Business Intelligence and Insurance

Application of business intelligence tools like data warehousing, OLAP, and data mining in insurance

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Try this question: What is the most important pre-requisite to survive in today’s volatile marketplace? The answer is rather straightforward – ‘Information’, or more precisely, ‘Actionable Information’. For no other industry is it as important as for the Insurance Industry, which is almost totally dependent on current and insightful information. This is exactly what Business Intelligence (BI) tools like data warehousing, data mining, and OLAP seek to provide. A close look at the insurance value chain suggests that BI can play a crucial role in almost every aspect of the chain. It can help identify the right customers for target marketing and analyze the reasons for customer attrition. It can help the insurer better manage its agents and sales force and improve the effectiveness of actuarial and underwriting functions. BI forms the most critical component of claims management, helping in fraud detection and claims estimation. On the asset management side, it can lower the insurer’s risk through sophisticated risk models developed using data mining tools. And most importantly, BI tools can help insurers provide crucial information to corporate clients, which can go a long way in cementing the insurer’s relations with the clients.
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Introduction

Late seventeenth century was an era of growing international trade. New shipping routes were discovered and adventurous sailors brought exotic products from strange and alien lands. But their journeys across the oceans were fraught with danger and unknown risks. They required some kind of protection against the peril lurking in high seas. This gave rise to a new breed of entrepreneurs - marine underwriters - who agreed to cover the losses in return for a fixed amount of premium. Their business depended on current information about the sea routes, pirates, political condition, weather patterns, conditions aboard the ship, and consumer tastes for exotic products. In order to acquire business information, many marine underwriters began to frequent Edward Lloyd's coffeehouse in London. This was the place where they could share business intelligence with other underwriters and captains of trading ships. In 1771, seventy nine underwriters who did business at Lloyds' got together to form a society that went on to become the most famous of all insurance companies - Lloyd's of London.

The very 'Business Intelligence' that brought together the marine underwriters at Lloyds' is, if anything, much more crucial for the insurance industry today. It pervades almost every aspect of the value chain and technology has the potential of making it ubiquitous across the organization. Today, an underwriter would not go to a coffeehouse to gain business intelligence; but, probably, to get away from it. And one thing is sure: she cannot afford to stay in the coffeehouse for long.

The insurance industry is totally dependent on the ability to convert raw data into intelligence - intelligence about customers, markets, competitors, and business environment. Over the years data processing technology has progressed phenomenally and tools like data warehousing, OLAP and data mining, which constitute the cornerstone of an effective business intelligence (BI) environment, have been widely accepted across industries. However, insurance companies have been relatively slow in adopting these tools, primarily because of lack of competition due to protective regulations. But now, they can no longer afford to be complacent as the Internet, deregulation, consolidation, and convergence of insurance with other financial services are fast changing the basic structure of the industry.

Insurance Industry Overview and Major Trends

The insurance industry is quite diverse in terms of portfolio of products provided by different companies. The products can be broadly classified into two product lines: property and casualty (P&C) and life insurance. Life insurance product line can be further sub-divided into life insurance, health insurance and annuity products.

Growing consolidation and change in the regulatory framework has led many insurers to add new products to their portfolio. This presents its own unique challenge to the insurer in leveraging its greatest asset - data. A number of other trends in the insurance industry have also exponentially increased the importance of an effective business intelligence environment; at the same time, these trends are responsible for increasing the complexity of building such an environment:
Growing Consolidation: Consolidation is a major force altering the structure of insurance industry, as insurers seek to create economies of scale and broaden their product portfolios. The aggregated value of mergers and acquisition was $55.7 billion in 2000, up from $41.7 billion in 1999 and a mere $8.5 billion in 1993.

Convergence of Financial Services: Mergers and acquisition of insurance companies with other financial service providers like banks has led to the emergence of integrated financial services companies.

New Distribution Channels: New distribution channels are fast catching up with the traditional insurance agent. Though these channels are not a major threat as yet, they are rapidly changing the way insurers and customers interact with each other.

Focus on Customer Relationship Management: The only viable strategy for insurers today is to focus on the needs of the customers and strive to serve them better. Customers have extremely differentiated needs and, also, the profitability of individual customers differs significantly; hence, an effective CRM strategy becomes the most vital component of an insurer's overall business strategy.

Business Intelligence and The Insurance Value Chain

During the last three decades, insurance companies acquired significant product development capabilities; but they lagged behind in truly understanding the customer. This led most firms to develop products that they could, rather than those required by their customers. But during last few years, deregulation and growing competition has forced insurance companies to move from traditional product-centric operations to customer-centric operations.

![Insurance Value Chain](image-url)
To succeed in this market, insurers have to analyze their customers’ needs and tailor all the business processes in the value chain to effectively meet their unique requirements. Implicit in this argument is the assumption that insurance companies have the ability to turn volumes of data – pertaining to their customers, agents, claims and policies – into actionable information. Business intelligence tools like data warehousing, OLAP, and data mining can significantly help in almost all the aspects of the value chain to achieve this objective. Figure 1 illustrates the insurance value chain. In the following discussion we will focus on some of the business intelligence applications in each block of the value chain.

Customer Relationship Management

A typical insurance company has a huge customer base, varied product lines with number of products within each line, many distribution channels, and a market spread across geographies. To effectively interact with customers and design suitable products, the insurer’s CRM strategy has to fully utilize the potential of technology. The insurer has to leverage the vast pool of data at each step in the CRM process, and use the insight gained for developing new products and services to meet the ever-changing needs of the customers.

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**Figure 2: Business Intelligence and CRM**
The CRM process in an insurance company has three steps:

1. Identify the most profitable or potentially profitable customers for future interaction,
2. Understand their needs and buying patterns, and
3. Interact with them so as to meet all of their expectations.

Figure 2 illustrates the role of business intelligence in each step of the CRM process. Right from identifying the most profitable customers to improving the overall quality of customer interaction, BI tools can go a long way in making the insurer’s CRM strategy a roaring success.

- **Customer Profitability:** Rather than simply acquiring new customers, it is vitally important to retain and increase the profitability of existing ones. Identifying the most profitable customers is the first step in that direction. To arrive at the overall profitability of a customer, insurers must quantify (a) the costs involved in serving the customer over a period and (b) the revenues realized from the customer during that period. The results of customer profitability analysis can point towards the reasons behind why some customers are not as profitable as others are. For example, a customer might be unprofitable because the products used by her do not match her risk profile. Customer profitability analysis can significantly help in developing new products and customizing existing products for a customer or customer segment.

- **Customer Lifetime Value:** Customer profitability is not the sole measure of a customer's value to the insurance company. A customer may have the potential of buying profitable products in the future; she may also serve as an excellent reference for more profitable customers. Customer Lifetime Value (LTV) is, hence, a more insightful measure. Often data mining tools are used to model customer lifetime value, taking into account all the factors that have a bearing on the customer's value over the entire course of her relationship with the insurance company.

- **Customer Segmentation:** Segmentation is used to segregate customers, who exhibit common characteristics, in different segments. These segments can then be treated as distinct entities and the future interaction with them can be tailored accordingly. Customer segmentation can save a lot of marketing effort, which would otherwise go waste. Often data mining tools are used for customer segmentation. These tools use 'clustering' algorithms for segmenting the entire customer base into clusters, identified on the basis of various demographic and psychographic factors.

- **Attrition Analysis:** Studies have shown that across industries, acquiring new customers is much more costly than retaining existing ones. This is especially true for insurance. Typically, buying an insurance product is a long-term decision for a customer; and if she decides to switch, it is very likely that she will not come back. Hence retaining the existing customers in of paramount importance; customer attrition analysis is the first step in this direction. It involves analysis of data captured during individual customer contacts at the various touch points. For attrition analysis, customer contact data is coupled with other data sources like claims and policies; the resultant data set is then associated with customers who have switched to analyze the possible reasons behind this decision. The results can also be used to improve the performance of customer touch points.
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- **Affinity Analysis:** It is often referred to as market-basket analysis. Certain products show an affinity towards each other, and are likely to be bought together. For example, a man in his early thirties who buys a life insurance policy might also be interested in a certain type of annuity. These affinities can be, at times, extremely difficult to unearth and often data mining tools are used for this purpose. These tools use a technique called ‘association analysis’ for arriving at the right combination of products and services for a customer or customer segment.

- **Target Marketing:** Target marketing - marketing to a specific customer group - is a natural outcome of customer segmentation. Once distinct customer segments are identified, BI tools can be used to study the products likely to be bought by the segment. Often data mining is used to develop predictive models to establish the buying propensity of a segment towards various existing or new products. Armed with this knowledge, marketing managers can design specific campaigns targeted at individual segments.

- **Campaign Analysis:** Campaign analysis is used to analyze the effectiveness of a marketing or promotion campaigns. The effects of a particular campaign on sales of the promoted product can be tracked using BI tools. Often the surge in sales of the promoted product can result in decrease in sales of other related products. BI tools can also help identify such relationships. The campaign data is stored in a data warehouse and can be used to predict the effectiveness of similar campaigns in future.

- **Cross Selling:** Cross selling is a major source of revenue for insurance companies. For effective cross selling, an insurer can leverage the data - housed in the data warehouse - to quickly zero down on the new products that would be required by its existing customers. These can then be offered to them during the next contact.

### Channel Management

Traditionally, insurance companies have relied on independent agents, brokers, and direct sales force for distributing their products. These are still the primary distribution channels and are likely to remain so in the near future. Internet is emerging as a popular distribution option for certain types of insurance products like auto insurance. But most of the insurance products have not been much successful on the Net, primarily because of the complex nature of transactions involved. Fear of channel conflict has also prevented many insurers from fully exploiting its potential. No wonder, most of the traditional insurers currently use the Internet only to provide information about their products. But one thing is sure: insurers will have to quickly integrate the Internet with their existing channels. At the same time they will have to improve the overall distribution effectiveness via the traditional channels. BI tools allow insurers gain insight into the various distribution channels to help them intelligently address the various issues in channel management:

- **Agent and Sales Force Deployment:** Based on geographical analysis of its customer base, insurers can optimally deploy the right number of agents and sales persons in different locations. This analysis should also include the potential customers for the new and existing products offered by the insurer.
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- **Agent Development and Relationship Management**: BI tools can leverage the sales data - stored in the data warehouse - to analyze the selling behavior of agents and sales persons. This analysis can identify the best agents and sales people who can then be adequately rewarded. The analysis can be extended to include more subtle behavioral aspects, which can be used to design training programs for agents. For example, some agents might just be selling certain products and totally missing out on others. This may indicate need for product specific training.

- **Channel Analysis**: This involves calculating the performance of various channels. Using BI tools, insurers can compare the performance of various channels and drill down to the level of individual agents and products. The performance should be tracked over time so as to measure the effectiveness of corrective/developmental actions undertaken by the insurer.

- **E Business Development**: A variety of analytics can be done on customer and transaction data captured via the Internet. This data should be integrated with data collected from traditional channels for a more meaningful segmentation of customers who buy policies over the net. This 'e-segmentation' can help in designing campaigns specifically for the online customers. There is another source of potentially useful data that can significantly help in improving online operations: web log files. Web log analysis includes:
  - **Site Navigation**: An analysis of the typical route followed by the user while navigating the web site. It also includes an analysis of the most popular pages in the web site. This can help in site optimization by making the web-site more user-friendly.
  - **Referrer Analysis**: An analysis of the sites, which are very prolific in diverting traffic to the insurer's web site.
  - **Error Analysis**: An analysis of the errors encountered by the user while navigating the web site. This can help in solving the problems and making the browsing experience more pleasurable.
  - **Keyword Analysis**: An analysis of the most popular keywords used by various users in Internet search engines to reach the insurer's web site.

**Actuarial**

The actuarial function forms the crux of the insurance business. It involves estimating risk pertaining to the asset that is being insured. In case of life and health insurance it involves calculating the probability of accident or death based on various demographic, psychographic, and environmental characteristics. The task of an actuary is extremely complex and has strategic implications for the insurance company; it often takes up to ten years to become a certified actuary. An actuary can use sophisticated mathematical models - developed using data mining tools - to calculate future premiums and to allocate portions of a book of business* for reinsurance:
- **Risk Modeling**: Actuaries can develop predictive models using data mining tools, for identifying risk profiles of various customer segments. These models can include risk measures like mean claim amount, claim frequency, and loss ratios. For example, rich men who show propensity towards drinking and drive sports cars constitute a high-risk profile group. Various risk measures can be calculated for this customer segment, which can, then, be used for calculating at the right premium amount.

- **Reinsurance**: A reinsurance company can take up a part of the insurers' risk in return for a part of the premium. In case of a claim, the reinsurance company will pay the corresponding claim amount. Actuaries need to decide the right amount of reinsurance in order to maximize the returns for the risk acceptable to the insurance company. Data mining tools can develop predictive models to arrive at the reinsurance level for the book of business based on the historical claims data residing in the data warehouse. These predictive models can identify suitable policies for reinsurance based on the loss experience of similar policies in the past.

- **Profitability Analysis**: Profitability of the existing products can be tracked along various factors like product line, geographic region, agency, customer segment, etc. This is often the first step in predicting the viability of new products. Based on historical profitability, actuaries can also develop more sophisticated predictive models - using data mining tools - for estimating the marketability of new products and identifying the most profitable customer segments for those products.

**Underwriting and Policy Management.**

An underwriter decides whether the risk undertaken by insuring a client is acceptable or not; and if it is acceptable, she determines the right amount of premium to be charged. Business intelligence tools can leverage the claims, policies, loss and other data stored in a data warehouse - to help improve underwriting and policy management. Following are some of the business intelligence applications in this area:

- **Premium Analysis**: Premium income is the primary source of revenue for an insurance company. Premium analysis allows the tracking of premium performance by a product or product line; a geographical region; an agency or a particular agent; and by a branch office. A variety of reports and analysis can be generated by 'slicing and dicing' the data.

- **Loss Analysis**: For some products or product lines, the premium revenue might be less than the cost of servicing them. This loss, often termed as underwriting loss, may be due to inaccurate initial risk estimate. Insurers need to constantly monitor the loss data to determine the cost of getting new customers and renewing old ones for those products or product lines. This can help in improving profitability of underwriting programs and help insurers salvage their book of business.
Claims Management

The importance of claims management cannot be overemphasized. Speedy and effective claims handling forms the basis of sound customer relationship management. At the same time, the insurer has to guard against the ever-increasing specter of fraudulent claims. Insurance fraud is now very common in America, as a recent study by Insurance research council (IRC) pointed out that almost 36% respondents believe that it's acceptable to inflate claim amount to make up for the premium paid over the years. According to another study by the Insurance Information Institute, in the US alone P&C fraudulent claims amounted to a mind-boggling figure of $24 billion or 10% of the total claims in 1999. The figure for health insurance is believed to be almost four times that. Most of this additional cost due to fraud is passed on to the consumer as higher premium.

The opportunity cost of ineffective claims management is extremely high - hasty claim settlement can result in increased fraud related costs and, at the same time, slow fraud detection can increase the overall claims cycle-time, leading to higher customer dissatisfaction. No wonder insurance companies around the world are looking at technology for that 'right' claims management solution. Experience of various companies suggests that without sophisticated analytical capabilities such a solution would remain an elusive dream. Following are some BI applications in claims management:

- **Claims Analysis:** Claims analysis is one of the most common BI applications in the insurance industry. It involves analysis of the claims data coupled with other data sources like underwriting and policies. It is primarily used to gauge claims processing efficiency, which has a direct bearing on customer satisfaction.

  Claims analysis is also used to understand subtle business trends in claims, which would have been otherwise difficult to spot. Typically OLAP tools are used to analyze and drill down to the detailed level for a better understanding of these trends. For example insurers can use this data to analyze trends in claims and loss patterns, which can help optimize reserve management, leading to lower risk and more available funds for investment. Claims analysis can also help in spotting fraud by analyzing above normal payoffs along different factors like geographical region, agent, and insured party.

  In case of health insurance, claims analysis can reduce abuse by analyzing the behavior of various practitioners. It can spot practitioners who have been consistently prescribing expensive medicines and tests in cases where they are not required. The analysis can also include other procedures and practices like the average length of hospital stay followed by the practitioner.

- **Fraud Detection:** The likelihood of fraud in a claim can be detected by sophisticated analysis of claims data coupled with other internal or external data like payment history, underwriting, and ISO Claim Search database. Data mining tools are typically used to develop models that can spot patterns in fraudulent claims. A claim, which shows fraud-related symptoms, can be sent to the Special Investigations Unit (SIU) for further investigation before the actual payment is made.

- **Claims Estimation:** The actual value of claims can not be known before hand when a new product is launched. In such cases, an estimated value has to be set aside in the form of cash reserves; and such funds cannot be used for long-term investments. The accuracy of these estimates has far reaching impact on the profitability
of the insurance company. OLAP tools can be used to do an analysis on the claims data across geographies and customer segments to arrive at better claim estimates. For higher accuracy, data mining tools can also used to develop sophisticated claim estimation models.

Finance and Asset Management

The role of financial reporting has undergone a paradigm shift during the last decade. It is no longer restricted to just financial statements required by the law; increasingly it is being used to help in strategic decision making. Historically, interest earned on investments has been a major source of income for insurers and this income has greatly contributed to the overall profitability of insurance industry; at the same time underwriting costs have drastically brought down profitability. To compete in this market, insurers need to increase their return on investments and bring down underwriting costs. This requires ready access to financial data for analysis purposes. Many companies, in an attempt to improve financial reporting and decision making, have integrated their financial data in a Financial Data Warehouse (FDW).

- **Budgeting**: Data warehousing facilitates analysis of budgeted versus actual expenditure for various cost heads like promotion campaigns, underwriting expenses, commissions, etc. OLAP tools can provide drill down facility whereby the reasons for cost overruns can be analyzed in more detail. It can also be used to allocate budgets for the next financial period. Various activity based costing models can be developed for better cost control and allocation.

- **Asset Liability Management**: Models can be developed using BI tools to measure the insurer’s exposure to various risk factors like change in the interest rate structure, share market volatility, etc. These models can be used to predict the performance of the portfolio under different economic scenarios and predict future liquidity needs of the insurer.

- **Financial Ratio Analysis**: Various financial ratios like debt-equity, liquidity ratios, etc. can be analyzed over a period of time. The ability to drill down and join inter-related reports and analyses - provided by all major OLAP tool vendors - can make ratio analysis much more intuitive.

- **Profitability Analysis**: This includes profitability of individual products, product lines, underwriting activity, and investments. A major component of profitability analysis is a thorough analysis of costs incurred during underwriting, which has been a major factor in bringing down the overall profitability of insurance companies.

- **Web Reporting and Analysis**: Swift decision-making requires ready access to financial data via an intuitive interface. Increasingly companies are providing concerned executives web-based access to financial data - stored in the financial data warehouse. Almost all the standard OLAP tools have a web interface that can greatly facilitate ad-hoc querying and report distribution.
Human Resources

Data warehousing can significantly help in aligning the HR strategy to the overall business strategy. It can present an integrated view of the workforce and help in designing retention schemes, improve productivity, and curtail costs. Some BI applications in HR are:

- **Human Resource Reports/Analytics**: Reports and analysis can be generated to support an integrated view of the workforce. Various analyses include staff movement and performance, workforce attrition by department, workforce performance by department, compensation and attrition, and other customized analyses and reports. The HR data can be integrated with benchmark figures for the insurance industry and various reports can be generated to measure performance vis-à-vis industry benchmarks.

- **Manpower Allocation**: This includes allocating manpower based on new product launches. According to increased requirement, agents sales people can be deployed in specific regions where demand projections are high or likely to increase.

- **HR Portal**: Employers need to maintain accurate employee data, which can be viewed by the employees for information about compensation, benefits, retirement facilities, etc. Payroll data can be integrated with data from other human resource management applications in the HR data warehouse. This data can then be made visible within the organization through the HR portal.

- **Training and Succession Planning**: Accurate data about the skill sets of the workforce can be maintained in the data warehouse. This can be used to design training programs and for effective succession planning.

Corporate Management

The top management of any insurance company has its own business intelligence requirements. The MIS department is typically responsible for providing all the reports to them. It is also responsible for providing statutory reports to various outside agencies and any other information requirement within or outside the company. This may include information given to its customers in the form of various reports and analysis. A business intelligence environment that leverages data collected across the value chain is possibly the only effective solution for MIS.

- **Dashboard Reporting**: Performance measures like product line profitability, overall underwriting costs, ROI on investment portfolio, etc. can be presented in dashboard reports to the top management to facilitate decision-making process. Also alerts can be triggered if any performance measure reaches a pre-defined threshold level. These reports can incorporate insurance industry benchmarks, provided by third party researchers.

- **Statutory Reporting**: Insurers have to provide a number of statutory reports to outside agencies, government bodies and trade consortiums. These reports can be easily generated from the business intelligence environment.
Customer Information Services: Historical claims data can be very vital for institutional clients like those offering workers' compensation against accident. It can help the customers identify major trends in claims and implement suitable corrective actions. Customer information services can not only reduce claims related costs for the insurance company; it can also go a long way in cementing insurance company's relations with its customers.

Conclusion

The insurance industry is extremely divided in its adoption of business intelligence environment based on technologies like data warehousing, OLAP and data mining. Quite a few insurance companies are in an advanced stage of their business intelligence initiative; yet there are many that are oblivious of its benefits. Some insurers have gone for non-scalable temporary solutions, which often fail to leverage the ever-increasing volumes of data. Hence, recognizing the need for an effective business intelligence environment based on the right architecture is vital. But it is just the first step. The real challenge is to make the BI environment an integral part of the decision making process. Efficiently gathering the information requirements of all the user-groups is thus extremely critical for the success of any data warehouse. The belief that "you build it, they will use it" is wrong. Also a data warehouse can not be the answer to all the information requirements; hence it is also very important to set clear business objectives for the business intelligence solution with total top management support.

Case Studies

The Customer: A large US Insurance Company

The Challenge: Our customer needed a decision support system to analyze the effectiveness of claims processing and call center performance. The claims data resided in a proprietary claims application. For the purpose of decision support system, this data had to be integrated with data stored in other systems like Siebel, Filenet, and Genesis.

The Wipro Solution: The Wipro team started by studying and understanding the Siebel CRM system and other source applications. They then identified and extracted data that was required for reporting and analysis using the Cognos Decision Stream ETL tool. Using its unique Insta Intelligence framework, Wipro designed and implemented a data mart for claims and customer information. Our solution included development of a range of analyses and reports using Cognos products like Impromptu and PowerPlay. These reports were published on the corporate Intranet using Cognos Upfront tools.

The Customer: A Fortune 100 Insurance Company

The Challenge: To provide a decision support system catering to a large sales force spread across multiple locations in the United States.
The Wipro Solution: The Wipro team of consultants helped the client implement a complete decision support system to meet its requirements. The team was involved in database modeling & in designing the ETL & Reporting Architectures. They used Informatica to load data from existing source systems into the data mart. Whitelight and Seagate Info were used as the OLAP front-end tools for the business users.

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About Wipro

Wipro (NYSE: WIT) is the first SEI CMM Level 5 certified IT Services Company operating in the global market. Wipro provides software solutions and services to global corporate enterprises and Research and Development services to Telecom and Electronic product companies. In the Indian market, Wipro is a leader in providing IT solutions and services for the corporate segment offering system integration, network integration and IT services.

Wipro in Business Intelligence

Wipro provides end to end Data Warehousing and Business Intelligence services to Global Corporate Enterprises. Wipro has implemented Business Intelligence and Data Warehousing solutions for over 30 Fortune 1000 customers across various vertical industries like Finance, Insurance, Utilities, Telecom, Retail, Logistics, Manufacturing and Healthcare.

Wipro has evolved its "Insta Intelligence" project management and delivery methodology built around leading edge technologies in the areas of Data Acquisition, Data Modeling, Data Management, OLAP, Data Mining, and Meta-data Management to deliver innovative, surefire solutions to its customers. It has entered into Business and Technology alliances with some of the leading vendors like IBM, Informatica, Cognos, Microstrategy, Brio, SAS to offer customized solutions to its customers.

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