



Design of Integrated Business Intelligence System Framework for Insurance Business Processes

Dilbag Singh

Deptt. of Comp. Sc. & Applications
Ch. Devi Lal University, Sirsa (HR), India

Pradeep Kumar

Deptt. of Comp. Sc. & Applications
Ch. Devi Lal University, Sirsa (HR), India

ABSTRACT

Business intelligence is a key means to promote core competence of enterprise. The high construction cost of business intelligence severely limits the popularization and development of business intelligence system. Business process management (BPM) is a key business initiative that enables companies to align strategic and operational objectives with business activities in order to fully manage performance through better informed decision making and action. Effective business performance requires an organization to model and monitor not only its tactics but also its strategies and the assumption on which these strategies are built. Decision making is an important task for enterprise managers, and is typically based on various data sources derived from information systems, such as enterprise resource planning, supply chain management and customer relationship management. Numerous business intelligence tools (BI) thus have been developed to support decision making. Some existing BI tools have several limitations, for example lacking data analysis and visualization capabilities. The aim of this paper is to examine the processes, methodologies and technologies underlying BPM in insurance, the relation between BPM and business intelligence, and to propose a framework for integrating corporate performance management and business intelligence.

Keywords

Insurance, business intelligence, business process, framework

1 INTRODUCTION

In the past years, companies have understood the importance of enforcing achievement of the goals defined by their strategy through metrics-driven management. Insurance organizations have vast technology assets to assist them with day-to-day operations, regulatory compliance, and financial reporting. Such systems record transactions and manage operational processes, automate compliance and controls, and roll up financial performance data. To varying degrees, these systems populate data warehouses (DW) that are exploited by business intelligence (BI) systems. [1] The DW process, though supporting bottom-up extraction of information

from data, fails in top-down enforcing the company strategy.[2] The missing element, one that finance and IT teams are now pursuing, is the integration of these systems into a unified source of performance information and analysis capability.

Early adopters of business process management have focused on making the finance function more strategic – mainly because people have tended to trust data coming out of a financial system more than other corporate systems, such as ERP or CRM. Almost every major business function has a performance management element that can be realized.[22] To enable this requires organizations to put in place the right data platform and source data and ensure that strategic thinking is driven by the wider needs of the business. Organizations of all shapes, sizes and markets are under pressure to conform to increased regulatory compliance pressures and have a need to link corporate performance to the decision-making process. BPM can be the right answer in the same direction.[23]

Now a days knowledge has become a key economic resource [4] and been an important means to form the core competence and obtain competitive advantage for all kinds of enterprises. Knowledge is embedded in the routine business data, such as consumption records of customers, sales orders for dealers and supply voucher of provider. To discovery the knowledge from those data could effectively aid enterprises in scientific decision-making and analysis.[5] Transforming the customer and operational information into knowledge, Business Intelligence (BI) provides the consolidation and analysis of raw data, and the capacity of processing raw data into the executable decision-making information. It could enhance the competitiveness of enterprises by using different sources from customers, operations and market information [6].

The aim of this paper is to examine the processes, methodologies and technologies underlying BPM in insurance, the relation between BPM and business intelligence, and to propose a framework for integrating corporate performance management and business intelligence. The proposed BI system can potentially be considered as an efficient data analysis tool for supporting business decisions.



2. BUSINESS INTELLIGENCE

The various operational and transaction data can be transformed into information and then knowledge by using business intelligence (BI) tools. Enterprises decision makers make better business decisions based on systematic acquisition, collation, analysis, interpretation and exploitation of information. BI components comprise online analytical process (OLAP), knowledge management, customer relationship management (CRM), visualization, decision support system/executive information system, data mining (DM) and geographic information system (GIS) [11,15]. Wingyan et al. [6] indicates that existing BI tools suffer several limitations, such as poor data analysis and visualization capabilities. Many advanced BI tools have been developed to overcome weaknesses, including HP Openview DecisionCenter [10] and Microsoft SQL Server 2008 [8].

Moreover, Michalewicz et al. [9] introduced a scheme of an adaptive BI system, which combines optimization, prediction and adaptability. The adaptive BI system is capable of answering two questions:[16]

(1) “What is likely to happen in the future?”

(2) “What is the best decision right now?”

Li et al. [12] indicate that BI comprises concepts, methods and process to improve business decisions, which employ information from multiple sources, and use experience and assumptions to develop an accurate understanding of business dynamics. BI has several objectives [7]:

- to gather data from various sources;
- to transform this data into information and then knowledge;
- to provide a friendly graphic interface to display this knowledge.

Figure 1 illustrates the BI process, which works to transform data into information, and then knowledge using analytical tools, such as DM, OLAP, visualization etc. Finally, the generated knowledge can be used to support business decisions. BI systems have been used to many application fields, such as ERP, SCM, CRM and human resource management. [13]

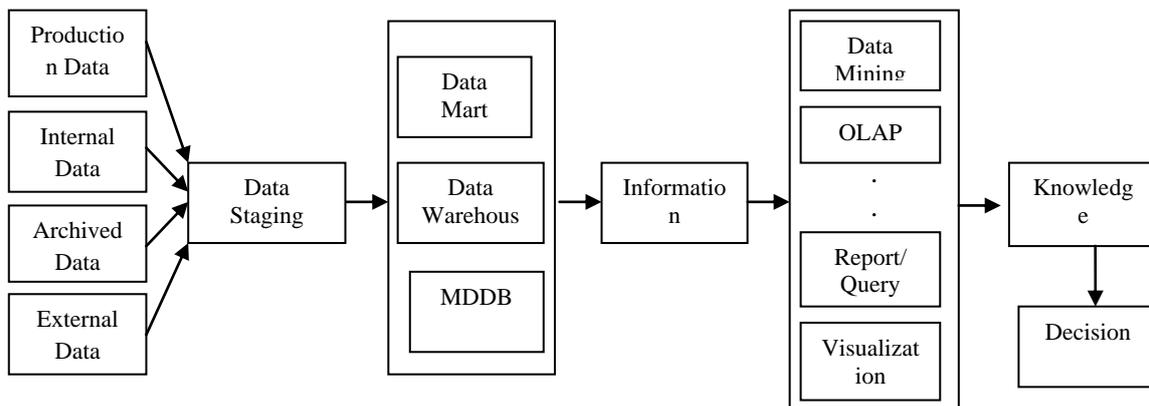


Figure-1: BI Process

3. BI TECHNOLOGIES AND BUSINESS PROCESSES

BI is composed of three core components, namely data warehouse(DW), online analytical processing(OLAP) and data mining(DM), where DW is the basis of BI which provides comprehensible and accurate data support for the other two components [14]. With the development of global economic integration process, enterprises in the world have broken through the national border to carry out the manufacture, operation, and service. Therefore, in construction of BI systems enterprises need to consider the following [18]:

Distributed user circumstance: Global economic integration makes various types of users in enterprise to distribute in different area of the world. It needs BI system to adapt to a distributed user circumstance.

Distributed data circumstance: Enterprises carry out activities on a global scope which result in the global distribution of business data. These data is the basis of the formation of BI. Therefore it needs BI system to adapt to a distributed data circumstance.

Heterogeneous data resources: The various business processing systems of enterprise, such as ERP, CRM, and SCM and so on, produce large amounts of business data every day. These data is heterogeneous, redundant and isolated each other. It needs BI system to integrate heterogeneous data resources.

Organizations make choices and decisions based on the quality of the information at their disposal. Data warehousing can be the key factor for providing management with the right information at the right time to make solid choices, allowing key decision makers to examine business trends and establish solid strategy for the future.[17] Data Warehousing is believed to be a competitive necessity. The management of knowledge supports the competitive advantage of organizations. Therefore, the effective use of data warehousing (McManus and Snyder, 2003) to store knowledge can be instrumental in supporting the competitive advantage of companies. Considering the extensive size of the database itself, the data warehouse is in a permanent state of redesign in its model and structure. Having a massive database is useless unless the relevant information is retrieved quickly on request by the end user in real time basis [20].



- Organizations need to have better and enhanced business intelligence in reduced time for the end users for efficient and effective decision making.
- Consolidation of heterogeneous information sources is a must for any firm to achieve strategic advantage over competitors in the market and market products and services at a faster level.
- Replacement of older, less responsive decision support systems is an important requirement to reduce dependence on Information Systems (IS) to generate reports.

The traditional implementation of BI is to extract data from various business processing systems or local data sources, transform and load data to DW at central site via computer network. [19] Then DW-oriented analysis and mining are carried out. It benefits scientific and effective decision making of enterprise [21]. Oriented to the current applied status, the traditional implementation method requires enterprises to provide high-speed data transmission networks, high-capacity data storage at central site. It brings a heavy financial burden to enterprises, especially to small and medium enterprises which possess poor resource. To enhance scientific decision-making and analytical capacity of the vast number of domestic traditional enterprises and small and medium enterprises in international competitiveness, this paper takes the advantages of multi-agent technology to give a low-cost BI systems design which can reduce the construction cost of BI system and extend the applied scope of BI by minimizing the amount of data transfer and data storage. [24, 25]

Any BI implementation is aimed at turning available data into information and delivering it to the decision makers. BPM is focused on a subset of the information delivered by a BI system – the information that shows business performance and indicates business success or failure and enables organizations to focus on optimizing business performance. [22]

BPM involves a closed-loop set of processes that link strategy to execution in order to respond to that task. Optimum performance is achieved by:

- Setting goals and objectives – strategize
- Establishing initiatives and plans to achieve these goals –plan
- Monitoring actual performance against the goals and objectives – monitor
- Taking corrective action – act and adjust

The key to effective BPM is tying performance metrics to business strategy, and that means a melding of two areas of technological functionality: strategic management systems and performance metrics.

The first are systems that manage the key business processes that affect strategy execution, including objective management, initiative management, resource management, risk management and incentive management.

The second is essentially a business intelligence platform for automated data exchange, reporting and analysis. BPM should produce three core deliverables: [23]

- Information delivery to enable managers to understand the business.
- Performance oversight to enable them to manage the business.
- Performance effectiveness to enable them to improve the business.

Business performance management must be an enterprise-wide strategy that seeks to prevent organizations from optimizing local business at the expense of overall corporate performance.

Business Information Technologies are seen as cutting edge Information Technologies made on purpose to support business information engineering. Management methods, techniques and support tools could be seamless integrated with Business Intelligence components in special tailored or customized Performances management systems. The main functions of these systems are:

- To gather and store different measures of the business on a regular basis (current state indicators of the business performances).
- To gather and store benchmarks and targets (threshold values) and business rules (interpretations of comparison results between current performance's indicators and etalon values).
- To facilitate roll-ups and drill-downs of analyzed indicators along hierarchical aggregation criteria (structured Performance Measurements).
- To keep the ongoing analysis alert - allowing decision makers to quickly evaluate which business processes are successful, and which need their attention.

To summarize, an effective Business Performance Information System is built and maintained by business users to support the decision-making process especially at strategic level, making use of various indicators – quantitative and qualitative, lagging and leading – balanced against targeted objectives and/or industry benchmarks. Lastly, with performance measurement periods becoming shorter, management must have the capability to more proactively influence the outcome.

That requires monitoring and tracking capabilities that can generate current, complete and accurate information upon which they can act in real time. Business information technologies must respond to that need of proactively managing business performance.

4. BI AND INSURANCE BUSINESS PROCESS MANAGEMENT

Business intelligence can be considered as being the final component of business process management (BPM) after the decision support systems, enterprise information



systems. If BPM is an outgrowth of BI and incorporates many of its technologies, applications and techniques, than why BI itself can't deliver the insight needed to improve overall business performance? From a theoretical viewpoint, it can. From a practical standpoint, it hasn't. Like decision support; BPM is more than a technology. It involves the processes, methodologies, metrics and technology used to monitor, measure and manage a business. Once selected the business process that has to be improved, and the business methodology to be implemented, there are the metrics (to monitor, measure and change) to be established. These metrics (key performance indicators) are defined and selected by the business and not by the IT. The final step is to choose the business performance measurement technology. We can say that business intelligence it is just business measurement and not business performance management. BPM is not a single technology, but rather a combination of elements – BI, score carding, profiling. BI looks at and analyses the past and what has happened up until today – this is useful, as planning requires knowledge and you can set planning goals based on the past. Score carding enables you measure how you are performing against those planned goals. Every organization has processes in place that feed back to the overall plan. [26]

What's new with BPM is the integration of these processes, methodologies, metrics and systems – an enterprise wide strategy that seeks to prevent organizations from optimizing local business at the expense of overall corporate performance.

The industry is looking to improve its performance in various areas: improved quality of underwriting, multiple options of premium payment, enhanced claims management processes, easy way of renewal, discontinuation of policy, better management of the exposure/risks created from declining investment returns and the development of better business controls and reporting, both operationally and financially[26]. Apart from these core areas, insurers are looking at increasing channels of distribution, which affects the profitability of their business, through alliances. The various areas of this sector in which business intelligence is required are [27]:

Sales and Marketing: Analyse customer behaviour and buying patterns to create new products and services that help sales teams to meet revenue goals. Identification of cross selling/ upselling opportunities involves identification of those customers in the existing database whose likelihood of responding to a product which they do not hold presently is the highest.

Claim Fraud Detection & Prediction: Identify fraudulent patterns and use historical data to uncover past fraud cases. Improve cost saving with more efficient and effective fraud detection. The analytic solutions which help manage the complex claims process effectively and help detect fraud by accurately forecasting likely outcomes in order to mitigate the severity of the claim.

Customer Segmentation/Classification: It is extremely important for insurer to segment customer based on their behavior and potential profitability. Analytics can help them more accurately, which policies and services to

offer to which customers. Apart from customer segmentation, data mining can also be used to predict the likelihood of policy cancellation in advance.

Market/Product Analysis: As there are several products to cater the need of various customers. Which product is suitable for the customer demographics? Planning and launching of new product for the targeted customers.

Risk Management: To adapt a risk based approach, insurers will have to implement an economic capital regime, where they predict and evaluate the risk profile of the underwritten business under both best case and worst case scenarios. Simulation techniques and stochastic model for various risk such as credit market liability; underwriting and operational risk can be used for scenario and stress testing to determine the optimum economic capital level.

5. DESIGN OF INTEGRATED BI FRAMEWORK FOR INSURANCE

The integration of business and IT process management and BI is a key enabler for BPM. It provides the ability to effectively manage the business and achieving business goals.

The BPM framework presented below is based on the integration of business and IT processes at all decision levels (strategic, tactical and operational).

In the figure-2, the various BI users are Market Product Research, Business development, Insurance consultant, Customer service, Management /DSS. Outside Databases includes data that are acquired from external market/industry research and multiple insurers in different formats. Company/product Databases includes insurance company/product analysis information, Product terms, fee rate, company analysis/rating information, etc. Operation Databases includes various kinds of operation information such as customer information (customer purchased product, buying behaviour, customer service), sales information (sales performance, productivity, activity management), etc.

A set of powerful Data Warehouse applications are built based on this infrastructure. Multiple well-established databases provide the following services to Data Warehouse users:

- **CRM services (for Business Development and Customer Service Dept.)** - in-depth analysis of customer value, needs, buying behavior, service requirements, etc. are provided to support more effective and targeted customer development and customer services.
- **Sales management services (for Sales Mgmt Dept.)** - in-depth analysis of sales team productivity and performance are provided to support tailored management, training and coaching efforts.
- **Market/product analysis services (for Research Dept.)** - accumulated product sales data and market research data are used as input to adjust product-selecting approach and guide strategic direction of future development.

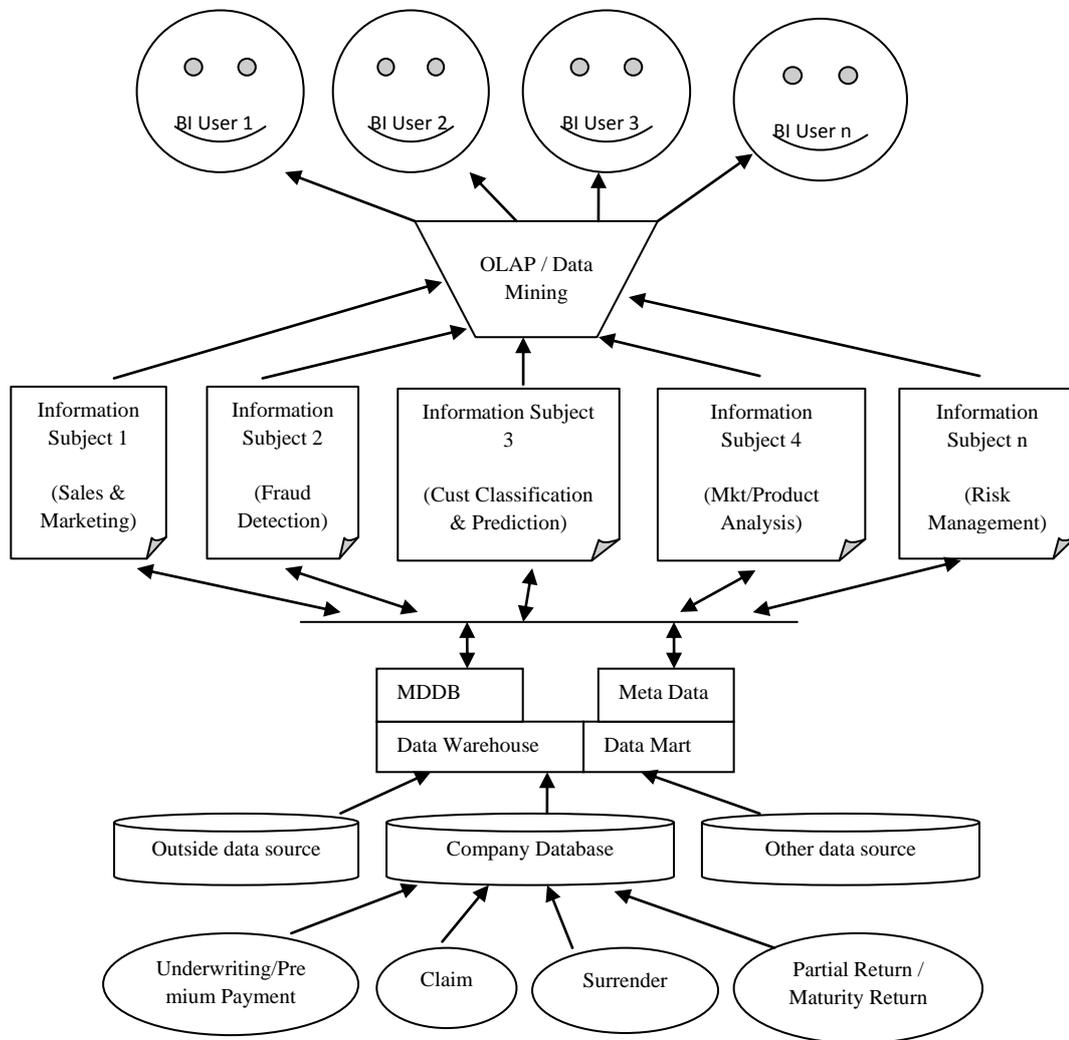


Figure-2: Integrated BI framework for insurance

- **Management and decision supporting services (for Management)** - management/ operation performance tracking analysis are provided based on integrated OLAP (Online Analytical Processing), data mining technologies to support key management decisions to ensure market competitiveness.

Business intelligence is a business management term, which refers to applications and technologies that are used to gather, provide access to, and analyze data and information about company operations. Business intelligence systems can help companies have a more comprehensive knowledge of the factors affecting their business, such as metrics on sales, production, internal operations, and they can help companies to make better business decisions.

Business flexibility and agility require continuous monitoring of the business processes and support of an appropriate BI environment. An environment that provides information sufficiently current (near real time) to support the requirements for both operational and strategic decision making. BI technologies and products are evolving in order to provide such an environment, and we can list only some of the new trends:

- linking business process data to operational activity data for a complete for a complete view of the enterprise;
- implementation of business rules and Key Performance Indicators to enable consistent management of the business activities;



- automatic alert generation for proactive problem avoidance rather than reactive problem impact minimization;
- real time data flow to enable monitoring and proactive management of business processes.

A BI environment that include these capabilities enables companies to proactively manage their businesses, rather than just react and adjust to business situations as they arise. The main objective of BPM is to help companies improve and optimize their operations across all aspects of their business.

But implementing BPM is much more than just about choosing new technology – it suppose a constant analyze of business environment to determine if changes are required to existing business processes. To be successful with BPM, a company must fully understand it's own business processes and activities that support each area of business. Advancements in technology continue to change all businesses. Regardless of activity, it has become imperative for companies to clearly identify their cyber and network-related opportunities and avail the right form of insurance mechanism.

6. CONCLUSION

We have presented a framework that has incorporated the Data Warehouse building initiative for its effective operational performance. Insurance data warehouses store data that is old. The reason why the insurance companies need this deep history of old data is for several historical transactions processing. In almost every business the argument is made that the business in which the organization was engaging 50 years ago has very little to do with the business of today. But this is not true in the case of insurance.

There are many labour-intensive processes that impact bottom line as operational expenses. Data warehousing not only helps lower those cost, but variabilize them through transaction pricing. Data Warehousing provides technology-based solutions to integrate operations and lower application building and maintenance costs.

Most organizations have a finite and short business cycle. In an insurance environment, a claim is made and it may be five years later before the claim is settled. Alternatively, a policy is purchased and is in force and the final rates are determined six months later. Alternatively, a renewal has a two months grace period before the policy is closed. In a word, the speed at which the insurance environment works is quite different from the speed at which other organizations operate. Sensing this need insurance company embraced Data Warehousing technology for real time quick operations.

This difference in operations-speed will be reflected in the insurance data warehouse in near future. The resultant need for new products and services and sustaining competitive advantage still is a serious challenge for insurance market. This requires all stakeholders like the insuring customer, the regulator and the carriers etc all of whom need to work overtime to cope, in the face of a decontrolled but tightly regulated market place.

Managing and optimizing business performance is a critical requirement not only for maximizing business profitability but even for remaining in viable in today's fast moving and competitive business environment. Effective business

performance management will blend business intelligence with elements of planning, budgeting and real time monitoring as well as providing a window on performance. The integration of business and IT process management and Business Intelligence is the first step in managing business performance. Finally, BPM is all about taking a holistic approach for managing business performance. The holistic approach enables the integration and use of business intelligence, process management, business service management, activity monitoring and corporate performance management to achieve a single and complete view of the enterprise.

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