WSM

Unit - I

Analytics to Manage a vaccine Supply chain effectively and safely

* Magpie sensing employ's analytics to manage a vaccine supply chain effectively and safely
* A cold chain in healthcare is defined as a temperature-controlled supply chain involving a system of transporting & storing vaccines and pharmaceutical drugs.
* It consists of three major components
  → Transport & storage equipment
  → Trained personnel
  → Efficient Management procedures

The majority of the vaccines in the cold chain are typically maintained at a temperature of 35-46 degrees
* Fahrenheit [2-8 degrees centigrade]
* Maintaining cold chain integrity is extremly important for healthcare product manufactur

Especially for the vaccines; improper storage and handling practices that compromise vaccine viability prove a costly, time consuming affair.

*vaccines must be stored properly from manufacture until they are available for use

Managing a vaccine supply chain effectively & safely requires leveraging analytics to optimize operations, reduce risks & ensure the availability of vaccines at the right time & place. There are key analytical approaches & tools that can be applied.

1. Demand Forecasting

Purpose: predict vaccine demand to avoid shortage or overstocking

Techniques:

* Time series analysis to predict trends
* Machine learning models using demographic, seasonal & historical data

2. Inventory Management

Purpose: optimize stock levels to reduce wastage and ensure supply continuity

Techniques

* ABC & XYZ analysis to classify vaccines by importance & valuability
* Reorder point calculations using safety stock levels
* Inventory simulation models to plan buffer stocks

3. Cold chain Monitoring

Purpose: Ensure vaccines are stored & transported at correct temperatures

Techniques

* IOT (Internet of things) devices for real-time temperature & humidity tracking
* Analytics dashboards for anomaly detection
* Predictive maintenance for refrigeration systems using historical failure data

4. logistics & Distribution optimization

Purpose: Minimize delivery times & costs while maintaining vaccine quality

Techniques

* Route optimization algorithms for last-mile delivery
* Geospatial analytics to map distribution hubs & underserved areas
* Simulation models for transportation delays & risks

5. Risk Management

Identify & mitigate risks in the supply chain

Tech

* Scenario analysis to prepare for disruptions
Root cause analysis for supply chain failure
ML models to predict supply chain risks

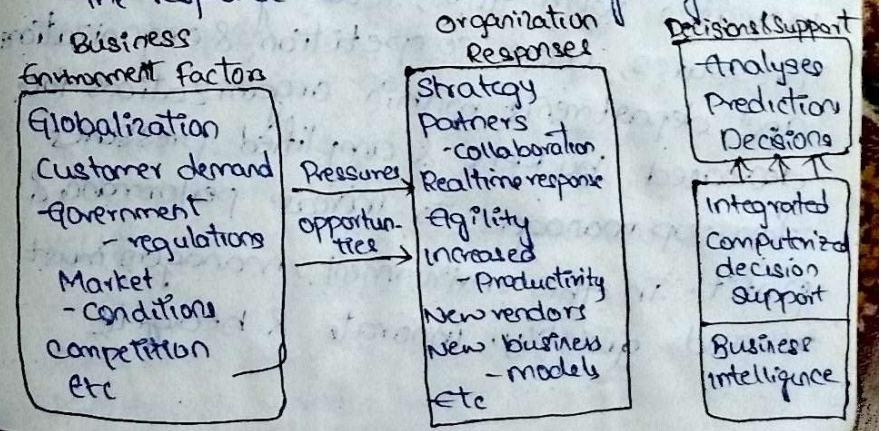
6. Waste Reduction: Minimize vaccine wastage due to expiration, spoilage or overstocking
Tech
* Shelf-life monitoring systems integrated with inventory data
* Advanced analytics - to match supply with actual demand
* Heatmaps - to identify high wastage locations
7. Data integration & visibility: centralize data to improve decision-making across the supply chain.
Tech
* Data lakes (or) cloud-based platforms to consolidate data from suppliers, warehouses & health care providers,
* visualization tools to monitor supply chain performance in real time
8. Regulatory compliance: ensure adherence to health & safety standards
Tech
* Automated reporting systems for regulatory bodies
* Text analytics to extract insights from compliance report
* Blockchain for secure & auditable vaccine tracking
9. Stakeholder collaboration: enhance coordination across suppliers, distributors & healthcare Providers
Tech
* Collaborative forecasting tools to align production with demand
* Shared dashboards to provide visibility into supply chain status.
* Communication platforms to coordinate during disruptions

Changing Business Environment and computerized Decision Support

It illustrates how a company can employ technologies to make sense of data & make better decisions. Companies are moving aggressively to computerized support of their operations
* To understand why companies are embracing computerized support, including business intelligence, we developed a model called the Business pressures - Responses - Support Model

The Business pressure - Responses - Support Model
It indicates three components

1. Business pressures that result from today's business climate.
2. Responses by companies to counter the pressures
3. Computerized support that facilitates the monitoring of the environment & enhances the response actions taken by organizations



The Business Environment

The environment in which organizations operate today is becoming more and more complex.

* this complexity creates opportunities on the one hand and problems on the other.
* Take globalization. Find suppliers and customers in many countries, which means you can buy cheaper materials & sell more of your products & services.
* globalization also means more & stronger competitors.
* Business environment factors can be divided into four major categories
  - → markets
  - → consumer demands
  - → technology
  - → societal

The intensity of most of these factors increases with time, leading to more pressures, more competition & organizations and departments within organizations face decreased budgets & amplified pressures from top managers to increase performance & profit. In this environment, managers must respond quickly, innorate & be agile

Organizational Responses

Be Reactive, Anticipative, Adaptive and proactive.

Both private & public organizations are aware of today's business environment & pressures. They use different actions to counter the pressures. Vodafone New Zealand Ltd (Korindo, 2008)

Ex: Turned to BI to improve communication & to support executives in its effort to retain existing customers & increase revenue from these customers

Managers take other actions including:

* Employ strategic planning
* use new & innovative business models
* Restructure business processes
* participate in business alliances
* improve corporate information systems
* improve partnership relationships
* Encourage innovation and creativity
* improve customer service and relationships
* Employ social Media & mobile platforms for e-commerce and beyond
* Move to make-to order production & on-demand manufacturing & services
* Use new IT to improve communication, data access & collaboration
* Respond quickly to competitor's actions
* Automate many tasks of white-collar employees

* Automate certain decision processes, especially those dealing with customers
* Improve decision Making, by employing analytics
* Many if not all, of these actions require some computerized support.
* These and other response actions are frequently facilited by a computerized decision support system (DSS)

Business Environment factors that create pressures on organizations

Factors	Description
Markets	strong competition Expanding global markets Booming electronic markets Innovative marketing methods opportunities for outsourcing with IT support Need for real-time, on demand transaction
Consumer demands	Desire for customization Desire for quality, diversity of products & speed of delivery Customers getting powerful & less loyal
Technology	More innovations, new products & new services Increasing obsolescence rate Increasing information overload
	Social networking, web 2.0 & beyond.
Societal	Growing government regulations & deregulations Workforce more diversified, older & composed of more women Prime concerns of homeland security & terrorist attacks Increasing social responsibility of companies Greater emphasis on sustainability

Closing the strategy Gap

One of the major objectives of computerized decision support is to facilitate closing the gap between the current performance of an organization & its desired performance, as expressed in its mission, objectives & goals & the strategy to achieve them.

Information Systems Support for Decision Making

For traditional uses in payroll & bookkeeping functions, computerized systems have penetrated complex managerial areas ranging from the design & management of automated factories to the application of analytical method for the evaluation of proposed merges & acquisitions. Nearly all executives know that information technology is vital to their business & extensively use information technologies

* Computer applications have moved from transaction processing & monitoring activities to problem analysis & solution applications with web-based technologies.

* In many cases accessed through mobile devices. Analytics & BI tools such as data warehousing, data mining, online analytical processing (OLAP), dashboard & the use of the web for decision support are the cornerstones of today's modern management.

* Managers must have high-speed, networked information systems to assist them with their most important task: decision making

* Some developments have clear contributed to facilitating the growth of decision support & analytics in a number of ways & following

→ Group communication & collaboration

* Groups can collabrate and communicate readily by using web-based tools as well as the ubiquitous Smartphones.

* Collaboration is especially important along the supply chain, where partners-all the way from vendors to customers-must share information

* Assembling a group of decision makers, especially experts, in one place can be costly.

* Information systems can improve the collaboration processes of group & enables its members to at different locations.

→ Improved data management

Many decisions involve complex computations, data for these can be stored in different data bases anywhere in the organization & even possible at web sites outside the organization.

* The data may include text, sound graphics & viedo & they can be different languages.

* It may be necessary to transmit data quickly from distance locations.

* Systems today can search, store & transmit data quickly economically, securely & transparently.

→ Managing giant data warehouses & big data

* large data warehouses like the onces operated by walmart contain terebytes & even petabytes of data.

* special method including paiallel computing are available to organize, search & mine the data.

* Technologies that fall under the broad category of Big Data have enabled massive data coming from a variety of sources in many different forms which allows a very different view into organizational performance that was not possible in the Past.

→ Analytics Support

With more data & analysis technologies, more alternatives can be evaluated, forecasts can be improved, risk analysis can be performed quickly & the view of experts can be collected at a reduced cost.

* Expertise can even be derived directly from analytical systems with such tools, decision-makers can perform complex simulations,
* check many possible scenarios & assess diverse impacts quickly & economically. This of course, is the focus of several chapters in the book.

→ Overcoming cognitive limits in processing and storing information:

The term cognitive limits indicates that an individual's problem-solving capability is limited when a wide range of diverse information & knowledge is required.

* Computerized systems enables people to overcome their cognitive limits by quickly accessing & processing vast amount of stored information

→ Knowledge management

Organizations have gathered vast stores of information about their own operations, customers, internal procedures employee interactions through the unstructured & structured communications taking place among the various stakeholders. The systems have become sources of formal & informal support for decision making to managers, although support sometimes they may not even be called KMS

→ Anywhere, any time Support

using wireless technology, managers can access information anytime & from any place, analyze & interpret it & communicate with those involved

* The speed at which information needs to be processed & converted into decisions has truly changed expectations for both consumers and businesses.

Decision support System (DSS)

Type of decision \ Type of control	operational control	Managerial control	Strategic planning
Structured	Accounts receivable. Accounts payable order entry	Budget analysis short-term forecasting personnel reports Make-or-buy	Financial management investment Portfolio warehouse location Distribution systems
Semistructured	Production scheduling Inventory control.	Credit evaluation Budget preparation Plant layout Project scheduling Reward system design Inventory categorization	Building a new plant Mergers & acquisitions New product planning Compensation planning Quality assurance HR policies Inventory planning
unstructured		Negotiating Recruiting an executive Buying hardware lobbying	R&D planning New tech development Social responsibility planning

* In early 1970's, Scott-Morton first articulated the major concepts of DSS.
* DSS is defined as Decision Support System as "interactive computer-based systems, which help decision makers utilize data & models to solve unstructured problems" (Gorry & Scott-Morton 1971)

Components of DSS

* DSS Database
* DSS Software system
* DSS user interface

Types of DSS

* Data driven
* Model driven
* Knowledge driven
* Document driven
* Communication driven

Another classic DSS definition, provided by Keen and Scott-Morton.

* Decision support systems couple the intellectual resources of individuals with the capabilities of the computer to improve the quality of decisions
* It is computer-based support system for management decision-makers who deal with semistructured problems

the term decision support system like management information system (MIS) & other terms in the field of IT is a content-free expression.

* There is no universally accepted definition of DSS
* Actually DSS can be viewed as a conceptual methodology - that is a broad, umbrella term.
* view DSS as a narrower, specific decision support application.

DSS as an umbrella Term

DSS can be used as an umbrella term to describe any computerized system that supports decision making in an organization

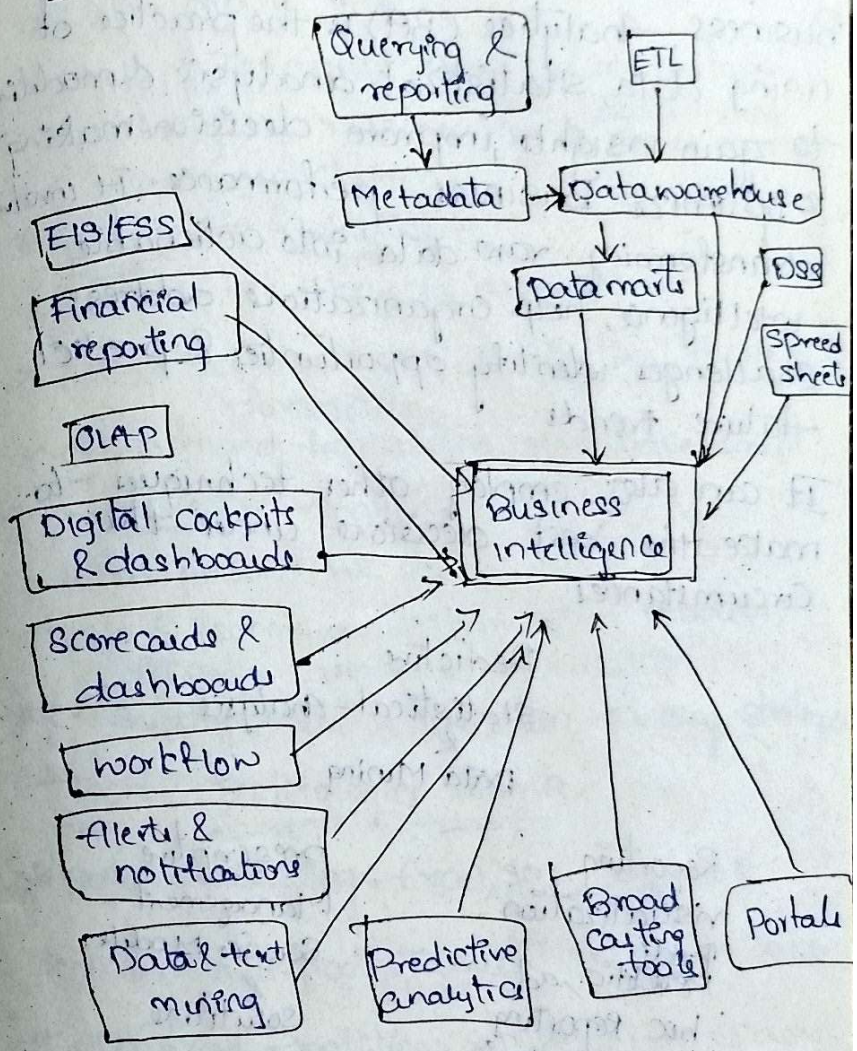
* An organization may have a knowledge management System to guide all its personnel in their problem solving
* Another organization may have separate Support Systems for marketing, finance and accounting
* A Supply chain management (SCM) System for production
* Several rule-based Systems for product repair diagnostics & help Desks.
* DSS encompasses them all

Evolution of DSS into Business Intelligence

In early days of DSS, managers let their staff do some supportive analysis by using DSS tools.

* As pc technology advanced a new generation of managers evolved - one that was comfortable with computing & knew that technology can directly help make intelligent business decisions faster.
* New tools such as OLAP, data warehousing, data mining & intelligent systems delivered web technology, added promised capabilities & easy access to tools, models & data for computer-aided decision making
* These tools started to appear under the names BI & business analytics in the mid-1990's.

Business Intelligence



Business Analytics Overview

Business Analytics (BA) is the practice of using data, statistical analysis & modeling to gain insights, improve decision-making & optimize business performance. It involve transforming raw data into actionable intelligence, help organizations address challenges, identify opportunities & predict future trends

It can also employ other techniques to make the best decisions under the circumstances

Predictive
Statistical Analysis
&
Data Mining

Reporting
visualization
Predi
Predictive, ad
hoc Reporting
Trend Analysis

prescriptive
Management -
Science Models
&
solutions

Three types of Business Analytics

1. Descriptive Analytics
   * what has happened?
   * Tools & Techniques: Data visualization, dashboards, reports
   * Ex: Sales trends analysis, performance metrics

2. Diagnostic Analytics
   * Why did it happen?
   * Tools & Techniques: Root cause analysis, data mining
   * Ex: Analyzing reasons for a sales drop or customer churn

3. predictive Analytics
   * what is likely to happen?
   * Tools & Techniques: ML, Statistical models, forecasting
   * Ex: Demand forecasting, risk assessment

4. prescriptive Analytics
   * What should we do?
   * Tools & Techniques: optimization models, decision analysis, simulation
   * Ex: Supply chain optimization, Pricing strategies

Tools & Technologies in BA

* Data processing: Excel, SQL, Python R
* visualization tools: Tableau, Power BI, Qlik
* Advanced Analytics: SAS, Matlab, Apache Spark
* Machine learning platform: Tensorflow, Scikit learn, Azure ML.

Applications

* Finance
* Marketing
* operations
* Healthcare
* Retail

Benefits

* Improved Decision Making
* increased efficiency
* Enhanced customer satisfaction
* Competitive Advantage

Challenges in BA

* Data quality & integration issues
* Lack of skilled personnel & analytical expertise
* Privacy & security concerns
* Resistance to adopting data driven decision making

Future Trends in BA

* AI & ML integration
* Real-Time Analytics
* Cloud-Based Analytics
* Natural language processing (NLP)
* Ethical AI & Analytics

Brief Introduction To Big Data Analytics

* Big data is data that cannot be stored in a single storage unit.
* Big Data refers to data that is arriving in many different forms, be they structured, unstructured or in a stream
* Two aspects to mag managing data on this scale: Storing & processing
* 3V's (volume, velocity, variety)

Hdfs
Hadoop
MapReduce

Unit-II

Machine versus Men on Jeopardy! The Story of Watson

Watson Overview

* Watson is an advanced computer system designed to answer natural human language Questions
* Developed in 2010 by IBM Research for the DeepQA project, named after IBM's first president, Thomas J. Watson

Background

* IBM Research pursued a challenge to rival Deep Blue & advanced computer science, benefiting science, business & society
* The challenge: build a real-time Jeopardy! Contestant capable of listening, understanding & responding

Competing Against the Best

* In 2011, Watson completed in Jeopardy! 's First human versus-machine match.
* Watson won a two-game match, defeating top players Brad Rutter & Ken Jennings
* Watson excelled in signaling but had trouble with short few word clues