

# Home Loan Approval Process using OLAP as a Financial Analysis Tool

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**Abstract** - With continuous development and progress of scientific technology, immense advancements in Business Analytics and Business intelligence have paved its way to the financial sector. Online Analytical Processing tools are widely used and exploited in business decision making as well as data mining. Banking deals with volumes of data on a day to day basis. The processing of data requires real time and fast tools that query at high processing speeds. OLAP cube is one such tool that can be used for business analysis and business intelligence functions in a financial or banking sector. This paper provides a brief introduction to this technology and its use in the banking sector.

**Key Words:** OLAP, Business Analytics, Business intelligence, the Indian banking system, financial analysis

## 1. INTRODUCTION

OLAP is a multidimensional approach to organize and analyze data. It plays a vital role in business decision making. OLAP along with data mining algorithms can be used in financial settings where tons of data are collected and handled regularly.

OLAP is a decision support tool that belongs to the information technology field. The goal of the decision support system is the same as the universal decision support system, and it will make the concealed complicated data visualization highly structured. There are many decision support technologies currently, but OLAP has its flexible analysis capabilities, intuitive data manipulation techniques, and visualization of the results, so it has gained great success in analytics. OLAP enables enterprise business management from the rear to front end; with decision analysis, which alternates through different levels of management to provide a multi-view and convenient way of exploring enterprise data. OLAP systems should have the capacity of processing logs, and provide analysis and statistics. Even though the system will be pre-programmed, that does not mean that the system will be able to function for all applications, hence the user can define a new application specifically calculated as part of the analysis, according to their need. In addition to the analysis of the data in OLAP, the user can merge other external analysis tools to analyze data, For example, the cost allocation tools, finance tools, data mining, etc.

Currently, there is a high demand for the rapid response capability of the OLAP, i.e. The general system should respond to most analytical needs of users in under five seconds.

If the end user has not received the response from the system in less than five seconds, the user will be impatient and this ultimately leads to the failure of the analysis tool and also leads to poor quality of analysis.

The financial sector in India has recently exploded in the types of various services they offer. From home loans to fixed deposits, these schemes are customer oriented. The bank deals with volumes of customer data. To be judgmental, the bank needs to analyze customer data and decide if a service is to be offered when requested. OLAP serves as a vital tool that helps in this judgment.

OLAP being a multidimensional tool verifies and validates various parameters associated with an account so in order to provide banking service to a customer. By three-dimensional analysis, one can make sound financial decisions while dealing with data in the banking sector.

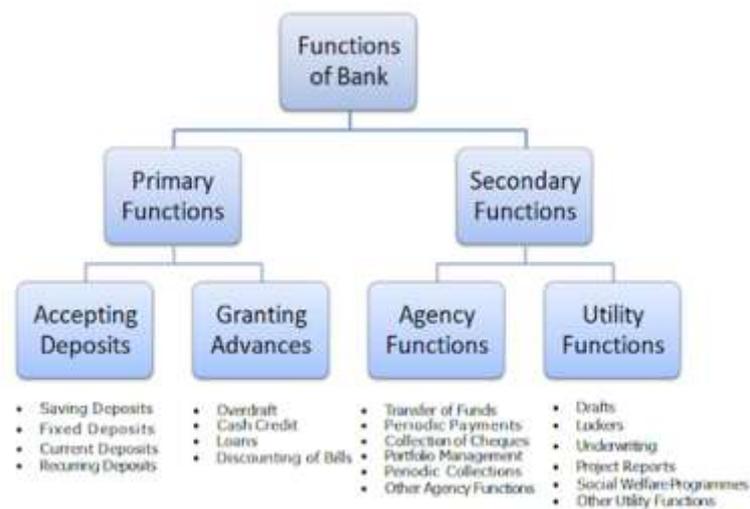


Figure 1.1 Functions in a banking sector

## 2. LITERATURE REVIEW

OLAP is the technology behind many Business Intelligence (BI) applications as discussed by Arta M.[1]. OLAP performs a multidimensional analysis of business data and provides for complex calculations, sophisticated data modeling and trend analysis. It is the foundation for many kinds of business applications that are used for Business Performance Management, Planning, Supply chain management, Budgeting, Forecasting, Financial Reporting, Logistics, Analysis, Simulation Models, Knowledge Discovery, and Data

Warehousing. Dr.B.Ravishankar et al [3,4] have proposed solutions under the reverse logistics field. OLAP enables end-users to perform analysis of data in multiple dimensions, thereby providing the insight and understanding they need for better decision making, and predictive “what if” scenario (budget, forecast) planning explains Dr. Arpita Mathur [2].

**OLAP in Business Analytics:** Business Performance Management (BPM), otherwise termed as Corporate Performance Management (CPM) or Enterprise Performance Management, is modelled toward optimization of overall business performance and achievement of business goals. It enables an organization to effectively enhance the management of their business performance through the aid of reports, analytics, Key Performance Indicators, etc. that help them measure and monitor efficiency and success of their business activities.

Business Intelligence systems provide historical, current, and predictive views of business operations, most often using data that has been gathered into a data warehouse or a data mart and occasionally working from operational data which is essential for Business Performance Management (BPM) or Corporate Performance Management (CPM). Software elements support reporting, interactive “slice-and-dice”, pivot-table analyses, visualization, and statistical data mining. Applications tackle sales, production, financial, and many other sources of business data for purposes that include business performance management.

**OLAP in Banking Scenario:** The first decision support system software, was developed by Comshare as a result of the attempt to expand the scope of the market and enhance the services offered. System W was the first OLAP tool to cater to financial applications and the first to apply hypercube approach in its multidimensional modeling.

Nowadays OLAP plays a very important role in the banking sector in India. In India, banks are providing various services to attract their customers due to tough competition. There are a lot of changes seen in recent years in the field of the banking industry. The strengths of OLAP and data mining can be used to link the decision modeling system to the banking system in India.

**The decision support system** is an application which can be used to manage information system whose main objectives are to help the decision maker to analyze, evaluate and manipulate the multitude of complex factors before making the right decision.

**Data warehousing** is a process of collecting, summarizing and storing of data from multiple and heterogeneous information sources. Dr.B.Ravishankar et al [9] have developed an algorithm for the warehouse. The objective of data warehousing is to provide a database which can be used for reporting and analysis. The aim of a data warehouse is to build a rigid and systemic data storage environment and

separate voluminous data needed by analysis, reporting, and decision-making from traditional operation condition.

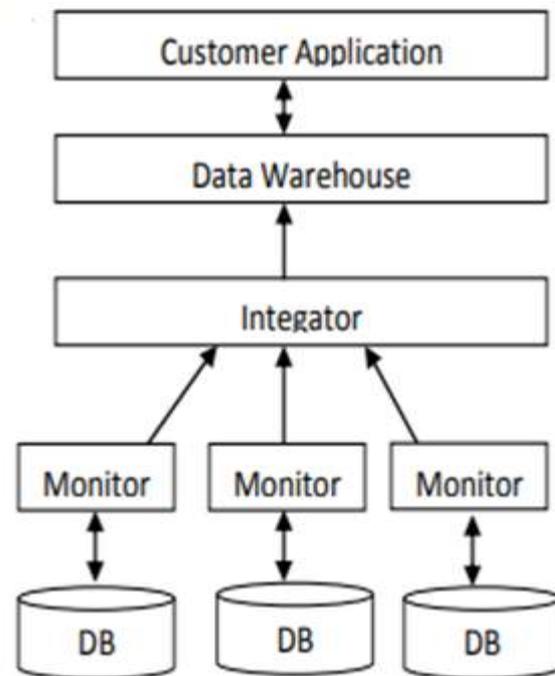


Figure 2.1: Data warehouse structure

**Data cube:** As we know OLAP is a multidimensional data modeling technique and to view the data is in the form of a data cube. It can be seen as a combination of facts and dimensions. The OLAP cube stores information and allows browsing at different conceptual levels.

### 3. OBJECTIVES

- 1) To study the importance of Business analysis and business intelligence in the financial sector.
- 2) To understand the use of OLAP in data analysis and data mining.
- 3) To illustrate how OLAP can be used in financial decision making in a Banking environment.
- 4) To emphasize the role of Business analytics and Business intelligence in integrating an Enterprise through an enterprise resource planning software.

### 4. BUSINESS ANALYTICS AND BUSINESS INTELLIGENCE.

In recent years, organizations have increasingly turned to advanced software solutions to manage workloads, maintain profitability and ensure competitiveness within their respective industries. Business intelligence and business analytics are arguably the most widely implemented data management solutions that aid in this purpose.

Business intelligence solutions are by far the most valuable data management tools currently available. BI solutions collect and analyze current, actionable data with the purpose of providing insights into improving business operations. Dr.B.Ravishankar et al [7] have established data structures for implementing decisions. Business analytics software is either a child or parent of the business intelligence category. Like BI, it is primarily used to analyze historical data, but with the intention of predicting business trends. It also usually has an eye toward improvement and preparation for change.

**5. WHY IS BUSINESS INTELLIGENCE IMPORTANT?**

The potential benefits of business intelligence tools include accelerating and improving decision-making, integrating self-learning and smartness into business systems, optimizing internal business processes, increasing operational efficiency, driving new revenues and gaining a competitive advantage over business rivals. BI systems can also help companies identify market trends and aid to spot business problems that need to be addressed.

Dr.B. Ravishankar et al [5,6,7] experimented on a variety of analyses with business processes and its data. BI data can include information that was historically stored in a data warehouse, as well as new data gathered from new sources, enabling BI tools to support both strategic and tactical decision-making processes.

**6. USE OF OLAP IN DATA ANALYSIS AND DATA MINING:**

OLAP is a powerful tool in BI and BA that has a plethora of applications in various fields such as production, finance, automobile, human resource, public works, etc. OLAP is primarily a tool that provides data when queried at very high speeds. This happens because of the multidimensional capability of OLAP. The OLAP cube consists of various data parameters that are predefined by the user. This cube mainly contains three data functions, that help draw conclusive data at the fastest of speeds. Hence the cube plays a vital role in data analysis. By data mining, this data can be extracted and analyzed. A large number of algorithms can be put in place to help with data extractions and analysis. In this modern era of business intelligence, OLAP plays a vital role in financial analysis. The multiversity that the tool provides for is highly exploited to enhance the speed of ERP systems whilst data extraction as well as data analysis. Dr.B.Ravishankar et al [11,12] have discussed the implementation of logistics in India under retrologistics and reverse logistics topics using data analytics tools.

**7. ILLUSTRATION OF HOW OLAP CAN BE USED IN A BANKING SECTOR TO APPROVE HOME LOAN**

Home loans are one of the many services offered by public and private sector banks in India. It is estimated that around 60% of home buyers in urban cities seek to banks for financial assistance. Hence the prominence of home loans has

increased and hence consequently the amount of data that must be handled has increased. This brings huge challenges in determining how home loans need to be approved and to whom. This difficulty can be eased by using OLAP as a tool for data analysis. OLAP due to its multi-dataset can be used to determine various parameters which will help make decisions regarding the approval of home loans to customers. Dr. Harsh Dev [8], Dr.B.Ravishankar et al [9], Min Guo[10] have discussed information structures.

**General parameters that are important while approving a home loan:**

Each customer corresponds to his/her account number. Based on the following parameters/data sets, decisions are made regarding approval of a home loan.

- 1) **CIBIL score:** It is a three-digit numerical summary of one’s credit history. It gathers data from a credit information report that’s directly linked to one’s PAN number. This score gives information directly relating to the account holders prospective to repay the loan sanctioned. Hence it is of great importance to banks. The score ranges from 300 to 900.
- 2) **Income/Salary:** It is the net income that a person generates or gains per financial year. It could be from various sources. This is the basis on which a loan is sanctioned. It also determines the maximum loan value.
- 3) **Employment type:** It is the type of occupation ones pursuing. It could range from IT professional to self-employed. This plays a key role in sanctioning as it decides the reimbursement probability of the loan by the individual.
- 4) **Property validation/valuation:** The property in concern to be purchased is assessed for encumbrance and worth in monetary terms so as to decide the maximum loan amount.
- 5) **Debts:** The current liability of an individual determines his ability to pay the monthly EMI premium.



**Figure 7.1: Parameters for home loan approval**

**6) Age:** Age of an individual is a key factor that determines how much premium is given to an individual and also the repayment period. The general age must be above 18 years of age and less than 60.

**The parameters of data storage are as follows:**

- 1) Account number of customer
- 2) Decision parameters – Cibil score, Employment type, Salary/Income in Lpa, Debts in Lpa.
- 3) Decision Results and algorithm

**Algorithms and Decision making:**

**a) Employment/Professional:** This depicts the type of profession the individual is undertaking. It is solely the manager’s decision to approve the loan based on employment and type of profession.

**b) CIBIL score:** If the cibil score is greater than 450, a “yes” decision is made else a “no” decision is made.

**c) Salary/income:** If the income per year is less than one-fifth of one’s asking loan amount, a “No” decision is made else a “Yes” decision is made.

**d) Debt/s:** If one’s current debt per month is less than 30% of the EMI, a “yes” decision is made else a “no” decision is made.

These decision algorithms are provided by the business analytics module of an ERP software. The analyzed data is then directly fed into the OLAP cube for retrieval and decision making.

**Table 7.1: Legend for profession/employment**

LEGEND	
IT	Information Technology
SE	Self Employed
DC	Doctor
Pvt	Private Sector
Govt	Government employee
TCH	Educationalist

**Table 7.2: Hypothetical customer data**

Customer data	CIBIL Score	Salary/Income per year in Lpa	Loan amount in Lakhs	EMI/month	Profession	Debts/year	CIBIL score >450	Salary / Income per year >( loan amount/5)	Debts < 30% of EMI
1100670098	578	11	6000000	INR 52,069	IT	220000	yes	no	yes
1100676579	732	8	3500000	INR 30,374	SE	400000	yes	yes	no
1100675465	345	10.5	3400000	INR 29,506	DC	320000	no	yes	no
1100671208	657	15	5900000	INR 51,202	Pvt	0	yes	yes	yes
1100670430	463	22	6800000	INR 59,012	Govt	550000	yes	yes	no
1100670106	665	7	2000000	INR 17,356	Govt	410000	yes	yes	no
1100670307	690	5.3	2900000	INR 25,167	IT	140000	yes	no	yes
1100672502	713	8.7	3100000	INR 26,903	TCH	220000	yes	yes	no
1100670808	885	13.5	4500000	INR 39,052	SE	210000	yes	yes	yes
1100672512	590	6.2	1800000	INR 15,621	SE	11000	yes	yes	yes
1100670404	393	12.4	4200000	INR 36,449	IT	320000	no	yes	no

Customer account number series 110067

Customer ID	CIBIL score	Salary / Income Lpa	Employment/ Profession	Debt Lpa	Employment/ Profession	CIBIL score > 650	Salary / Income per year (loan amount/5)	Debt < 30% of EMI	AT BANK MANAGER'S DISCRETION	LOAN APPROVAL
0098	578	11	IT	2.2	IT	Yes	no	Yes	no	no
6579	732	8	SE	4	SE	Yes	Yes	Yes	Yes	no
5465	345	10.5	DC	3.2	Pvt	no	Yes	Yes	Yes	Yes
1208	657	15	Pvt	0	DC	Yes	Yes	Yes	Yes	no
0430	463	22	Govt	5.5	Govt	Yes	Yes	Yes	Yes	no
0106	665	7	Govt	4.1	Govt	Yes	no	Yes	Yes	Yes
0307	690	5.3	IT	1.4	IT	Yes	Yes	no	Yes	no
2502	713	8.7	TCH	2.2	TCH	Yes	Yes	Yes	Yes	Yes
0808	885	13.5	SE	2.1	SE	Yes	Yes	Yes	Yes	Yes
2512	590	6.2	SE	0.11	SE	Yes	Yes	Yes	Yes	no
0404	393	12.4	IT	3.2	IT	Yes	Yes	Yes	Yes	no

Figure 7.2- OLAP CUBE coupled with decision algorithms

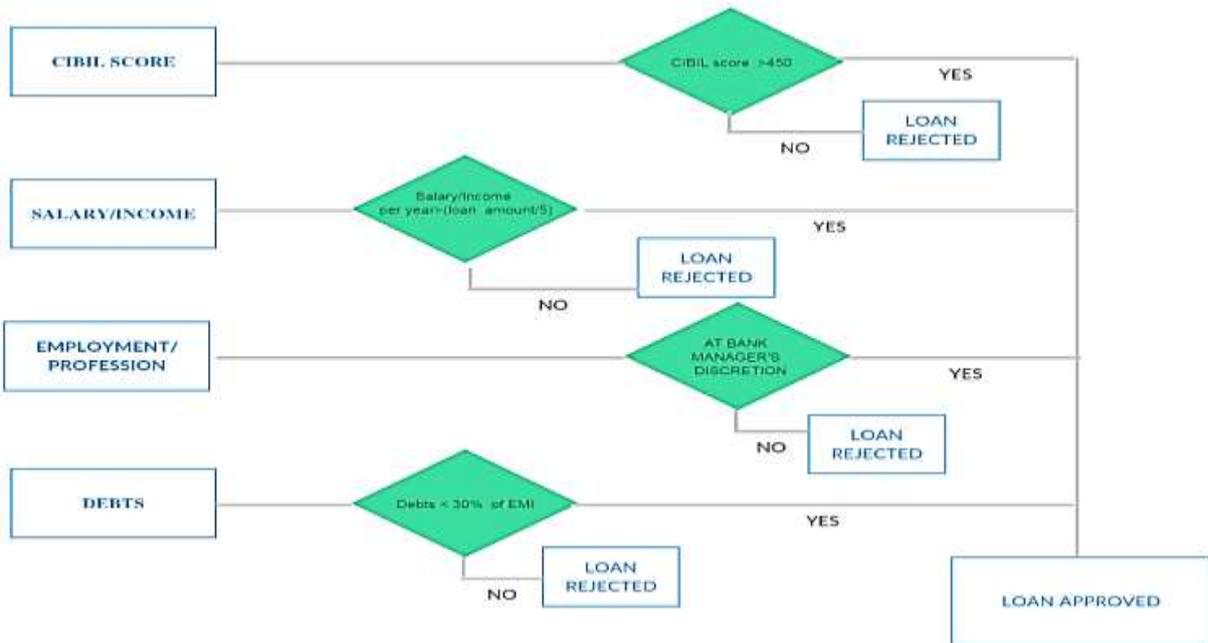


Figure 7.3: Loan approval decision making representation

## 8. ROLE OF BUSINESS ANALYTICS AND BUSINESS INTELLIGENCE IN INTEGRATING AN ENTERPRISE THROUGH AN ERP SOFTWARE

Business intelligence and analytics are highly imperative in making sound business decisions when volumes of data are in concern. An enterprise functioning depends on a sound ERP software. This expects wise decisions to be made at the shortest of time. An OLAP cube acts as a tool not only an easy decision making but also in data retrieval at very high speeds. This is done either by run up or run down of the cube. Data stored can be obtained by slicing and dicing of the cube. By providing a multidimensional approach for data storage, OLAP hastens the overall response time of the storage system. This is critical to the success of any Enterprise resource planning software.

## 9. CONCLUSION

Online analytical processing is a very important tool that has revolutionized the way data is stored and mined. Business analytics and business intelligence have become key players in today's businesses and have enabled businesses to interface data as well as analyze them at very high speeds. OLAP is not only a tool that helps with business analytics but with the right algorithms, it can be used in decision making. Financial sectors deal with huge amount of data and require decisions to be made at rapid paces. OLAP provides the right decisions based on the data and algorithms employed at rapidly high speeds. This speed of decision making is highly necessary for the banking sectors. This paper provided an insight into how OLAP is used in decision making in banks regarding the approval of the home loan. By employing such tools, a plethora of decisions can be made that not only provides profits but also holds a newfangled view of technological changes. OLAP undoubtedly can be regarded as a complete financial tool that will change the way businesses used to function.

## 10. REFERENCES

- [1] Arta M. Sundjaja, Implementation of business intelligence on banking, retail, and educational industry, International Journal of Communication & Information Technology, Vol. 7 No. 2 October 2013, pp. 65-70
- [2] Dr. Arpita Mathur, Nikhita Mathur, Design of OLAP Cube for Banking System of India, International Journal of Computer Trends and Technology (IJCTT) – Volume 35 Number 3-May -2016
- [3] Dr. B Ravishankar et.al at the 2013 POMS Annual Conference May 3 to May 6, 2013, at the Denver Marriott City Center, U.S.A. "A Macro-Environmental Analysis Of Reverse Logistics Practices In India "
- [4] Dr. B Ravishankar et.al at the 2013 POMS Annual Conference May 3 to May 6, 2013, at the Denver Marriott City Center, U.S.A. "A Pragmatic Procedure For Deciding The Need Of Implementing Reverse Logistics "
- [5] Dr. B Ravishankar et.al at the 2013 POMS Annual Conference May 3 to May 6, 2013, at the Denver Marriott City Center, U.S.A. "Multi-Factor Significant Improvements Derived Adopting Yield Analysis In A Typical Indian SME "
- [6] Dr. B Ravishankar et.al at the 2013 POMS Annual Conference May 3 to May 6, 2013, at the Denver Marriott City Center, U.S.A. " Critical Analysis of tangible gains post ERP Implementation in an Indian SME"
- [7] Dr. B Ravishankar et.al at the 26<sup>th</sup> Annual POMS Conference Washington, D.C. USA May 8-11, 2015 paper titled "Design of Information structure for competitive productivity for a large scale manufacturer in India "
- [8] Dr. Harsh Dev, Suman Kumar Mishra, Design of Data Cubes and Mining for Online Banking System, International Journal of Computer Applications (0975 – 8887) Volume 30– No.3, September 2011
- [9] Min guo, Financial System Analysis and Research of OLAP and data warehousing, Technology ,IT journal, 2014
- [10] Dr. B. Ravishankar et al at the International Journal of Science & Engineering Development Research (IJSER) paper titled "development of algorithm and flowchart for the operation optimization in warehouse. July 2016. issn: 2455-2631, issue: July 2016, volume 1, issue 7, impact factor: 4.07
- [11] Mrs. S Maheshwari & Dr. B. Ravishankar, International Conference on Challenges and Opportunities in Mechanical Engineering, Industrial Engineering and Management studies, ICCOMIM 2012 @ Bangalore - 12th July 2012 " Retlogistics - Significant Opportunities and Key Challenges in India"
- [12] Mrs. S Maheshwari & Dr. B. Ravishankar, 54th International conference of Indian Institute of Industrial Engineering Annual Convention 2012 @ Bangalore-31st October 2012 "Design of methodical approach for adopting reverse logistics"
- [13] Naseema Shaikh, Dr. Wali Ullah, Dr. G. Pradeepni, OLAP Mining Rules: Association of OLAP with Data Mining, 2016, American Journal of Engineering Research (AJER)