COMPREHENSIVE REVIEW OF BUSINESS INTELLIGENT (BI) AND ARTIFICIAL INTELLIGENT (AI) FOR SUPPLY CHAIN SYSTEM

Bhushan Pandit
Lecturer, Gujarat University
Gujarat University
Ahmedabad

Abstract: -

Organizations are arranging business intelligence (BI) systems to enable analysis for data assets of establishing management decisions. Corporate data captured using enterprise systems (ESs) are leveraged through BI to evaluate digital information for arranging business strategies. This paper present through BI in organizations for managing supply chain operations. The current BI practices for manufacturing firm is evaluated from transforming transactional data captured through ESs into organizational knowledge in search of realizing supply chain goals. This results is underutilized through BI tools and the data assets for establishing business decisions. However, more and more companies are now arranging BI strategies for unplanned decision making in managing supply chains.

The term "supply chain" refers to a network of facilities that includes a variety of companies. To minimize the entire cost of the supply chain, these paper must collaborate. These paper represent on the uses of artificial intelligence techniques in supply chain management. It includes the supply chain management, for example like demand forecasting, supply forecasting, text analytics, pricing planning, and more to help companies to improve their processes, lower costs and risk, and boost revenue. It gives us a quick rundown of all the key principles of economics and how to grasp and use them effectively. This paper represents the application of Business Intelligent and Artificial Intelligent for Supply Chain System.

Key Terms-   Artificial intelligence, supply chain management, machine learning, internet of things, Business intelligence (BI), enterprise system (ES)

1.   INTRODUCTION

Today's campaign against any cyber-attack has put a huge demand on cyber security and on information security folks at different levels of different organization. Therefore, processing of incoming data as sets of information becomes more and more critical. Moreover, the data are often, imprecise and will include both quantitative and qualitative elements. For these reasons it is important to extend traditional decision-making processes by adding instinctive reasoning, human subjectivity and imprecision. To enhance this process of decision-making, these authors have taken an unconventional approach by applying a new growing technology known as neural network as part of driving infrastructure for artificial intelligence system, it takes over from human being in order to satisfy the demand for real time decision making.

As far as Business Intelligence (BI) is concerns, the term Business Intelligence refers to technologies, applications and practices for the collection, integration, analysis, and presentation of business information across the enterprises and organizations. The purpose of Business Intelligence is to support the better business decision making. Essentially, Business Intelligence systems are data-driven Decision Support Systems (DSS). Business Intelligence is sometimes used interchangeably with briefing books, report and query tools and executive information systems.

2. WHAT IS BUSINESS INTELLIGENCE (BI)

Business Intelligence systems provide historical, current, and predictive views of business operations, most often using data that has been gathered into a data warehouse or a data mart and occasionally working from operational data. Software elements support reporting, interactive "slice-and-dice" pivot-table analyses, visualization, and statistical data mining. Applications tackle sales production, financial, and other sources of business data for purposes that include business performance management. Information is often gathered about other companies in the same industry which is known

as benchmarking and they are competitors in same domain or produced products that are manufactured or presented in the similar market place.

Currently organizations are starting to see that the data and content should not be considered separate aspects of information management, but instead of managing the integrated enterprise approach. Enterprise information management brings Business Intelligence and Enterprise Content Management together. Currently organizations are moving towards Operational Business Intelligence which is currently under served and recognized by the vendors. Traditionally, Business Intelligence vendors are targeting the top pyramid but now there is a pattern of shift moving toward Business Intelligence to the bottom of the pyramid with a focus of self-service business intelligence.

As we have expressed in some of our published books and articles in various journals "Knowledge is Power in Four Dimensions" [14,15] and order to have the knowledge, one needs Information and Information comes from Data as presented in Figure 1 here. As Figure 1 indicates that the main core of the power, consequently knowledge, information and data rests on the Business Resilience System (BRS) Risk Atom as illustrated in Figure 2 here
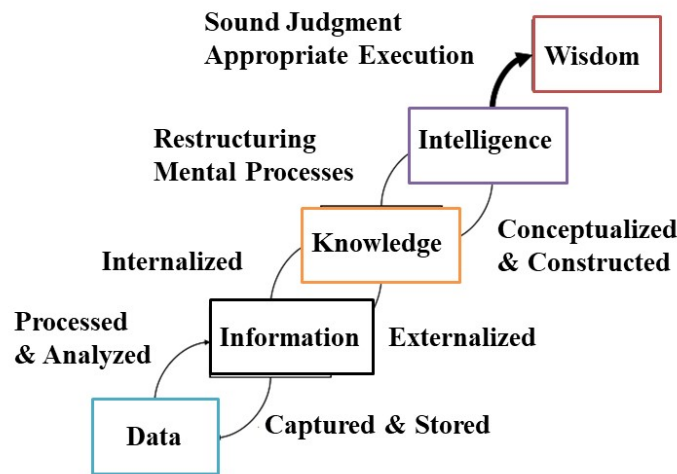

Figure 1: Depiction of Data, Information, and Knowledge is Power in Four Dimensions.
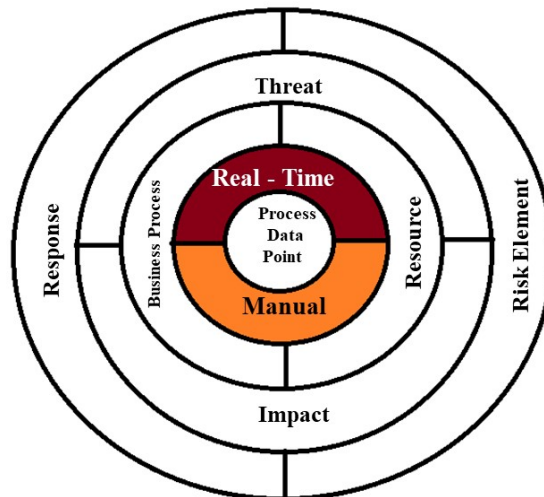

Figure 2: The Business Resilience System Risk Atom.

Bear in mind that, one of the critical aspects of the Business Resilience System is the Risk Analysis and Risk Assessment Process. However, a critical aspect of the risk analysis process is to identify the preparation and defensive measures take place at any point in time. Once the potential areas of high exposure to the organization are identified, additional defensive measures can be considered for implementation. Regardless of the prevention techniques employed, possible threats that could arise inside or outside the organization need to be assessed.

Demand for Business Intelligence (BI) applications continues to grow even at a time when the demand for most information technology (IT) products is soft [Soejarto, 2003; Whiting, 2003] [4 ,5]. Yet, information systems (IS) research in this field is, to put it kindly light.

While the term Business Intelligence is relatively new, computer-based business intelligence systems appeared, in one appearance or other, near to forty years ago [2]. BI as a term replaced decision support, executive information systems, and management information systems [Thomsen, 2003][3]. With each new interactions, capabilities increased as enterprises grew ever-more sophisticated in their computational and analytical needs and as computer hardware and software matured.

The objective is to improve the timeliness and quality of inputs to the decision process, hence facilitating managerial work. Sometimes business intelligence refers to online decision making, that is instant response. Most of the time, it refers to reduction the time frame so that the intelligence is still useful to the decision making when the decision time comes. In all case, use of business intelligence is viewed as being proactive. Essentially components of proactive BI are [Lang Seth and Vivatrat, 2003] [7]:

• Real-time data warehousing,
• Data mining,
• Automated anomaly and exception detection,
• Proactive alerting with automatic recipient determination,
• Seamless follow-through workflow,
• Automatic learning and refinement,
• Geographic information systems
• Data visualization

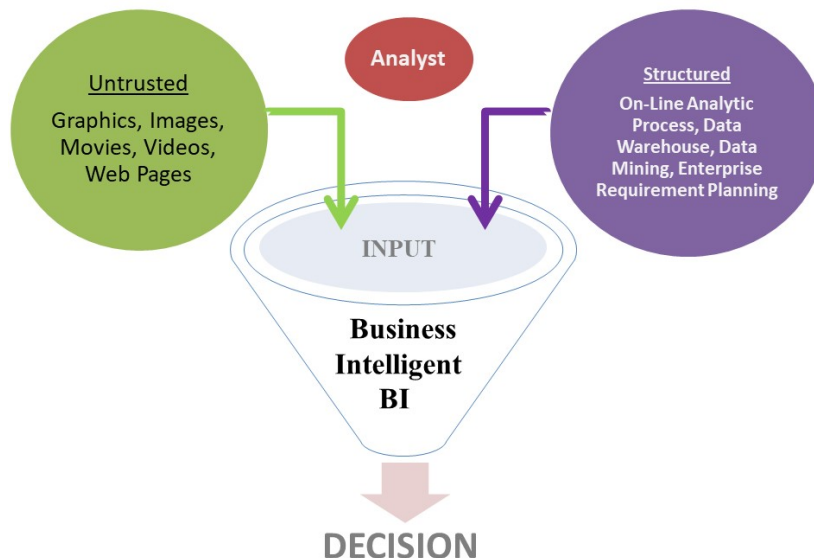Figure 3 shows the variety of information inputs available to provide the intelligence needed in decision making.

Figure 3: Inputs to Business Intelligence Systems

3. WHAT DOES BI (BUSINESS INTELLIGENCE) DO?

BI assists in strategic and operational decision making. A Gartner survey ranked the strategic use of BI in the following order [Willed, 2002] [5]:

1. Corporate of performance management.
2. Optimizing customer relations, monitoring business activity and traditional decision support.
3. Packaged standalone BI applications for specific operations or strategies.
4. Management in reporting of business intelligence.

One suggests that ranking is merely reporting the performance of a firm and its competitors, which is the strength of many existing software packages, is not enough. A second suggestion is that, too many firms still view business intelligence (like DSS and EIS before it) as an inward looking function.

Business intelligence is a natural outgrowth of a series of previous systems designed by the support decision making. The emergence of the data warehouse as a repository, the advances in data cleansing that lead to a single truth, the greater capabilities of hardware and software, and the boom of Internet technologies that provided the prevalent user interface all combine to create a richer business intelligence environment than was available previously. BI pulls information from many other systems. Figure 4 depicts some of the information systems that are used by BI.
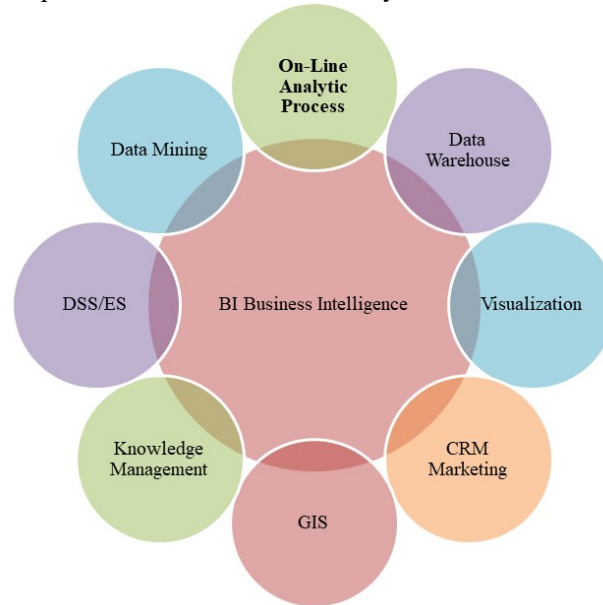

Figure 4: BI Relation to Other Information Systems.

BI converts data into useful information and through that human analysis, into knowledge of some tasks performed by BI are:
• Creating forecasts based on historical data, past and current performance, and estimates of the direction in which the future will go.
• "What if" the analysis of impacts is to change and alternative scenarios.
• Ad hoc access to the data to answer specific, non-routine questions.
• Strategic insight

4. SCM (Supply Chain Management)

Supply chain management (SCM), the management of the flow of goods and services [9]. It includes the movement and storage of raw materials, work-in-process inventory, and finished goods from origin point to consumption point.

Company makes a product from parts/components/materials purchased from suppliers, and those products are sold to customers, that company have a supply chain. Some supply chains are simple, while others are complicated. The complexity of the supply chain will vary from the size of the business and the complexity and numbers of items that are manufactured.

Supply chain management is interconnected or interlinked network, channel and node businesses combines in the provision of products and services required by end customers in a supply chain [10]. Supply-chain management has been defined by the "design, planning, execution, control, and monitoring in supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally [12].

Supply chain management (SCM) is the management of the flow of goods. Company makes a product from parts/components/materials purchased from suppliers, and those products are sold to customers, that company have a supply chain. Some supply chains are simple, while others are complicated. The complexity of the supply chain will vary from the size of the business and the complexity and numbers of items that are manufactured.

SCM practices to draw heavily from the areas from industrial engineering, systems engineering, operation management, logistics, procurement and information technology, and attempts for an integrated approach.

A critical component in a company's ability is to achieve competitive advantage by using a BI approach which enhances efficiency of analytics for SCM. An executive's reasoning abilities are enhanced using BI while monitoring supply chain process outcomes. BI systems integrate and consolidate information to support firms that are seeking supply chain effectiveness through vendor and customer loyalty and retention (Rajah 2008) [6]. Several researches have explored the business value of BI systems through analytics in supply chain. Haddock (2003) [7] has noted by creating supply chain intelligence, opportunities to reduce the cost and stimulate revenue growth are revealed, enabling firms to evaluate the complete supply chain from a customer's perspective. The key analytics include primary drivers from supply chain processes like planning, procurement, manufacturing, logistics, and returns to increase the efficiency within the SCM. For achieving this, creating a multi-dimensional view of the supply chain by capturing transactional data, is controlled and provided a quick access of information with end-user view representation is essential. Supply chain performance measurement against organizational objectives is identified by different opportunities to increase the manufacturing of competences, improve vendor management, reduce costs, and optimize deliveries. Supply chain analytics struggle to provide strategic information to decision-makers in firms by applying BI to data from ESs.

Based on such organizational needs, ES vendors have incorporated the BI module and its analytical functionalities into their offering as SAP has done with Strategic Enterprise Management in conjunction with Business Information Warehouse (SEM-BW) creating the ability to provide information in real-time for current decision making. Some of the key functionalities of BI tools have to enable the sharing of enterprise while information across different functional units for decision making is summarized in Table 1.

Table1. Main Business Intelligent (BI) Functionalities tools that contribution in Decision making

Purpose	Business Intelligent Functionalities
Reporting of Business	➢ Be responsible for. Ability to drill down through layers of different data, and do the examination in any form like: chart, spreadsheet, hyperlinks) without troubling user with technical details. ➢ Support the setting up of crosstabs, data filters and user-friendly queries to answer definite question. ➢ Cover standard ES reports (e.g., order consumption report or aging analysis) to progress in productivity and optimize capacity planning.
Reduce excess material	➢ Collects the meaningful information, which help to managers know more about their business and start looking for association with specific question, since ES implementation can be irresistible causing intonation overload.
evaluation Support for management performance	➢ Stable records are used in aggregation with data mining to collective databases for performance and assessment increasing managerial systematic capabilities. ➢ Assistance business managers generate relevant data views to make knowledgeable decisions bringing clarity on critical information element.
Business process situation and model	➢ The built-in combined reporting and dynamic question generation fiction allows consumers to extract intermediate data and assess different possible simulated consequences. ➢ Systematic processing can be applied to setups by adding experience, context, and interpretation

Add-on Structures	➢ Allow organizations to identify a standard against which normal could be defined and the information presented as a report, scorecard, since many firm do not even know what they want to measure. ➢ Customization with add-on structures (e.g., a dashboard could deliver more appropriate information that helps in perceptive decision making).

5. STRATEGIC AND TRADE SERVICE OF THE SUPPLY CHAIN MANAGEMENT

The term "supply chain management" is entered in the public domain in the year 1982 when Keith Oliver, a consultant at Booz Allen Hamilton, is used in interview for the Financial Times. However, the concept of a supply chain management was a great importance long before, in the early 20th century, especially with the creation of the assembly line. The characteristics of this era of supply chain management include the need of large-scale changes, re-engineering, downsizing driven by cost reduction programs, and widespread attention to Japanese management practices [13].

Elements of the Supply Chain are:

- **Customer**: The customer starts the chain of events when they decide to purchase product that has been offered by the sale of a company. The customer contacts the sales department of the company, which enter the sales order for a specific quantity to be delivered on a specific date. If the product has to be manufactured by the company, the sales order will be included in a requirement that needs to be fulfilled by the production facility.
- **Planning**: The requirement triggered by the customer's sales order will be combined with other orders. The planning department will create a production plan to produce the products to fulfill the customer's order. To manufacture the products of the company will have to purchase the raw material needed for production.
- **Purchasing**: The purchasing department receives a list of raw materials and services required by the production department to complete the customer's order. The purchasing department sends purchase order to a selected supplier to deliver the necessary raw materials to the manufacturing site on the required date.
- **Inventory**: The raw materials are received from the suppliers are checked by the quality and accuracy of those to move into the warehouse. The supplier will send an invoice to the company for the items they delivered. The raw materials are stored until they are required by the production departments.
- **Production**: Based on a production plan, the raw materials are moved inventory to the production areas. The finished products ordered by the customer are manufactured using the raw materials purchased from suppliers and delivered it by the inventory. After the items have been manufactured and tested, they are stored back in the warehouse prior to delivery to the customer.
- **Transportation**: When the finished product arrives in the warehouse, the shipping department determines the most efficient method to transport the products so that they are delivered on or before the date has been specified by the customer. When the goods are received by the customer, the company will send an invoice for the delivered products.

Trade Services and the Supply Chain

To ensure that the supply chain is operating as efficient as possible and generating the highest level of the customer satisfaction at the lowest cost, companies have adopted Supply Chain Management processes and associated technology [18].

Supply Chain Management has three levels of activities that the different parts of the company will focus on: strategic; tactical; and operational.

- **Strategic**: At this level, company management will be looking to high level strategic decisions concerning the whole organization, such as the size and location of manufacturing sites, partnerships with suppliers, products to be manufactured and sales markets.
- **Tactical**: Tactical decisions focus on adopting measures that will produce cost benefits such as using best industry practices, developing a purchasing strategy with favored suppliers, working with logistics companies to develop cost effect transportation and developing warehouse strategies to reduce the cost of storing inventory.

- **Operational**: Decisions at this level are made each day in businesses that affect how the products move along to the supply chain. Operational decisions involve making schedule changes to production, purchasing agreements with suppliers, taking orders from the customers and moving products in the warehouse.

6. SCM TECHNOLOGY AND APPLY IN DIFFERENT MANAGEMENT

If a company expects to achieve benefits from their supply chain management process, they need to require some level of investment in technology. The backbone for many large companies has been the hugely expensive in Enterprise Resource Planning (ERP) suites, such as SAP and Oracle. These enterprise software implementations will encompass a company's entire supply chain, from purchasing of raw materials to warranty service of items sold. The complexity of these applications does require a significant cost, not only a monetary cost, but the time and resources required to successfully implement an enterprise wide solution. Buy-in by senior management and adequate training of personnel are keys to the success of the implementation. There are now many ERP solutions to choose from and it is important to select one which fits the overall needs of a company's supply chain [19].

Since the wide adoption of Internet technologies, all businesses can take advantage of Web-based software and Internet communications. Instant communication between vendors and customers allows for timely updates of information, which is the key management of the supply chain.

Demand Management: Demand Management is a planning methodology used to predict, plan and manage the demand for products and services. This can be at macro levels as in economics and at micro levels within individual organizations. Demand management has a defined set of processes, capabilities and recommended behaviors for companies that produce all manner of goods and services. Companies often lead in the application of demand management practices to their demand chains; demand management outcomes are a reflection of policies and programs to influence demand as well as competition and options available to users and consumers. Demand management begins with an in-depth perception of existing business requirements, historical buying the behavior and expected requirement for the service or product sourced by an organization. This research includes an assessment of purchase orders, service or product specifications and strategic business plans.

Demand management helps streamline purchasing techniques. When applying demand management, key considerations include:
- Available options for volume discounts
- Order timing's impact on pricing
- Whether or not the best suppliers are being utilized
- Precise attention to described contract processes

Forecasting Demand:

Forecasts are becoming the lifeline of business in a world, where the tidal waves are changed by the sweeping the most established of structures, inherited by the human society. Commerce just happens to the one of the first casualties. Survival in this age of economic predators requires the tact, talent and technique of predicting the future. Forecast is becoming the sign of survival and the language of business. All requirements of the business sector need the technique of accurate and practical reading into the future. Forecasts are, therefore, very essential requirement for the survival of business and its development. Management requires forecasting information while making a wide range of decisions.

Price Optimization and promotion management:

Price & Promotion Management synchronizes promotion planning, forecasting and price optimization with supply chain, advertising and price execution. A company can more efficiently and accurately manages a wide range of processes: Increase awareness and understanding of how customers react to pricing and promotions ; Applying a consistent, systematic approach to improve and automate one's daily activities, including the review of in-season performance; Realign performance goals are based on automatic, system-generated recommendations ; Incorporate the effects of price

adjustments and promotions into a single demand forecast that is shared enterprise-wide; Align purchasing and fulfillment decisions with anticipated demand; Automatically generate high volumes of significantly versioned ads with maximum efficiency; Streamline and automate trade event and promotion programs for better results; More efficiently it is established everyday by pricing the best follows to category pricing strategies while reducing the impact on store labor.

The complexity of pricing thousands of items in highly dynamic market conditions, modeling results and insights helps to forecast the demand, develop pricing and promotion strategies, control inventory levels and improve customer satisfaction. Company uses Price Optimization Models to:

• Price Optimization Models help the business to determine the initial price, promotional price and markdown (or discount) price:

• Initial price optimization works well for the companies with a stable base of long life-cycle products-grocery stores, drug chains, office—supply stores and commodities manufacturers

• Promotional price optimization helps the set of temporary prices to branch sales of items with long life-cycles-newly introduced products, products bundled together in special promotions and loss leaders

• Markdown optimization helps business in selling the short lifecycle of the products subject to fashion trends and seasonality airlines, hotels, specialty retailers and mass merchants.

Procurement & Supplier Management:

"Procurement is the business management function that ensures identification, sourcing, access and management of the external resources that are organized by the needs or may need to fulfill its strategic objectives"[10]. Procurement is the business management function that ensures identification, sourcing, access and management of the external resources that the organization needs or may need to fulfill its strategic objectives. Procurement and supply management involves buying the goods and services that enable an organization to operate.

Supplier Analysis and support in procurement decision:

The selection of the most suitable supplier for a procurement process has a decidedly strategic aspect for a company. Lack of uniformity in the terms used to define the phases or components of a procurement process as well as in the election of the critical variables used to select the most suitable supplier. For optimizing such a selection wide variety of individual and integrated methodologies have been developed by many individual. Supplier's evaluation and selection model has also been developed. This model homogenizes the terminology involved in such processes and fulfills three main goals. First, models allow the joint assessment and comparison among new and historical suppliers, identifying and the key evaluation factors in each case seen in Figure 5.
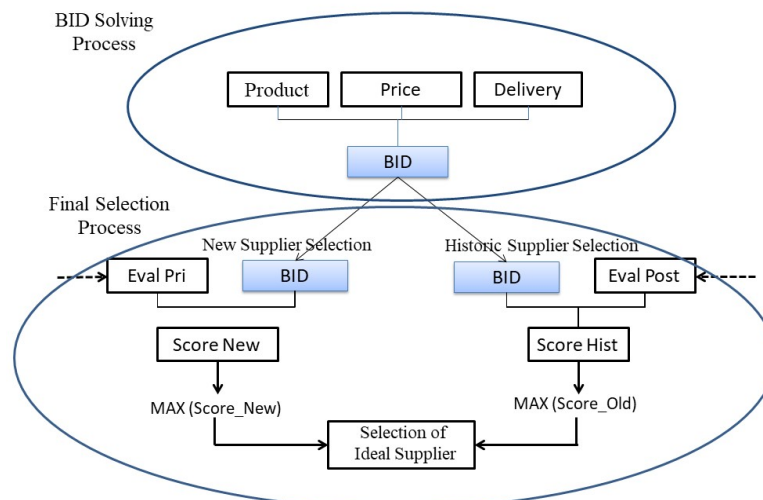

Figure 5: Selection of Supplier

Second, models allow the inherent knowledge about the evaluation of a flexibility adapted by the types of product to be purchased. Finally, a FDSS is proposed to make the model operational. Some of those models are robust enough to improve the main shortcomings of more simplistic methods (e.g. those based on weights) and eases of the comprehension of the embedded knowledge within the supplier of evaluation processes. Simultaneously, these methods avoids the complexity of real-life implementation that many more sophisticated hybrid methods proposed in recent times – not free of certain additional disadvantages. Finally, the practical usefulness of the methods is ascertained through an empirical test in a specific business environment. One such model can be outlined as the graph given here **[11].**

7. ELEMENTS OF ARTIFICIAL INTELLIGENCE IN PROVIDING SUPPLY CHAIN

Supply chains throughout the world are adopting AI to enhance their processes, reduce costs and risk, and grow revenue [16]. Here are 10 strategies that you could leverage the ability of cubic centimeter for your delivery chain.

Demand foretelling: Let AI eliminate the idea of foretelling and keep you from delivering chain surprises.

1. Leverage AI to regulate sophisticated and unpredictable fluctuations in incorporated volumes.
2. Provide foretelling: Entire supplier commitments and lead instances, the payments of fabric and PO's statistics are frequently established, and proper predictions could also be created for deliver forecasts. To balance the incorporate, and transform your enterprise you must be compelled to span the whole fee chain.
3. Text analytics: To force better decisions, data is frequently cleaned with matter-content analytics. Text analytics are frequently applied with delivery statistics, companion statistics, or loading statistics to arise higher insights from the supply chain.
4. Planning a budget: Use cubic centimeters to optimize expansion or lower product fees to include developments, product lifecycles, and stack merchandise with the competition.
5. Inventory management: Mechanically increase POs with suppliers based entirely on shortages or future incorporate shortages by predicting each incorporate and delivery to ensure you have the correct merchandise at the correct time but are not overspending for extra stock.
6. Inventory value reconciliation: Cubic centimeter will advise merchandise that are in additional and robotically reduces the fees to scrub stock consequently. The cubic centimeter makes use of historic statistics like on the far side, buying designs to advise merchandise supported stock positions.
7. Stock analytics: Supported over established and unstructured datasets, machines will currently expect the cause for out-of-inventory objects or while those objects can run out of inventory more quickly than before, so that you can completely set up shipments and shipping consequently.
8. Exception analytics: Stock-outs at every stage within the delivery chain are frequently foretold. Understand the thought process behind inventory outs and forecast correct developments with longer lead times from suppliers to reduce inventory outs.
9. Element-level analytics: Use dynamic filling of supported staples to set up your delivery on a problem stage.
10. Production planning: Utilize Iota sensors and production automation mechanics to increase or decrease the merchandise and increase customer satisfaction.

8. APPLICATIONS OF ARTIFICIAL INTELLIGENCE IN SUPPLY CHAIN

In maintaining a commercial enterprise successful and profitable, it is important to make certain changes that are in demand situations and troubles inside the availability chain are addressed and solved in a short time, errors are avoided, and future possibilities are anticipated as appropriately as possible. Implementing AI and gadget getting to know

algorithms inside the availability chain of your commercial enterprise proves to achieve success in the next few cases.

Companies actively accumulate transportation management systems to plug freight financial savings and offer a more aggressive carrier while figuring out the effect on overall performance [17]. Machine learning (ML) offers agencies the chance to get right of entry to the possibly insightful statistics and see the answers to the questions regarding the establishment's overall performance (Figure 2).

- Do carrier stage requirements meet in terms of shipping and schedule?
- That lanes rectangular degree related to several carrier delays?
- What is the rectangular degree of the stops that cause delays to shipments?

Having all this information at hand, the organization will understand answers to conflicts most of the time as gadget getting to know promotes excessive carrier tiers and the manner of better expertise for the shippers on the way to supplying the consequences expeditiously.

Warehouse management:

AI provides several precise stock controls that enable the call for boom and its subsequent drops. ML is utilized in warehouse optimization, assisting most of the detection of excesses and shortages of shares, saving your time [20].

Demand prediction:

The AI to know-powered call for prediction set of rules offers several advanced calls for prognostication functions. By reading customer conduct tendencies, companies will have the ability to search for conduct and shape the customer portfolio with precision. With predictive analytics for most of the provision chain, companies' rectangular degrees are capable for controlling shown in Figure 6.
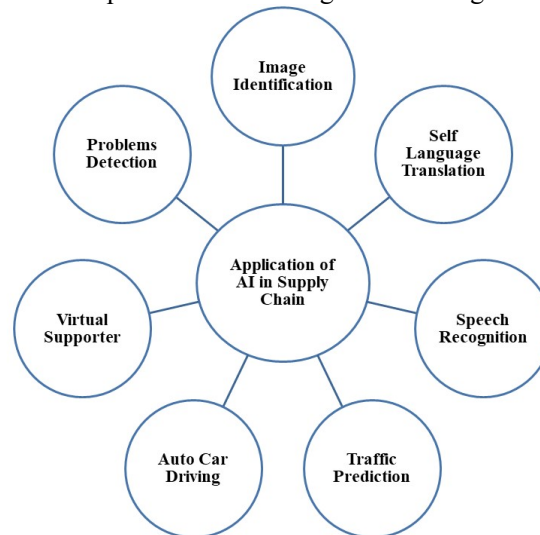

Figure 6: Applications of machine learning in supply chain management.

Logistics route optimization: It's essential to have gadgets to know for direction optimization that analyses the current routes for faster shipping of products. This function conjointly prevents delays in shipping and allows enhanced customer satisfaction. However, with regards to employee development, using current manufacturing data, device learning can be created in several appropriate environments that can obviously adapt into various circumstance changes in the future.

End-to-end visibility: AI learning algorithms play a key role in presenting stop-to-stop visibility from providers and producers to shops and clients are getting ridded of the hazard of conflicts due to the fact that the era will appropriately decide inefficiencies that require a right way of response.

9. CONCLUSION

The study has emphasized the significance of identifying needs and implementing critical BI practices to manage the supply chain operations in organizations. These practices are installed when the BI tools are used to provide vital information for resolving underlying supply chain issues and improving organizational

processes. These practices assist in monitoring and measurement of critical supply chain deliverables and implementation of strategic business plans. The BI practices the impact of an administration's ability to realize the goals and objectives set in managing SCM processes. BI tools enhance analytical metrics through measurable summary reports, graphical models, and tabular data assisting managers in execution of knowledgeable decision making.

Performance review assessments are supported by an underlying BI and data warehouse application drives an effective response to achieve better strategic and operational results. To investigate opportunities and risks in operations, a BI evaluation approach allows the overall financial objectives to align to functional metrics for installing a contingency plan based on the examination of multiple "what if" and use of business process simulation techniques. Assessments performed in areas of sales volume realized, customer orders received, vendor supplies accepted, inventory levels achieved, production output realized, product quality attained, and product deliveries executed lead to understanding the optimization of data flows within SCM at discrete levels for an improved operational performance. This enables the organization to enhance supply chain efficiencies, in improving the product quality and timely dispatched products to customers. Further, these practices help in collaboration with network partners in business such as distributors, key suppliers and customers by providing vital information such as data on inventories and in-market sales that help in aligning supply and determining demand. However, the availability of high quality and consistently integrated data is critically important to realize the supply chain operational goals. Additionally, the BI support and IT infrastructure must be aligned to the business needs of the organization.

Any disruption can be detected, and their forecast will more accurately forecast demand in the global supply chain. Technologies like AI make it easier to manage validity and accurately forecast demand in the global supply chain. At least half of all global supply chain companies will use AI by 2023. AI has the potential to add value to the supply chain in a variety of ways. It can be used to improve customer service activities by more efficiently routing customers to the information they need. As we saw in the above part of this study, AI uses the case in forecasting includes the demand sensing, new product introduction, new forecasting algorithm, and forecast level optimization.

AI knowledge is a critical tool in supply chains because it enables computing fashions to adapt to positive conditions, changes, and trends at some point in a business environment with the ability to reinforce them over time. Aside from that, ML algorithms discover new patterns in supply chain records with minimal guide interference while still providing accurate statistics and predictions that help the business. Offering chains location units conferred with increasing accuracy in several branches in their commercial enterprise-like provision, operations, planning, and hands by utilizing gadgets, gaining knowledge of generation, and incorporating it.

10. REFERENCES

Book

1. Thomsen, E. (2003) "BI's Promised Land", Intelligent Enterprise, (6)4, pp. 21-25.
2. Soejarto, A. (Mar. 20, 2003) "Tough Times Call for Business Intelligence Services, an Indisputable Area of Growth", http://vb.channelsupersearch.com/news/var/40682.asp or www.VarBusiness.com (current May 5, 2003).
3. Whiting, R. (Jan. 13, 2003) "Look Within—Business-Intelligence Tools have a New Mission:
4. Evaluating All Aspects of a Company's Business", InformationWeek, pp. 32.
5. Willed, C. (Jan. 14, 2002) "Airborne Opportunities", Intelligent Enterprise, (5)2, pp. 11-12.
6. Lang Seth, J. and N. Vivatrat (2003) "Why Proactive Business Intelligence is a Hallmark of the Real-Time Enterprise: Outward Bound," Intelligent Enterprise, (5)18, pp. 34-41.
7. 6. Raman, B.S.S.J. 2008. "Real Time Business Intelligence in Supply Chain Analytics," Information Management and Computer Security (16:1), pp. 28-48.

8. Haddock, M. 2003. "Supply/Chain Intelligence." SAS Ascent, vol. 5, available at: www.ascet.com/documents.asp?d_ID_¼_1968 (accessed September 15, 2009).

9. CSCMP , Hazed Chen, C. Clifford Defoe, Brian J. Gibson, Joe B. Hanna : Defining the Supply Chain. Jan 10, 2014, **INFORMIT**, Pearson.

10. Lambert, D. M. (2008): Supply Chain Management: Processes, Partnerships, Performance (3rd Edition Ed.). (D. M. Lambert, Ed.) Sarasota, Florida: Supply Chain Management Institute.

11. Katrina Whitestone: Procurement 101: what it is and how it can help your business. 0508 20 30 40 | ask@n3.co.nz | www.n3.co.nz. 5/18/2016

12. Ho, W., Cu, X., Day, P.K: Multi-Criteria Decision Making Approaches for Supplier Evaluation and Selection: A Literature Review. **European Journal of Operational Research.** Vol.202, No.1. pp. 16-24. 2010.

13. Supply chain management (SCM). APICS Dictionary. Retrieved 2016-07-19. supply chain management : The design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand, and measuring performance globally.

14. Harland, C.M.: Supply Chain Management, Purchasing and Supply Management, Logistics, Vertical Integration, Materials Management and Supply Chain Dynamics. In: Slack, N (ed.) **Blackwell Encyclopedic Dictionary of Operations Management**. UK: Blackwell. 1996.

Paper:

15. Balasubramanian, V. and A. Bashan (1998) "Document Management and Web Technologies: Alice Marries the Mad Hatter", Communications of the ACM, 41(7), pp. 107.

16. Leonardo dos Santos Pinero and Mark Drabs, "Stock Market Prediction with Deep Learning: A Character-based Neural Language Model for Event-based Trading." https://www.aclweb.org/anthology/U17-1001

17. Marr, Marr. "A Short History of Artificial Intelligence – Every Manager Should Read". Forbes. Retrieved 28 Sep 2016.

18. Fernandez S.M. et al. "Optimization of a Truck-drone in Tandem Delivery Network Using K-means and Genetic Algorithm" Journal of Industrial Engineering and Management, 9(2): 374–388, 2016.

Link:

19. https://www.sas.com/en_us/insights/analytics/machine-learning.html

20. For SCM related to services, see for example the Association of Employment and Learning Providers' Supply Chain Management Guide at http://www.aelp.org.uk/supply/details/supply-chain-management-guide/, published 2013, accessed 31 March 2015