Insurance Business Enterprises' Intelligence in View of Big Data Analytics

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Abstract

The insurance industry runs on data, and the success of its business model is based on analyzing data to evaluate information and take appropriate decisions.

Business Intelligence is a set of activities supported by concepts, techniques, and technologies for improving business decisions by reducing uncertainty. Ultimately, it aims at improving the ability of an organization to respond to eventsand changes in customers, markets, or the environment. Business Intelligence (BI) is also defined as a set of technologies that gather and analyses data to improve decision-making.

Analytics is the future of big data because only transforming data into information gives themvalue and can turn data in business in competitive advantage. In a competitive market place, up-to-date information can make an insurance organization realize what strategies need to be formulated and implemented to achieve competitive advantage over rivals in the market.

This research aimed to Determine the concepts ,components, techniques and benefits of Business Enterprises› Intelligence, view the challenges encountered by insurance firms while using Business Enterprises› Intelligence for Improving decision-making and establishing the relationship between Business Enterprises› Intelligence and Improving decision-making in insurance firms.

1. Introduction:

In such a highly competitive industry, insurance companies need better insights to be able to gain a more holistic view of enterprise performance. In order to increase efficiency and boost profitability it is critical for everyone in the business to make the optimal decisions and, in order to do this, they need the right data.

Insurance companies need to provide the right information, to the right people, in a timely manner. This will allow employees to solve complex issues, react quickly to market trends and drive efficiencies throughout the business. Business intelligence can make things by helping to understand changes in Insurance business, and in the market.

The challenge for insurance companies is not with the data itself. Most insurance companies have collected hundreds, thousands or even millions of rows of granular data about every aspect of their business. Large volumes of data surrounding factors such as policies, policyholders, risk assessments and claims histories will be stored somewhere in the business.

The challenge comes in collating information from

this multitude of different sources and turning it into something from which the end user can actively derive insight. Business intelligence when applied across the entire insurance organization, gives decision-makers the vital information they need to do this.

The main purpose of Business Intelligence is to support better and faster business decision making. Insurance Organizations are being compelled to capture, understand and harness their data to support decision making in order to improve insurance business operations.

2. Business Intelligence:

The term Business Intelligence (BI) refers to technologies, applications and practices for the collection, integration, analysis, and presentation of business information.

2.1 Business Intelligence concepts:

There are many different definitions on BI. For example,
• BI is defined as providing decision makers with valuable information and knowledge by leveraging a variety of sources of data as well as structured and unstructured information .
• BI refers to as a collection of information systems (IS) and technologies that support managerial decision makers of operational control by providing information on internal and external operations .
• BI is a framework consisting of a set of concepts, theories, and methods to improve business decision making by using fact-based support systems .

The first definition of BI emphasizes information and knowledge for decision makers. The second definition stresses "a collection of ISs and technologies" while specifies the decision makers to "managerial decision makers of operational control", and information to "information on internal and external operations". The last definition emphasizes "a set of concepts, theories, and methods to improve business decision making".

Based on the above analysis, BI can be defined as a set of theories, methodologies, architectures, systems and technologies that support business decision making with valuable data, information and knowledge.

Stackowiak et al. (2007) define Business intelligence as the process of taking large amounts of data, analyzing that data, and presenting a high-level set of reports that condense the essence of that data into the basis of business actions, enabling management to make fundamental daily business decisions.

Cui et al. (2007) view BI as way and method of improving business performance by providing powerful assists for executive decision maker to enable them to have actionable information at hand. BI tools are seen as technology that enables the efficiency of business operation by providing an increased value to the enterprise information and hence the way this information is utilized. (Ranjan, 2009))

Zeng et al. (2006) define BI as "The process of collection, treatment and diffusion of information that has an objective, the reduction of uncertainty in the making of all strategic decisions." Experts describe Business intelligence as a "business management term used to describe applications and technologies which are used to gather, provide access to analyze data and information about an enterprise, in order to help them make better informed business decisions."

(Tvrdíková, 2007) describes the basic characteristic for BI tool is that it is ability to collect data from heterogeneous source, to possess advance analytical methods, and the ability to support multi users demands. Business intelligence (BI) is the ability of a company to make meaningful use of data it collects in the course of its day-to-day business operations (Kimble & Milolidakis, 2015).
The BI could play an important role in improving organizational performance by identifying new opportunities, highlighting potential threats, revealing new business insights and enhancing decision making processes among many other benefits . (Azma & Mostafa pour, 2012))

2.2 Business Intelligence Components

BI components are groups to compose a completely integrated system that works as a backbone to allow organization sustain and to survive with correct

response to environmental pressures.(Ranjan, 2009))

2.2.1 On-Line Analytical Processing

This part provides us of multidimensional visions of data which are stored in warehouse this part performance many kinds if missions like: Answering complicated queries by interpreting these queries in a significant mode and retrieving the needed data in reports and understandable statements . OLAP gives the user a possibility to access data warehouse. OLAP creates models that make life easier to users to categorize problem in simple forms and shows all variables affect the problem model.

2.2,2 Advanced analytics

This part is a superior model of OLAP and it cares more about the future prediction which based on statistics processed and delivered by OLAP. OLAP has advanced analytics features; it deals with complicated problems and vast amount of data.

2.2.3 Data Warehouse and Data Mart

This part is acting as a data source that helps BI with historical deep information which is necessary for OLAP to counter complex queries In many researches and studies, data warehouse and data market are different from each other. On the other hand, some researches consider both of them as one.

2.2.4 Data Mining

The first role of this part is classifies unstructured data in to levels and categories. The second role is to think in deeply to extract historical data and provide upcoming predictions. In addition data mining used to analyze unorganized data which based on stored data in warehouses and data markets. «Data mining and OLAP have generally the same roles in BI system but the difference is that OLAP generates report with summary and results while data mining is more detailed oriented. It delivers comparisons and statistics».

2.3 Business Intelligence architecture

Davenport and Harris (2007) identified six key elements of the Business Intelligence architecture. These included:

1. Data Management: which defines how the required data is sourced and managed.

2. Transformation Tools and Processes: which defines how the data is extracted, cleansed, transformed and stored in databases.

3. Data Repositories: reflects how data is stored and transformed ready for use. This includes the metadata that describes the data. This includes data warehouse and data marts.

4. Analytical Applications: which provide the ability to manipulate the data for analysis and can include,
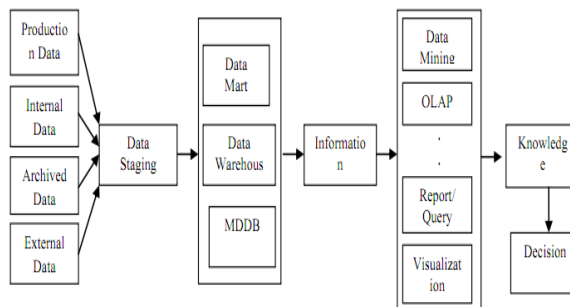

Figure 1: Business Intelligence processes

2.4 The Business Intelligence benefits

 A number of benefits that can be achieved through the use of Business Intelligence and its components. These include improvements in the areas of:(Cohen, 2009)).

2.4.1 Decision Support The focus of Business Intelligence is to organize and deliver information to support the decision making process in an organization . Due to the large amounts of information, accumulated in today's organizations, traditional databases can be difficult to organize and provide access to data for decision making . Business Intelligence provides the tools and techniques to integrate data from various sources making it available for analysis . This enables companies to make decisions which allow greater insight into the company and are more strategic in nature.

 It also allows end users to rethink how they solve problems. Indeed multi-dimensional analysis provides end users with the ability to manipulate data from various source systems in a way that was not previously available. Data mining enables the end users to discover relationships between performance factors which they were not previously aware of. This

knowledge discovery and analysis flexibility can lead to better decisions that may result in significant revenue growth, cost reduction, enhanced customer satisfaction leading to an increase in profits.

2.4.2 Information Analysis ‑ Business Intelligence provides the ability to perform sophisticated analysis of data. The Business Intelligence environment allows for information from transactional systems to be replicated, standardized, integrated and stored for later analysis. This allows decision makers to manipulate the information to enhance analysis without interfering with the transactional systems. Information manipulation techniques include, slicing and dicing, pivoting, drilling across and down, and aggregation.

In addition to manipulation techniques, Business Intelligence provides advanced statistical analysis tools for knowledge discovery and data mining.

2.4.3 Information Integration ‑ Information stored across different heterogeneous systems makes it difficult to source, integrate and ultimately use this information for decision making.

2.4.4 Decision Efficiency ‑ Decision latency refers to the amount of time taken to access the required information, so as to allow individuals to make a particular decision . This has become increasingly important in hyper-competitive markets where companies are looking for operational efficiencies.

Business Intelligence can reduce decision latency by consolidating and integrating information from different functional areas and storing this information in structures which facilitate quick access and analysis. This has resulted in companies implementing "real time" Business Intelligence environments. (Matei, 2010)

2.5 Business Intelligence and Decision Making Process

Decision making process starts from the need to solve the problem by identifying this problem and the variables that have impact on business functions.

The general framework of the decision making process is recommended by Simons who includes four stages, Intelligence, design choice and implementation

.

In the operational level the decisions have taken to support a daily basis procedure and to meet operational level strategies and objectives.

The strategies at the operational level are the input for middle management level.

At the same time at the middle management level,

BI component	Benefits and impacts on decision making
On-Line Analytical Processing	Analyze huge amount of data from different sources
	Data models
	Reports and conclusion generation
Advance Analytical	Analyze huge amount of data from different sources
	Data models
	Statistical reports
Data warehouses and data marts	Storage for huge amount of data
	Input for using OLAP techniques
	Provides multidimensional view of data
Data Mining	Detailed reports
	Provides future prediction based on historical data

Table No. (1) BI and decision-making

3. Big Data Analytics And Insurance:

3.1 Big Data Analytics Concepts

Big data is an evolving term that describes any huge amount of structured, semi-structured and unstructured data that has the potential to be mined for useful information. Big data is data that exceeds the processing capacity of traditional databases.

The data is too big to be processed by a single machine. The evolving field of big data analytics examines large amounts of data to uncover hidden patterns, correlations and other insights.
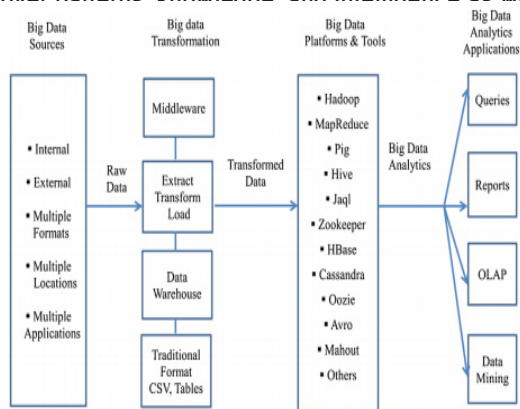
Big data technology has become possible with the latest developments in computer technology as well as algorithms and approaches developed to handle big data.

Big Data is the term for a collection of data sets so large and complex that it becomes difficult to process using conventional data mining techniques and tools.

The overall goal of the big data analytics is to extract useful information from a huge data set and transform it into an understandable structure for further use.

The major processes of big data include capture, curation, storage, search, sharing, transfer, analysis, and visualization.

Big data analytics can be defined as the process of collecting, organizing and analyzing big data to discover patterns, knowledge, and intelligence as well

Figure 2 : Big Data Analytics Architecture

Recently the importance of this field has attracted enormous attention because it gives businesses useful information and better insight of both structured and unstructured data, which may lead to better informed decision-making .

In a business context, big data analytics is the process of examining "big data" sets to uncover hidden patterns, unknown correlations, market trends, customer preferences and other useful business information .

Today's advances in technology combined with the recent developments in data analytics algorithms and approaches have made it possible for organizations to take advantage big data analytics.

3.2 Fundamentals and Components of Big Data Analytics

The main components of big data analytics include big data descriptive analytics, big data predictive analytics and big data prescriptive analytics. (Balachandran, & Prasad, 2017))

3.2.1 Big data descriptive analytics is descriptive analytics for big data, and is used to discover and explain the characteristics of entities and relationships among entities within the existing big data. It addresses the problems such as what happened, and when, as well as what is happening.

3.2.2 Big data predicative analytics is predicative analytics for big data, which focuses on forecasting trends by addressing the problems such as what will happen, what is likely to happen and why it will happen . Big data predicative analytics is used to create models to predict future outcomes or events based on the existing big data.

3.2.3 Big data prescriptive analytics is prescriptive analytics for big data, which addresses the problems such as what we should do, why we should do it and what should happen with the best outcome under uncertainty.
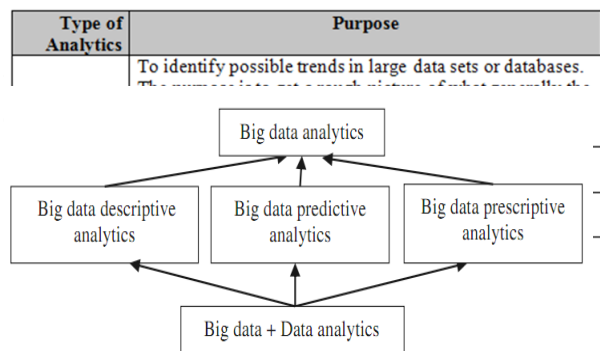

Figure 3 : Types of Big Data Analytics

In brief, data analytics can be then considered as data-driven discoveries of knowledge, intelligence and communications.
More generally, data analytics is a science and technology about examining, summarizing, and drawing conclusions from data to learn, describe and predict something.

The fundamentals of big data analytics consists of mathematics, statistics, engineering, human interface, computer science and information technology .

The techniques for big data analytics encompass a wide range of mathematical, statistical, and modeling techniques .

Big data analytics always involves historical or current data and visualization . This requires big data analytics to use data mining (DM) to discover knowledge from a data warehouse (DW) or a big dataset in order to support decision making, in particular in the text of big

business and management .

DM employs advanced statistical tools to analyze the big data available through DWs and other sources to identify possible relationships, patterns and anomalies and discover information or knowledge for rational decision making . DW extracts or obtains its data from operational databases as well as from external open sources, providing a more comprehensive data pool including historical or current data .

Big data analytics also uses statistical modelling (SM) to learn something that can support decision making.

Visualization techniques as an important part of big data analytics make knowledge patterns and information for decision making in a form of figure or table or multimedia. In summary, big data analytics can facilitate business decision making and realization of business objectives through analyzing current problems and future trends, creating predictive models to forecast future threats and opportunities, and analyzing/optimizing business processes based on involved historical or current data to enhance organizational performance using the mentioned techniques.

Insurance generates a huge amount of data, which can be analyzed by employing descriptive, predictive and prescriptive analytics to derive business insights for enhancing business while rendering better service to their clients.

-Descriptive Analytics and Insurance

Descriptive analytics provides the results that further help the organization to enhance their benefit. This type of analytics uses the historical data present with the organization.

For instance, a sensor device is attached to the car, which will monitor different activities such as total amount of distance traveled, a sudden change in speed, duration of high-risk driving, and number of the time hard brakes are applied. These events will be treated as predictor variables while pricing the insurance premiums.

-Predictive Analytics and Insurance

Using predictive analytics, insurance companies can predict trends in various activities. For instance, predicting possible fraudulent claims, various health care frauds, insurance needs based on customer data etc. Thus, predictive analytics brings in revenue for the company.(Fang, K., Jiang, Y.,& Song, M.(2016)).

-Prescriptive Analytics and Insurance

Prescriptive analysis suggests some optimized solutions to a problem based on other analytical results. Prescriptive analytics is always evolving and of crucial importance to the business values.

Example of prescriptive analytics are as follows:

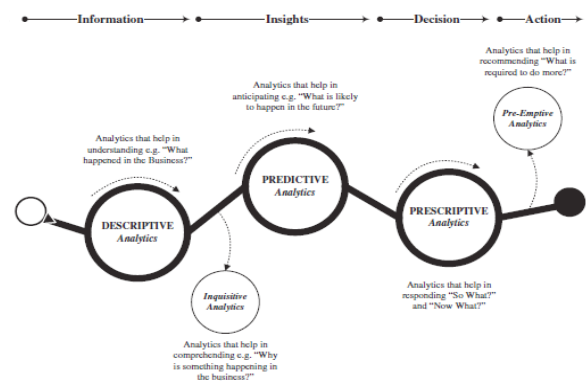i. Casualty insurance providers can use historical climatic data for catastrophe modeling and prediction

Figure 3. Insurance and Analytics

Big data analytics plays a major role in the insurance industry in its different aspects. The insurer performs risk analytics for issuing any insurance. Predictive analytics can be used to fix the premium value of vehicle insurance by analyzing the historical data of the driver, i.e., predicting the probability of the driver to meet an accident. (Fang, K., Jiang, Y., Song, M, 2016)

3.3 Big Data Analytics Benefits

Some of the most common Big Data Analytics Benefits are:

3.3.1 Cost reduction - Big data technologies like Hadoop and cloud-based analytics can provide substantial cost advantages..

3.2.2 Faster, better decision making - Analytics has

always involved attempts to improve decision making, and big data doesn't change that. the Big data analytics really makes the business managers good decision makers.

3.2.3 New products and services - Perhaps the most interesting use of big data analytics is to create new products and services for customers. Online companies have done this for a decade or so, but now predominantly offline firms are doing it too.

3.2.4 Product recommendation - It is obviously very clear that the adoption of big data and analytics have proved to be a very powerful strategy for online businesses. The influence of the huge data of the customers on the business is turning to be very significant and economic tool for strengthening a business.

3.2.5 Fraud Detection - High-performance analytics is not just another technology fad. It represents a revolutionary change in the way organizations harness data. With new distributed computing options like in-memory processing on commodity hardware, businesses can have access to a flexible and scalable real-time big data analytics solution at a reasonable cost. This is sure to change the way insurance companies manage big data across their business - especially in detecting fraud. (Bose, 2009).

4.3 Business Intelligence and Big Data Analytics:

Based on the previous subsection's discussion, big data analytics can be considered a part of Business intelligence, because it "supports business decision making with valuable data, information and knowledge».

Both Business intelligence and big data analytics are common in emphasizing either valuable data or information or knowledge.

Business intelligence includes a range of areas such as competitor intelligence, customer intelligence, market intelligence, product intelligence, strategic intelligence, technological intelligence and business counter-intelligence.

4.3.1 The role of Big Data in enhancing business value through business intelligence:

Big data analytics can assist companies to better exploit big data for improving customer satisfaction, managing supply chain risk, generating competitive intelligence, providing business real-time insights to help make important decisions and optimizing pricing if appropriately utilized .

Generally, there are five prime advantages of big data analytics.

First, it increases visibility by making related data more accessible.

Second, it facilitates performance improvement and variability exposure by collecting accurate performance data.

Third, it helps in better meeting the actual needs of customers by segmenting the population.

Fourth, it complements the decision making with automated algorithms by revealing valuable insights. Fifth, it yields new business models, principals, products and services. (Vitt, Luckevich & Misne, 2010).

Big data analytics can also help to support the decision making processes. The effective use of big data is based on an improved understanding of diverse decision contexts and the required information processing mechanisms. Companies that intend to implement big data analytics for the decision processes should attach great importance on reducing equivocality and data variety.

Collaboration among decision makers and data analysts can enhance the effective utilization of big data in decision making, however, the decision processes should be carefully managed in order to minimize the possible understanding gaps.

4.3.2 Challenges of Big Data analytics in the context of Business Intelligence:

Although big data can help companies achieve competitive advantage over its rivals through many aspects, big data analytics still face a variety of challenges .

The main challenge of big data analytics include lack of intelligent big data sources, lack of scalable

real-time analytics capabilities, the availability of sufficient network resources for running applications, the demand in necessary expansion for peer-to-peer networks, the concerns about data privacy, and information security regulations, the problems with data integration and fragmented data and lack of availability of cost effective storage subsystem of high performance. (Ndambo, 2016)

4-The Relationship Between Business Intelligence And Improving Insurance Decision-Making:

"A critical component for the success of a modern organization is its ability to take advantage of all available information".

In fact, the ability to gather and timely transform all information in effective business information is not only essential to succeed, but also necessary to survive .

Organizations are more likely to have success with Business Intelligence when the following conditions exist:

1. Management of an organization should have a vision for Business Intelligence and believe in information-based decision making.

2. The use of Business Intelligence and analytics should be part of the organizational culture and counter decision making based on intuition or "gut feelings".

3. Alignment between business strategies, business model, and Business Intelligence strategies enables an organization to create organizational change and new business opportunities.

4. An organization should have a strong and effective Business Intelligence governance and infrastructure, because it will address business alignment, funding, project prioritization, and data quality.

5. Lastly, an organization needs to provide users with appropriate Business Intelligence tools for their needs and give effective training and support to these users. (Rostek, 2009).

4.2 Big Data, Business Intelligence, and Decision Making
Big Data, Business Intelligence, and Decision Making are considered as three strongly related research areas.

For example, in 1977 Simon already introduced his normative model of decision making that provides a clear overview of the link between Big Data, Business Intelligence, and Decision Making. Simon›s (1977) famous model of decision making contains three phases: (Hedgebeth, 2007)

1. Intelligence gathering: the identification of the problem calling for a decision and the data collection of the problem.

2. Design: inventing, developing, and analyzing the available data to test the outcome of the available options.

3. Choice: select a particular option based on the selection criteria.

The different phases in this conceptual model are:

1) Big Data: identifying the problem that is calling for a decision and gather intelligence by collecting lots of data .

2) Business Intelligence: applications, methodologies, practices, systems, techniques, and technologies that analyze the data from phase one and helps to test the outcome of the available options

3) Decision Making: the choice between two or more options and where an individual prefers one options above the available options.

Business intelligence is a key means to promote core competence of enterprise. 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.(Rama, Zhangb, & Koroniosc, 2016)

43- The various areas of Insurance in which business intelligence is required are:

4.3.1 Sales and Marketing:

Analyze customer behavior and buying patterns to create new products and services that help sales teams to meet revenue goals.
(Singh, Kumar, 2012).

4.3.2 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.

4.3.3 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.

4.3.4 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.

4.3.5 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.

4.4 Business Intelligent applications for insurance business

Insurance companies need to be able to process considerable amount of data (about customers, agents, compensations and policies) into useful business information, which allows proper decision making processes. Business Intelligence tools can greatly improve the goal achievement in different parts of the value chain.

4.4.1 BI for Customer Relationship Management

Three steps can be distinguished in the insurance company CRM process :

• Identification of the most profitable current customers and the ones that will be profitable in the future,

• identification and understanding of customers selected in the previous step and the analysis of their needs,

• cooperation with identified customers in order to fulfil their expectations.

Business Intelligence tools, precisely reflecting the activities consumed in the process of customer service can provide useful guidelines in the scope of adjustment of services processes to the needs and requirements of customers.

4.4.2 BI for actuary analysis

Activities of actuary departments are very complex and have strategic meaning for the insurance company. Actuary uses complex mathematical models, which are used to calculate future insurance premiums and allocation of their part for reinsurance.

4.4.3 BI for risk evaluation and policy management

Risk evaluating teams decide whether the risk taken in the process of insuring a customer is acceptable for the company and determine the proper value of insurance premium that will be collected. Business Intelligence tools are supporting such types of analysis . (Singh, & Kumar, 2012).

5-Summary

The main purpose of Business Intelligence is to support better and faster business decision making. Organizations are being compelled to capture, understand and harness their data to support decision making in order to improve business operations.

Big data analytics can assist companies to better exploit big data for improving customer satisfaction, managing supply chain risk, generating competitive intelligence, providing business real-time insights to help make important decisions.

Big data analytics can be considered a part of Business intelligence, because it "supports business decision making with valuable data, information and knowledge" .

Both Business intelligence and big data analytics

are common in emphasizing either valuable data or information or knowledge.

Decision-making is an important task for enterprise managers, and is typically based on various data sources derived from information systems. Numerous business intelligence tools (BI) thus have been developed to support decision making.

Insurance companies need to be able to process considerable amount of data (about customers, agents, compensations and policies) into useful business information, which allows proper decision making processes. Business Intelligence tools can greatly improve the goal achievement.

Access to business intelligence and analytics is vital for any insurance company wanting to succeed in an increasingly competitive industry. The ability to turn large volumes of raw data into actionable insights represents a significant value proposition for these businesses.

The use of Business Intelligence and analytics should be part of the organizational culture and counter decision-making based on intuition.

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