I'm not a bot

Business intelligence and analytics systems for decision support

Ramesh Sharda has a remarkable academic background with an MBA and Ph.D. from University of Wisconsin—Madison. He is currently the Director of PhD in Business for Executives Program at Oklahoma State University (OSU), where he also holds the ConocoPhillips Chair of Management of Technology and is a Regents Professor of Management Science and Information Systems. Sharda has published over 200 papers in top-tier journals, including Operations Research, Management Science, and Decision Support Systems. He co-founded AIS SIG on Decision Support Systems and Knowledge Management (SIGDSS) and serves as an editorial board member for several leading publications. In addition to his academic roles, Sharda is the Executive Director of the Teradata University Network and has authored/co-authored numerous books and research papers. Dursun Delen holds a Ph.D. from Oklahoma State University and currently serves as the Spears and Patterson Chairs in Business Analytics at OSU. Prior to academia, he worked as a research scientist for five years at Knowledge Based Systems Inc., where he led projects funded by federal agencies such as DoD and NASA. Delen's research has been featured in top journals like Decision Support Systems and Communications of the ACM. He is also an accomplished author, having published four textbooks: Advanced Data Mining Techniques, Decision Support and Business Intelligence Systems, Business Intelligence: A Managerial Approach, and Practical Text Mining. As a renowned expert in his field, Delen frequently delivers keynote addresses at national and international conferences on topics related to data/text mining, business intelligence, decision support systems, and knowledge management. Efraim Turban, a renowned expert in enterprise modeling, is currently a visiting scholar at the Pacific Institute for Information System Management, University of Hawaii. With a distinguished career spanning multiple universities worldwide, including the City University of Hong Kong and the University of Southern California, Dr. Turban has authored over 100 refereed papers and 20 books on various topics, including electronic commerce and information technology for management. As a consultant to major corporations globally, Dr. Turban's current areas of interest include web-based decision support systems, social commerce, and collaborative decision-making. His work focuses on helping organizations make data-driven decisions using business intelligence and analytics infrastructure. Business intelligence refers to the infrastructure that collects, stores, and analyzes data from various sources, including big data. It is essential for managers to have access to relevant information to make informed decisions. On the other hand, business analytics involves tools and techniques for analyzing and understanding data, such as online analytical processing (OLAP), statistics, models, and data mining. Several leading providers of business intelligence and analytics products include Oracle, SAP, IBM, Microsoft, and SAS. These products offer cloud and mobile versions to cater to the evolving needs of businesses. The Purdue College of Agriculture is using business intelligence and analytics to help farmers make precise decisions about fertilizer levels, planting depth, and irrigation requirements. Business Intelligence and Analytics: A Powerful Tool for Decision Making Effective business intelligence and analytics require the integration and organization of various data sources to provide actionable insights. This foundation is built on a powerful database system, which captures relevant data to operate the business. A comprehensive toolset of software is used to analyze data, produce reports, respond to managerial queries, and track key performance indicators. Managers play a crucial role in imposing order on analysis using methods that define strategic goals and measure progress. Results from business intelligence are delivered through various platforms, including Management Information Systems (MIS), Decision Support Systems (DSS), and Executive Support Systems (ESS). These systems can now integrate data and share information among different levels of the organization. The user interface plays a vital role in presenting data in an engaging manner. Business analytics software suites feature data visualization tools, such as graphs, charts, dashboards, and maps, which enable users to quickly comprehend complex information. Examples like Tableau Software demonstrate how non-technical users can create interactive dashboards to provide business insights from diverse data sources. Moreover, the integration of social media platforms is expanding decision-making capabilities to online groups. Business intelligence and analytics aim to deliver accurate, near-real-time information to decision-makers, allowing them to quickly understand the data and take action. BI systems deliver various functionalities to achieve business goals: predefined reports tailored to industry needs, parameterized reports that allow users to filter data by specific criteria like region and time of day. For example, Starbucks might find that East Coast customers primarily buy coffee in the morning, while Northwest customers purchase throughout the day, leading to targeted marketing campaigns. Additionally, dashboards/scorecards provide visual tools for presenting performance data as defined by users. Ad hoc query/search/report creation enables users to create their own reports based on queries and searches. Drill down functionality allows users to move from a high-level summary to a more detailed view. Forecasts, scenarios, models include the ability to perform linear forecasting and what-if scenario analysis using standard statistical tools. Predictive analytics is an important capability of business intelligence analytics that enables businesses to model future events and behaviors by analyzing historical data and making assumptions about future conditions. This involves identifying variables that can be measured to predict future behavior, such as age, gender, and driving record for insurance companies. A collection of these predictors is combined into a predictive model for forecasting future probabilities with an acceptable level of reliability. Many businesses, including FedEx, have successfully incorporated predictive analytics into their operations, achieving accuracy rates ranging from 65 to 90 percent. Applications include sales, marketing, finance, fraud detection, and healthcare, such as credit scoring in the financial services industry and identifying high-cost patients for healthcare insurers. Companies like Slack Technologies use predictive analytics to identify customers who are most likely to use their products very frequently. Big Data Analytics: A Game-Changer for Businesses and Cities Predictive analytics are increasingly leveraging big data from both private and public sectors, including social media, customer transactions, and sensor output. In e-commerce, online retailers are making personalized product recommendations to stimulate purchases and guide decisions on merchandise stock. However, these efforts are now being taken to the next level by analyzing large quantities of customer data, along with social media information, to make individualized recommendations. These efforts have led to higher customer spending and retention rates. Table 12.5 provides examples of companies using big data analytics, including public sector initiatives that aim to create "smart cities." These cities use digital technology to make better decisions about running the city and serving residents. Public records have produced a vast amount of data, including property transfers, tax records, and environmental compliance audits. Predictive modeling programs are now informing public policy decisions on utility management, transportation operation, healthcare delivery, and public safety. The ability to evaluate how changes in one service affect other services enables holistic problem solving that was previously unimaginable. To keep tabs on device performance, various companies are turning to cloud connectivity for generators, jet engines, locomotives, and oil-refining equipment. Location data is also being used to inform business decisions, thanks to location analytics and geographic information systems (GIS). For instance, a marketer can use location analytics to determine which customers to target with mobile ads based on their proximity to specific businesses or events. Utility companies can also use this technology to visualize and measure outages, thereby prioritizing maintenance and customer service efforts. Moreover, GIS software allows decision-makers to visualize problems through mapping, tying location data about population distribution and other resources to points, lines, and areas on a map. This tool has various applications, such as helping governments calculate response times for natural disasters or assisting banks in identifying optimal locations for new branches or ATMs. Even law enforcement agencies can use GIS to pinpoint hotspots of crime. In fact, businesses like UPS and Starbucks are already leveraging location analytics to optimize their operations. For example, Starbucks uses a system that analyzes vast amounts of data on customer demographics and behavior to determine the best places to open new stores without cannibalizing sales at existing locations. As part of the Teradata University Network, Dr. Dursun Delen's research focuses on decision support systems, business analytics, and information overload management technologies. He is the Spears and Patterson Chairs in Business Analytics, Director of Research at the Center for Health Systems Innovation, and Professor of Management Science and Information Systems at Oklahoma State University. Prior to his academic career, he worked as a research scientist at Knowledge Based Systems Inc., leading various decision support and information systems projects funded by federal agencies. Dr. Delen's work has been published in prominent journals such as Decision Support Systems, Communications of the ACM, and Computers and Operations Research. He has also authored four textbooks: Advanced Data Mining Techniques, Decision Support and Business Intelligence Systems, Business Intelligence: A Managerial Approach, and Practical Text Mining. As a visiting scholar at the Pacific Institute for Information System Management, Dr. Efraim Turban's research interests include data-driven decision-making, business intelligence, and decision support systems. He has authored over 100 refereed papers on these topics and is an expert in distinguishing between two essential tools: Business Intelligence (BI) and Decision Support Systems (DSS). Understanding Business Intelligence (BI) BI involves a wide range of tools, technologies, and know-how systems for gathering, processing, and summarizing data to facilitate decision-making by the organization. Its components include data warehousing, ETL processes, OLAP tools, and reporting and visualization software. Data Warehousing: In BI solutions, data resources are typically stored in data warehouses that provide a centralized repository for storing, managing, and retrieving large amounts of structured and unstructured data. This enables organizations to make more informed decisions by analyzing historical and real-time data from various sources. Databases and external platforms are collected and maintained. BI tools use advanced analytics methods such as data mining, statistical analysis, and predictive modeling to generate insights from raw data. This enables the creation of custom reports and visually appealing dashboards that deliver key numbers and trends in an engaging format. Users can access important business metrics and KPIs in real-time through BI dashboards, maintaining pace with competitive environments and monitoring performance towards organizational goals. Leading BI vendors include Tableau, Microsoft Power BI, Qlik View, Wise BI, and MicroStrategy. Each provides unique features for solving different business issues. A decision support system (DSS) is an interactive computer-based system that supports the decision-making process by providing analysis of relevant information, analytical models, and decision support tools. The components of a DSS include data management, model management, user interface, and decision analysis. Data management combines internal databases and external repositories for seamless flow of information. Model management uses mathematical models, simulations, and optimization techniques to analyze complex cases. User interfaces are easy to use, enabling decision-makers to access data, change variables, and perform 'what-if' simulations. DSS tools empower decision-makers to subject decisions to sensitivity analysis and forecast potential outcomes with pointers to risks and uncertainties. Major DSS market contributors include IBM Watson, Oracle DSS, SAP BusinessObjects, and SAS Decision Manager. These providers offer compounded solutions for businesses from various sectors. The main distinctions between BI and DSS lie in their focus and scope. BI focuses on analyzing past data for trends and patterns, while DSS supports real-time decisions with predictive modeling and scenario analysis. DSS is designed for tactical decision-making like resource allocation, risk management, and forecasting. Business Intelligence (BI) and Decision Support Systems (DSS) share the goal of supporting data-driven decision-making, but they serve distinct purposes and offer unique functionalities. BI is geared towards analyzing past and present information to uncover valuable insights, allowing organizations to make informed decisions based on historical trends. On the other hand, DSS is designed for short-term operational decision-making, focusing on immediate business needs and responding rapidly to current market conditions. By understanding their differences, businesses can effectively utilize both tools to drive innovation, improve operational efficiency, and achieve strategic objectives in today's dynamic business environment.