Module I

Decision support and business intelligence-introduction, changing business environments, managing decision making, computerized support for decision making, an early framework, work system view, major tools and techniques, plan

Introduction

This chapter covers the managerial decision making and its computerized support. The business environment today is changing and becoming more and more complex. Organizations are required to make frequent strategic, tactical and organizational decisions. Some of which are very complex. Making such decisions may require considerable data, information and knowledge. Processing these, must be done quickly, frequently in real-time and using computerized support. This module is about using business intelligence as computerized support for managerial decision making.

Changing Business Environments and Computerized Decision Support

To realize why companies are embracing computerized support, including business intelligence a "business ***pressures-responses-support*** model" has been developed. The model components are:

1. The business environment (becomes complex)
2. Organizational responses: be reactive, anticipative, adaptive, and proactive, so as to take advantage of opportunities available
3. Computerized support that facilitates monitoring and enhance response

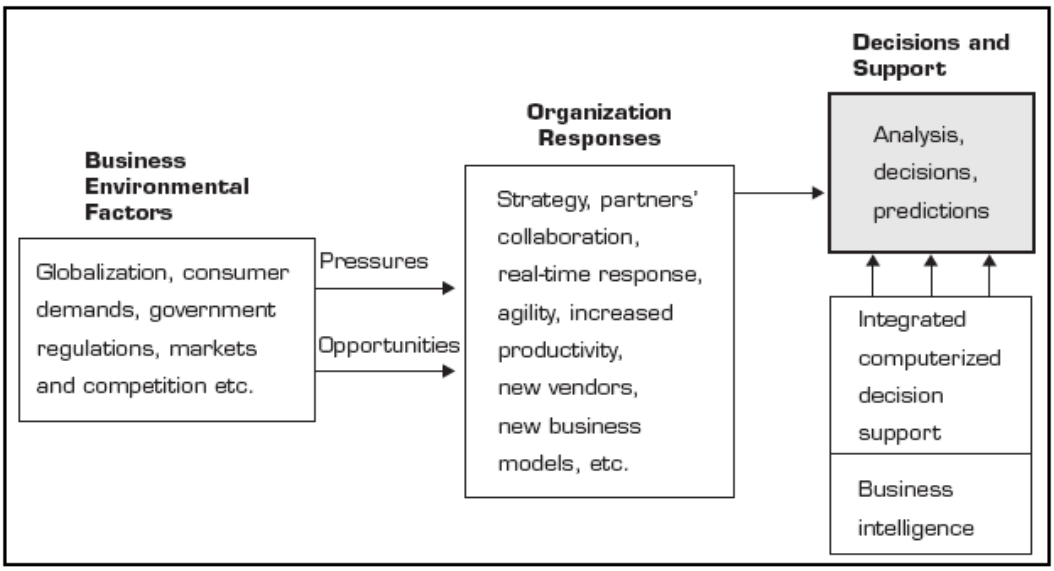


FIGURE 1.1 The Business Pressures–Responses–Support Model

- The business Environment:
  - Today's environment complexity creates
    a) opportunity on one hand and
    b) Problems on the other hand for organizations.
  - Example: Globalization (Internet)
    a) One can easily find suppliers and customers in many countries, which means buying cheaper materials and sell more products and services.
    b) More and stronger competitors.
- The intensity of the business environment factors (Markets, customer demands, Technology and societal) increases with time, leading to more pressure and competition.
- Q) How managers will respond quickly, innovative and agilely under the above environment?
  - By using computerized support. Organizations turned to BI to improve communication and to support executives in their effort to know exactly what is going on in each area of operation (real-time)
- Doing so, organization can cut expenses and increase customer satisfaction.
- Q) What is the major objective of the computerized DS?

– It is to facilitate closing the gap between the current performance of an organization and its desired performance.

TABLE 1.1 Business Environment Factors That Create Pressures on Organizations

Factor	Description
Markets	Strong competition Expanding global markets Booming electronic markets on the Internet Innovative marketing methods Opportunities for outsourcing with IT support Need for real-time, on-demand transactions
Consumer demands	Desire for customization Desire for quality, diversity of products, and speed of delivery Customers getting powerful and less loyal
Technology	More innovations, new products, and new services Increasing obsolescence rate Increasing information overload Social networking, Web 2.0 and beyond
Societal	Growing government regulations and deregulation Workforce more diversified, older, and composed of more women Prime concerns of homeland security and terrorist attacks Necessity of Sarbanes-Oxley Act and other reporting-related legislation Increasing social responsibility of companies Greater emphasis on sustainability

Managerial Decision Making

A decision is selections the best alternative from two or more solutions. Management is a process by which organizational goals are achieved through the use of resources. Resources are considered to be **Input**. Attaining goals is viewed as **output**. The degree of success is measured by **productivity** (ratio of output to input). Managers continuously make decisions to carry out their functions (planning, organizing, directing and controlling).

The level of productivity or the success of management depends on the performance of managerial functions, such as planning, organizing, directing and controlling. To perform their functions, managers are engaged in a continuous process of making decisions. Making a decision means selecting the best alternative from two or more solutions.

<u>The nature of manager's work</u>

Managers perform 10 major roles classified into 3 categories.These roles organized set of behaviours belonging to a position –describe what managers actually do, whereas functions of managers had historically described what managers should do

1. Interpersonal Roles

    i. A manger is a symbol, or a figurehead.

    This role is necessary because of the position occupied. It consists of such duties as signing certain documents required by law and

officially receiving visitors.

ii. A manager serves as a leader i.e., he trains, encourages, remunerates, judges the subordinates.

iii. A manger serves as a liaison between outside contacts such as the community, suppliers and others and the organization.

2. Informational Roles

iv. As monitors, mangers gather information in order to be well informed

v. Managers are disseminators of information flowing from both internal and external sources.

vi. Managers are spokespersons or representatives of the organisation. They speak for subordinates to superiors and represent upper management to subordinates.

3. Decisional roles

vii. Managers as entrepreneurs are initiators, innovators, problem discoverers, and designers of improvement projects that direct and control change in the organisation.

viii. As disturbance handlers, managers react to situations that are unexpected, such as mass absenteeism, resignation of subordinates, or losing of customers.

ix. A third decisional role is that of resource allocator, i.e. who will get what?

x. Finally managers are negotiators. The mangers negotiate with customers, suppliers etc.

The above ten roles form an integrated whole. Thus, managers act as channels of communication within the organisation.

- To execute these roles, managers need information that is delivered efficiently and timely by computers. Manager is a decision maker. Organizations are filled with decision makers at different levels.

<u>The Decision Making Process</u>

- Lately, managers considered decision making as a talent acquired over a long period of time through experience.

- Managers usually make decision by following a 4 steps process:
    a. Defining the problem (a decision situation that may deal with some difficulty or with an opportunity)
    b. Constructing a model that describes the real-world problem
    c. Identifying possible solutions to the modeled problem and evaluating the solutions
    d. Comparing, choosing, and recommending a potential solution to the problem
- One must make sure that sufficient alternative solutions are being considered, that the consequences using these alternatives can be predicted. The environment factors make the evaluation process difficult for:
    a. Technology and globalization result in more alternatives
    b. Uncertainties produced from government, politics competition and changing consumer demand, make prediction difficult.
    c. Need for making rapid decisions
    d. Environmental complexity grows every day, making decisions a complex task

  Based on above 4 reasons, it is nearly impossible to rely on trial-and-error approach to management. Managers must use new tools and techniques for decision making.

Computerized Support for Decision Making

Computerized supports are now penetrating complex managerial areas:

- Design
- Management of automated factories
- Application of AI methods
- Evaluation process

Computer applications have moved from transaction processing and monitoring activities to problem analysis and solution applications. Most of the activities are done with the web-based technologies.

The followings are the cornerstone of today's modern management for decision support:

1. BI tools
2. Data warehousing
3. Data Mining

4. Online Analytical processing (OLAP)
5. Dashboards
6. The web

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

Why use computerized decision support systems?

1. Speedy computations: enables decision makers to perform quick computations, low cost, timely and thousands of alternatives can be evaluated fast
2. Improved communication and collaboration: groups in different locations can use the web-based tools to communicate
3. Increased productivity of group members: using web-based tools saves money and time, since group gathering in one place is no more needed. Also software help decision makers to determine the best way to run a business in a short time
4. Improved data management: data stored inside and outside the organization (web). Computers transmit; search and store needed data quickly, economically, securely and transparently (how?)
5. Managing giant data warehouses: computers can deal (store, access) with huge digital data of any type quickly (parallel computers)
6. Quality support: quality of decisions can be improved since more data can be accessed, more alternatives can be evaluated, view of experts can be collected quickly, AI methods can be used to derive expertise, and complex simulations can be performed.
7. Agility support: DS technologies (intelligent systems) can empower people by allowing them to make good decisions quickly, even if they lack knowledge.
8. Overcoming cognitive limits in processing and storing information: the man mind has limited ability to process and store information.
    - Cognitive limits indicate that the individual's problem-solving capability is limited when a wide range of diverse information and knowledge is required.
    - Computerized systems enable people to overcome the cognitive limits by quickly accessing and processing vast amount of stored information.
9. Using the Web: the web changed how decision makers are supported.
    - Access to vast body of data ,information, and knowledge available around

the world

- A common user friendly GUI that is easy to learn to use and readily available
- The ability to effectively collaborate with remote partners
- The availability of intelligent search tools that managers to find the information they need quickly and inexpensively

10. Anywhere, anytime support: using wireless technology , managers can access information anytime and from anyplace, analyze and interpret it, and communicate with those involved.

An Early Framework for Computerized Decision Support

Gorry and Scott-Morton created and used this framework in the early 1970's, and the framework then evolved into a new technology called DSS.

FIGURE 1.2 Decision Support Frameworks

	Type of Control		
Type of Decision	**Operational Control**	**Managerial Control**	**Strategic Planning**
Structured	1 Accounts receivable, accounts payable, order entry	2 Budget analysis, short-term forecasting, personnel reports, make-or-buy	3 Financial management (investment), warehouse location, distribution systems
Semistructured	4 Production scheduling, inventory control	5 Credit evaluation, budget preparation, plant layout, project scheduling, reward system design, inventory categorization	6 Building new plant, mergers and acquisitions, new product planning, compensation planning, quality assurance planning, HR policies, inventory planning
Unstructured	7 Selecting a cover for a magazine, buying software, approving loans, help desk	8 Negotiating, recruiting an executive, buying hardware, lobbying	9 R & D planning, new technology development, social responsibility planning

Figure shows the 3x3 matrix proposed framework for computerized DS introduced by Gorry and Scott (1971).

The two dimensions are:

– D1: Degree of structuredness for the type of the decision.

– D2: Type of control

Degree of structuredness (D1)

1. Structured decisions (programmed): routine and typically repetitive problems for which standard solution exist.
2. Unstructured decisions (non programmed): complex problems for which there are no cut-and-dried solution methods.

Four-phase decision making process

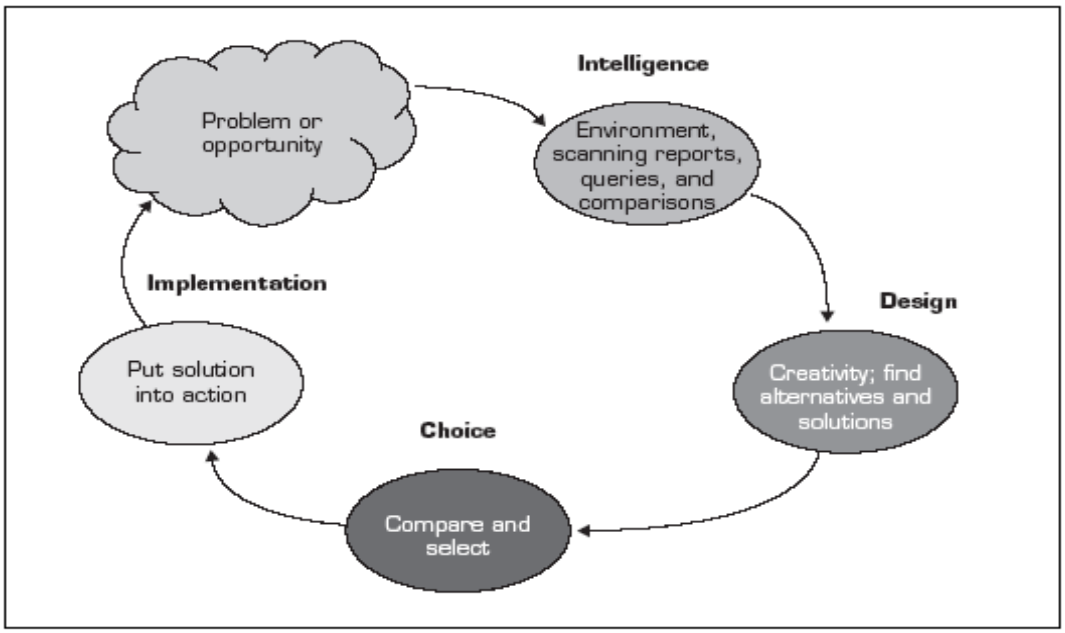
Intelligence: This phase involves searching for conditions that call for decisions.

Design: This phase involves inventing, developing and analyzing possible alternative courses of action

Choice: This phase involves selecting a course of action from among those available.

Implementation: This phase involves adapting the selected course of action to the decision situation (i.e., problem solving or opportunity exploiting)

FIGURE 1.3 The Steps of Decision Support



- An unstructured problem is one in which none of the four phases is structured
- In a structured problem, all phases are structured. the procedures for obtaining the best

solution are known.

- Semi structured problems: fall between structured and unstructured problems, having some structured elements and some unstructured elements .Such as setting marketing budget for customer product

Types of control in all managerial activities (D2):

Type of control that encompass all managerial activities:

- Strategic planning: which involves long range goals and policies for resource allocation
- Management control: the acquisition and efficient use of efficient use of resources in the accomplishment of organizational goals
- Operational control: the efficient and execution of specific tasks

The decision support matrix

- The initial purpose of this matrix was to suggest different types of computerized support to different cells in the matrix
- Structures and operational control-oriented tasks (cells 1, 2, 4) are performed by lower-level managers.
- Tasks (cells 6,8,9) are performed by top executives or highly trained specialists

Computer support for structured decisions

For each category of decision, an easy-to-apply prescribed model and solution approach have been developed; this approach is called management science (MS). Also called operations research (OR).

Management science (MS) or operations research (OR)

The application of a **scientific** approach and **mathematical** models to the analysis and solution of managerial decision situations (e.g., problems, opportunities)

MS says that solving a problem, managers should follow the 4 steps system.

MS added a new step (step 2) to the process:

1. Defining the problem (a decision situation that may deal with some difficulty or with an opportunity)
2. Classify the problem into a standard category
3. Constructing a model that describes the real-world problem
4. Identifying possible solutions to the modeled problem and

evaluating the solutions

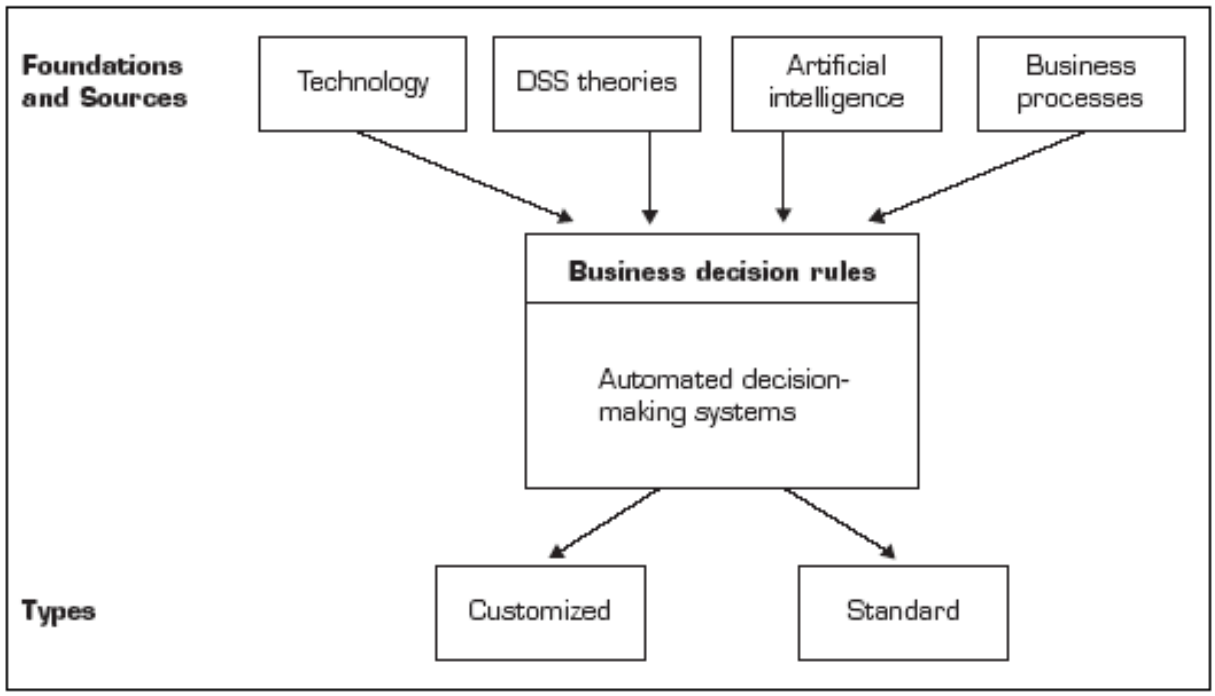
5. Comparing, choosing, and recommending a potential solution to the problem

Computerized methodologies can find solutions to the standard category model quickly and efficiently.

Automated decision systems (ADS)

A new approach to support decision making is called ADS.ADS is a business rules-based system that provides a solution uses intelligence, usually in one functional area, to a specific repetitive decisions (such as pricing). ADS are mostly suitable for frontline employees who can see the customer information online and frequently make quick decisions

FIGURE 1.4 Automated Decision-Making Framework



Computer support for unstructured decision

- Unstructured problems can be only partially supported by standard computerized quantitative methods.
- Customized solutions are usually necessary; such solutions may require certain expertise that can be provided by intelligent systems.

- Intuition and judgment, computerized communication, collaboration technologies and knowledge management play a great role in this type of decisions.

Computer support for semi structured problems

- For such problems a combination of both standard solution procedures and human judgment may be involved.
- MS can provide models for the structured portion.
- For the unstructured portion, a DSS can improve the quality of the information on which the decision is based by providing a range of alternative solutions along with their potential impacts.

The benefits of computerized decision support

- Companies work in an unstable or rapidly changing economy.
- E-commerce is changing the ways business is done.
- Existing IS do not fully support decision making.
- There are difficulties in tracking the numerous business operations. (timely information is needed)
- Competition has increased especially global competition. (Coast reduction is needed)

A Work System View of Decision Support

Work system

A system in which human participants and or machines perform a business process using information, technology, and other resources to produce products and/or services for internal or external customers.

A work system usually have nine elements, each of these elements can be varied or modified to provide better decision quality:

1. Business process: variations in the process rationale, sequence of steps, or methods used for performing particular steps
2. Participants: Better training better skills, higher levels of commitment, or better real time or delayed feedback
3. Information: better information, quality ,information availability or information presentation

4. Technology: better data storage and retrieval, models, algorithms, statistical or graphical capabilities ,or computer interactions
5. Product and services : Better ways to evaluate potential decisions
6. Customers : Better ways to involve customers in the decision process and to obtain greater clarity about their needs.
7. Infrastructure: More effective use of shared infrastructure, which might lead to improvements
8. Environment: Better methods for incorporating concerns from the surrounding environment.
9. Strategy :A fundamentally different operational strategy for the work system

The work system concept is interesting, and it has considerable expanded the field of managerial decision support. Much more research is needed before this can be used as a guide to both the academic and practical words.

The Major Tools and Techniques of Managerial Decision Support

A large number of tools and techniques have been developed over the years to support managerial decision making. Some of them appear under different names and definitions.

- Data management
- Reporting status tracking
- Visualization
- Business analytics
- Strategy and performance management
- Communication and collaboration
- Knowledge management
- Intelligent systems
- Enterprise systems

TABLE 1.4 Computerized Tools for Decision Support

Tool Category	Tools and Their Acronyms
Data management	Databases and database management system (DBMS) Extraction, transformation, and load (ETL) systems Data warehouses (DW), real-time DW, and data marts
Reporting status tracking	Online analytical processing (OLAP) Executive information systems (EIS)
Visualization	Geographical information systems (GIS) Dashboards Information portals Multidimensional presentations
Business analytics	Optimization Data mining, Web mining, and text mining Web analytics
Strategy and performance management	Business performance management (BPM)/Corporate performance management (CPM) Business activity management (BAM) Dashboards and scorecards
Communication and collaboration	Group decision support systems (GDSS) Group support systems (GSS) Collaborative information portals and systems
Social networking	Web 2.0
Knowledge management	Knowledge management systems (KMS) Expert locating systems
Intelligent systems	Expert systems (ES) Artificial neural networks (ANN) Fuzzy logic Genetic algorithms Intelligent agents Automated decision systems (ADS)

Tools-Web connection

All of these tools are available in both web-based and non web-based formats. The relationships between these tools and the web can be viewed as a two way street.

Hybrid (integrated) support systems

A support system that uses several tools and techniques to assist management in solving managerial or organizational problems and assess opportunities and strategies

- What is to select? Developing (Building) or acquiring (buying or renting) support systems
- Justification and cost-benefit analysis are needed to take the decision for the above.
- Security and protection of privacy are very important issues.
- Integration of MSS applications and other systems are very important.
- The Web in DSS/BI implementation is widely used

Information portals and MSS: visualization aids serves both customers and employees

A hybrid approach is often related to a problem solving approach that uses several tools in different ways such as the following

i. Use each tool independently to solve different aspects of the problem

ii. Use several loosely integrated tools. This mainly involves transferring data from one tool to another for further processing

iii. Use several tightly integrated tools. From the user's standpoint, the tool appears as a unified system.

In addition to performing different tasks in the problem solving process, tools can support each other. For e.g. an expert system can enhance the modeling and data management of a DSS.