DEMATEL approach. *International Journal of Procurement Management*, 126-145.
- Al-Okaily, A. (2022). An Empirical Study on Data Warehouse Systems Effectiveness: The Case of Jordanian Banks in the Business Intelligence Era.
- Ashraf Bany Mohammad, M. A.-O.-M. (2022). Business Intelligence and Analytics (BIA) Usage in the Banking Industry Sector: An Application of the TOE Framework. *Journal of Open Innovation: Technology, Market, and Complexity*, 1-16.
- BYKANOVA N.I, G. D. (2020). TRENDS AND PATTERNS OF THE BANKING SECTOR DIGITALIZATION PROCESS. *SCIENTIFIC RESULTS. ECONOMIC RESEARCH*, 42-51.
- Coxon, M. M. (2005). The Quality in Qualitative Methods. *FORUM: QUALITATIVE SOCIAL RESEARCH Sozialforschung*, 54-74.
- Doty, D., & Glick, W. (1994). typologies as a uniqueform of theory building: Toward improved understanding and modeling. *academy of management review* , 230-251.
- Edwards, M. (2021). the growth paradox, sustainable development, and business strategy. *Business Strategy and the environment* , 3079-3094.
- Elbanna, S. (2006). Strategic decision-making: Process perspectives. *international Journal of Management reviews*, 1-20.
- G. Koteswara Rao, R. K. (2011). FRAMEWORK TO INTEGRATE BUSINESS INTELLIGENCE AND KNOWLEDGE MANAGEMENT IN BANKING INDUSTRY. *Review of Business and Technology Research*, 1-14.4

- Ivan LUCHIAN, A. F. (2017). International Innovations on the Banking Card Market. *INNOVATION AND TECHNOLOGY TRANSFER* .
- JREISAT, A. (2021). Determinants of Banks Profitability in the middle east and the North Africa Region. *Journal of Asian Finance, Economics and Business*, 1-11.
- Maoyong Cheng, Y. Q. (2020). Does bank FinTech reduce credit risk? Evidence from China . *Pacific-Basin Finance Journal*.
- McDonald, J. D., Rajagopalan, S., Waizenegger, J. R., & Pardo, F. (2007). Realizing the Power of Data Marts. *IEEE Power and Energy Magazine*, 57 - 66.
- Moro, S., Cortez, P., & Rita, P. (2015). Business intelligence in banking: A literature analysis from 2002 to 2013 using text mining and latent Dirichlet allocation. *Expert Systems with Applications* , 155-170.
- Nithya, N. (2021). Impact of Business Intelligence Adoption on performance of banks: A conceptual framework. *Journal of Ambient Intelligence and Humanized Computing*, 3139–3150.
- Nyakarimi, S. N. (2020). Risk Assessment and Fraud Prevention in Banking Sector. *The Journal of Social Sciences Research*, 13-20.
- Qaisar Ali, A. S. (2020). Does Big Data Analytics Enhance Sustainability and Financial Performance? The Case of ASEAN Banks. *Journal of Asian Finance*.
- Sandy Q. Qu, J. D. (2011). The qualitative research interview . *Qualitative research in accounting & management*, 239-264.
- Sauro Mocetti, M. P. (2016). Information Technology and Banking Organization. *Journal of Financial Services Research*, 313–338.
- Shariat, M. R. (2007). Conceptualizing Business Intelligence Architecture. *Marketing Management Journal*, 1-14.
- Shollo, A., & Galliers, R. (2016). Towards an understanding of the role of business intelligence systems in organisational knowing. *Information Systems Journal*, 339–36
- Szilard Farkasdi, B. S. (2021). DETERMINANTS OF COMMERCIAL BANKS PROFITABILITY: evidence from germany . *jurnal riset akuntansi kontemporer* , 82-88.
- Tu DQ. Le, T. N. (2020). The determinants of bank profitability: A cross-country analysis . *centrak bank review* , 65-73.
- Turban, E., Sharda, R., & Delen, D. (2011). Decision Support and Business Intelligence System. *NJ*.

- Vial, G. (2021). Understanding digital transformation. *J. Strateg. Inf. Syst.*, 118-144.

Conferences resume

- Agarwal, P. (2019). Redefining Banking and Financial Industry through the application of Computational Intelligence. *2019 Advances in Science and Engineering Technology International Conferences (ASET)*. dubai: IEEE.
- Gerald Onwujekwe, K.-M. O.-B. (2020). A Framework for Capturing and Analyzing Unstructured and Semi-structured Data for a Knowledge Management System. *9th International Conference on Advanced Information Technologies and Applications*, (pp. 83-94). USA.
- Rifaie, M., Kianmehr, K., Alhajj, R., & Ridley, M. J. (2008). Data warehouse architecture and design. *IEEE International Conference on Information Reuse and Integration (IRI)* . Las Vegas.
- Timo Cziesla. (2014). A Literature Review on Digital Transformation in the Financial Service Industry. *he Bled eConference*. Slovenia,: AIS elibrary .

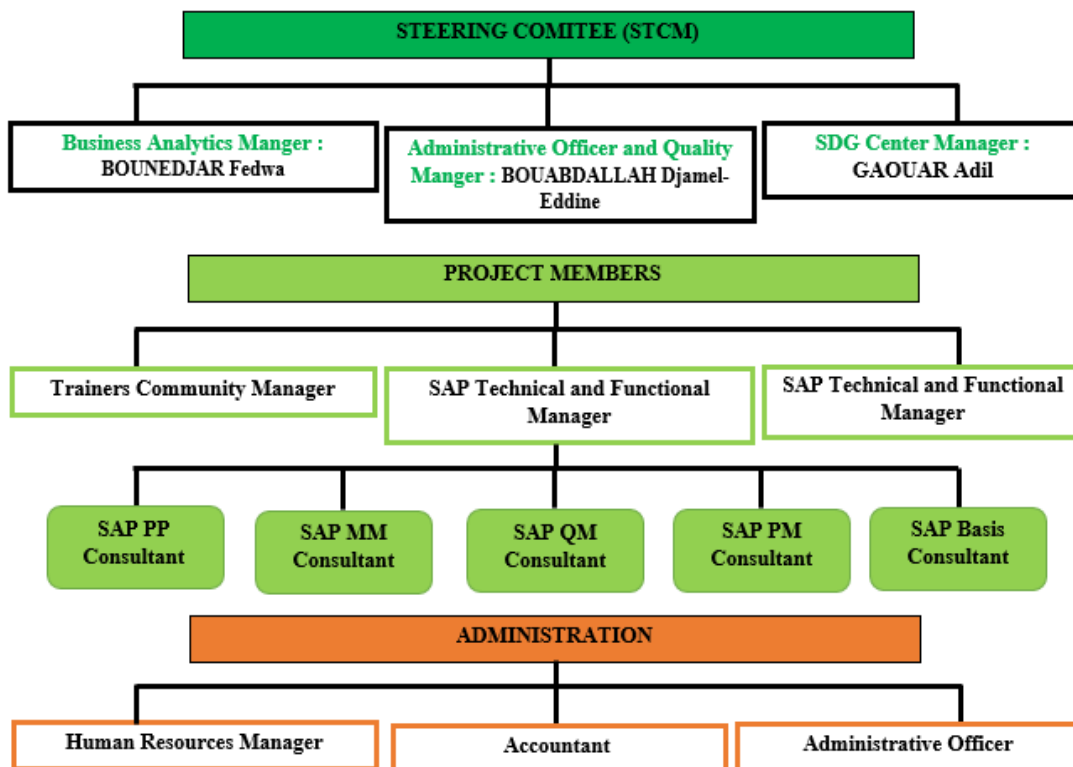
Books

- Keri E. Pearlson, C. S. (2024). *Managing and Using Information Systems: A Strategic Approach*.
- Negash, S. (2004). Business intelligence. *Communications of the Association for Information Systems*.
- Nidal A. Al-Dmour, L. A. (2023). *The Effect of Information Technology on Business and Marketing Intelligence Systems*. springer.
- Stora, B. (2004). *Algeria, 1830-2000: A Short History*. new york: cornell university press.

Annex

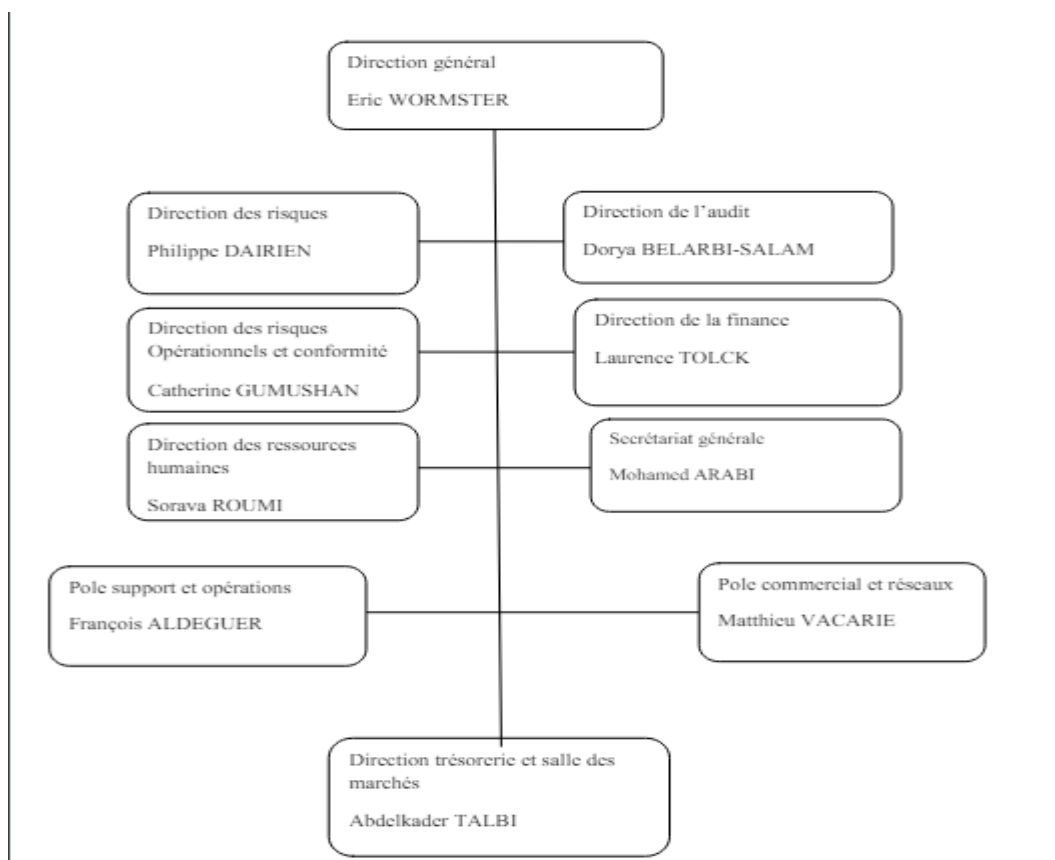
Annex a

Organizational chart of SDG group:



Annex B

Organizational chart of SGA Bank:



Annex C

Interview guide

INTERVIEW GUIDE
Project Management and Budgeting
what strategy did you use to manage the project timeline and budgeting when dealing with unforeseen technical complexities? Quelle stratégie avez-vous utilisée pour gérer le calendrier du projet et le budget lors de la survenue de complexités techniques imprévues?
Data Quality and Integration
how did you ensure the quality and consistency of data collection from disparate sources? Comment avez-vous assuré la qualité et la cohérence de la collecte de données à partir de sources disparates?
what process did you implement to handle missing or incomplete data sets? Quel processus avez-vous mis en place pour gérer les ensembles de données manquants ou incomplets?
Data Security
What are the security measurements that were put in place to safeguard sensitive data during the design and development process? Quelles mesures de sécurité ont été mises en place pour protéger les données sensibles pendant le processus de conception et de développement?
Testing and Performance
How did you ensure that the BI solution is tested for not only functionality but also for usability and performance? Comment avez-vous assuré que la solution BI a été testée non seulement pour sa fonctionnalité, mais aussi pour sa convivialité et ses performances?
Long-term Adaptation
what is the strategy you conducted to ensure long-term adaptation of the BI solution? Quelle stratégie avez-vous menée pour garantir l'adaptation à long terme de la solution BI?

Deployment and Business Continuity
What steps did you take to minimize disruption to ongoing business operations during the deployment phase? Quelles mesures avez-vous prises pour minimiser les perturbations des opérations commerciales en cours pendant la phase de déploiement?
Feedbacks
How did you gather feedback from end-users after the BI solution has been deployed? Comment avez-vous recueilli les retours des utilisateurs finaux après le déploiement de la solution BI?
Continuous Improvement
What processes did you implement to monitor the performance of the BI solution and identify areas for ongoing optimization? Quels processus avez-vous mis en place pour surveiller les performances de la solution BI et identifier les domaines nécessitant une optimisation continue?