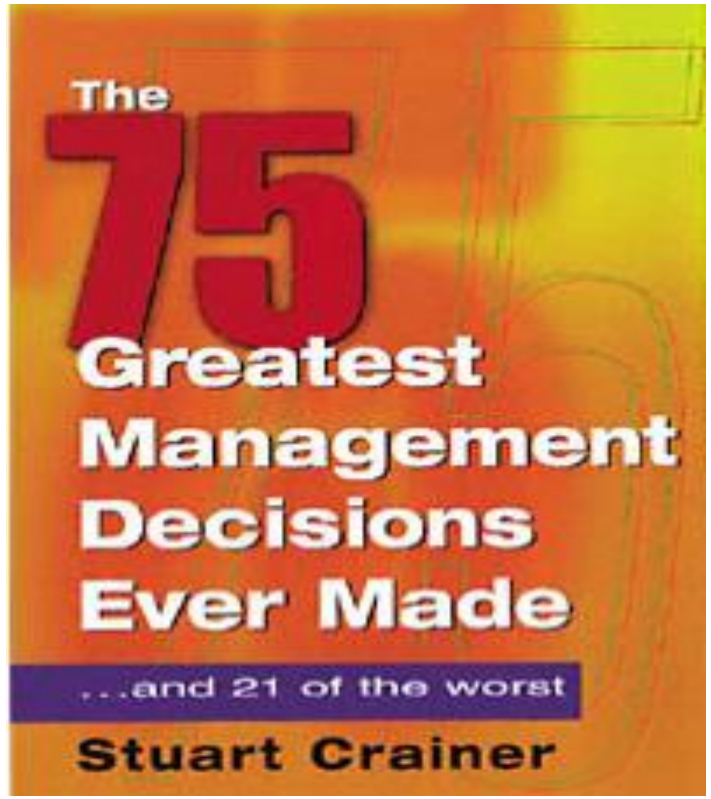
Business Intelligence

"***Any fool can make things bigger, more complex, and more violent. It takes a touch of genius-and a lot of courage-to move in the opposite direction.***" - Albert Einstein

Instead
of the BI acronym



tinyurl.com/y6k228al

Business Intelligence (BI) is a discipline that aligns:

- systems,
- data,
- people,
- and processes

to provide leaders with consumable information in the form of reports, dashboards, or online analytics to make better decisions.

https://continuingstudies.stanford.edu/coursework/document.php?id=161

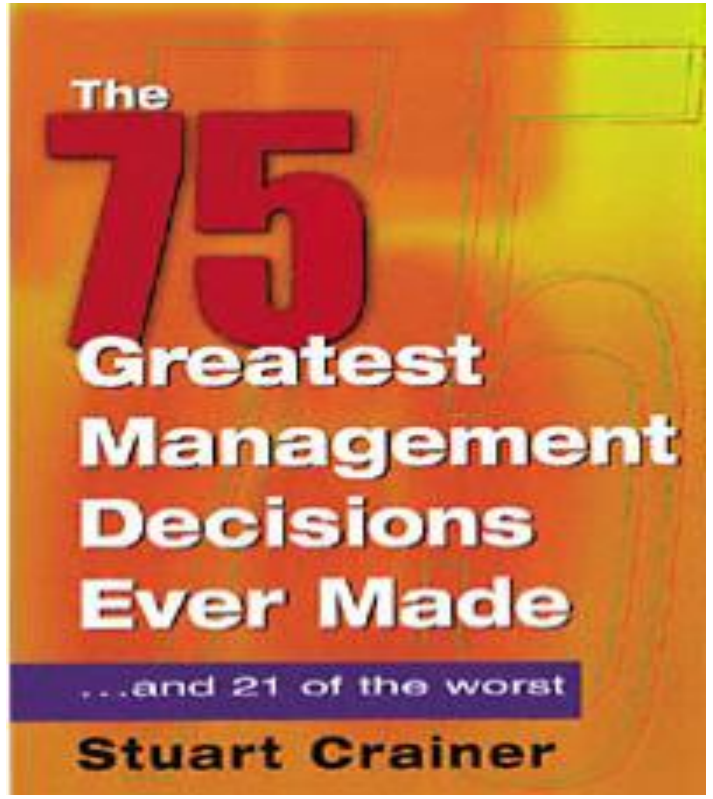
"***Knowledge has become the key economic resource and the dominant, if not the only, source of competitive advantage.***" - Peter F. Drucker, management consultant, educator and author

Instead
of the BI acronym

INVENTORS: One is to come up with a great business idea and something else to change in the face of the business world. Henry Ford, Apple and Sears Roebuck are among those announcing a new era.

THE NAME MAKES THE GAME: Deciding to name your company IBM (International Business Machines) instead of Computing Tabulating & Recording Co. it can make the difference between a modest success and one at the planetary level. To give a baby a name is a difficult thing; giving a company a name is even more problematic.

THE MAGIC OF MARKETING: A single marketing decision can change the shape and fate of a business. As a testimony, this is the decision of the Coca-Cola company to make its product available to US troops during the war, or the decision of the Greatful Dead to allow fans to record their concerts. Such brilliant decisions can take various forms.



tinyurl.com/y6k228al

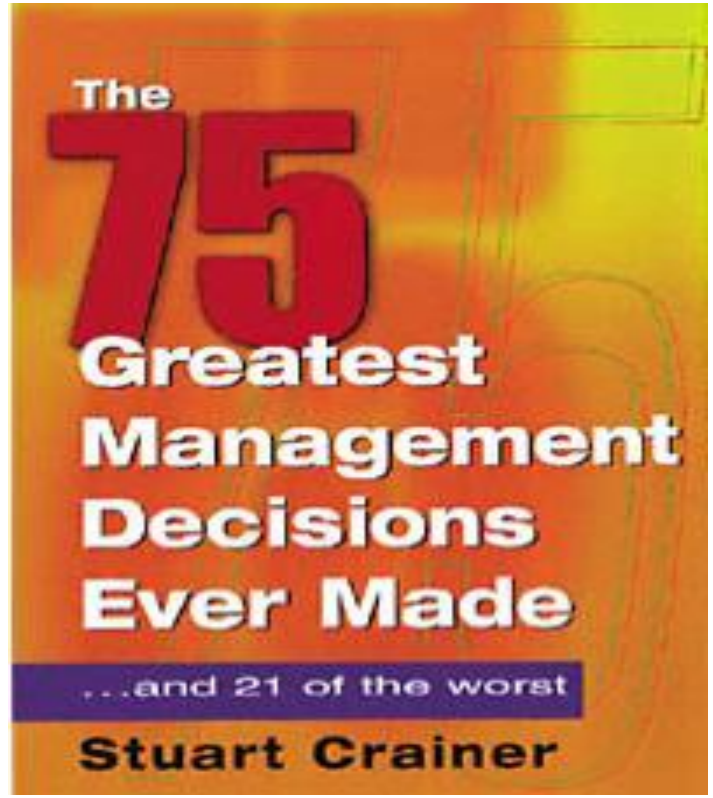
This celebration of the best 75 management decisions is elaborated taking into account the whole history of humanity…

Instead of the BI acronym

LUCKY FORECASTS: intuition / inner feeling / instinct. Call it the way you want, but it plays a huge role in decision making, even if you will not share it to the board. Do not forget the analysis but rely also on intuition.

BRIGHT IDEAS: Innovation is the glory anthem of modern times. In the midst of the gray reality of business life, bright ideas are often noticed by absence; but some have managed to spread color in this gray environment.

THE POWER OF PEOPLE: People are everything. In every business people are involved. The trouble is that, among the papers, deadlines, important issues and corporate policies, people are easily forgotten ...



tinyurl.com/y6k228al

... and reminds us that troubles are more common in life than triumph (especially in business life).

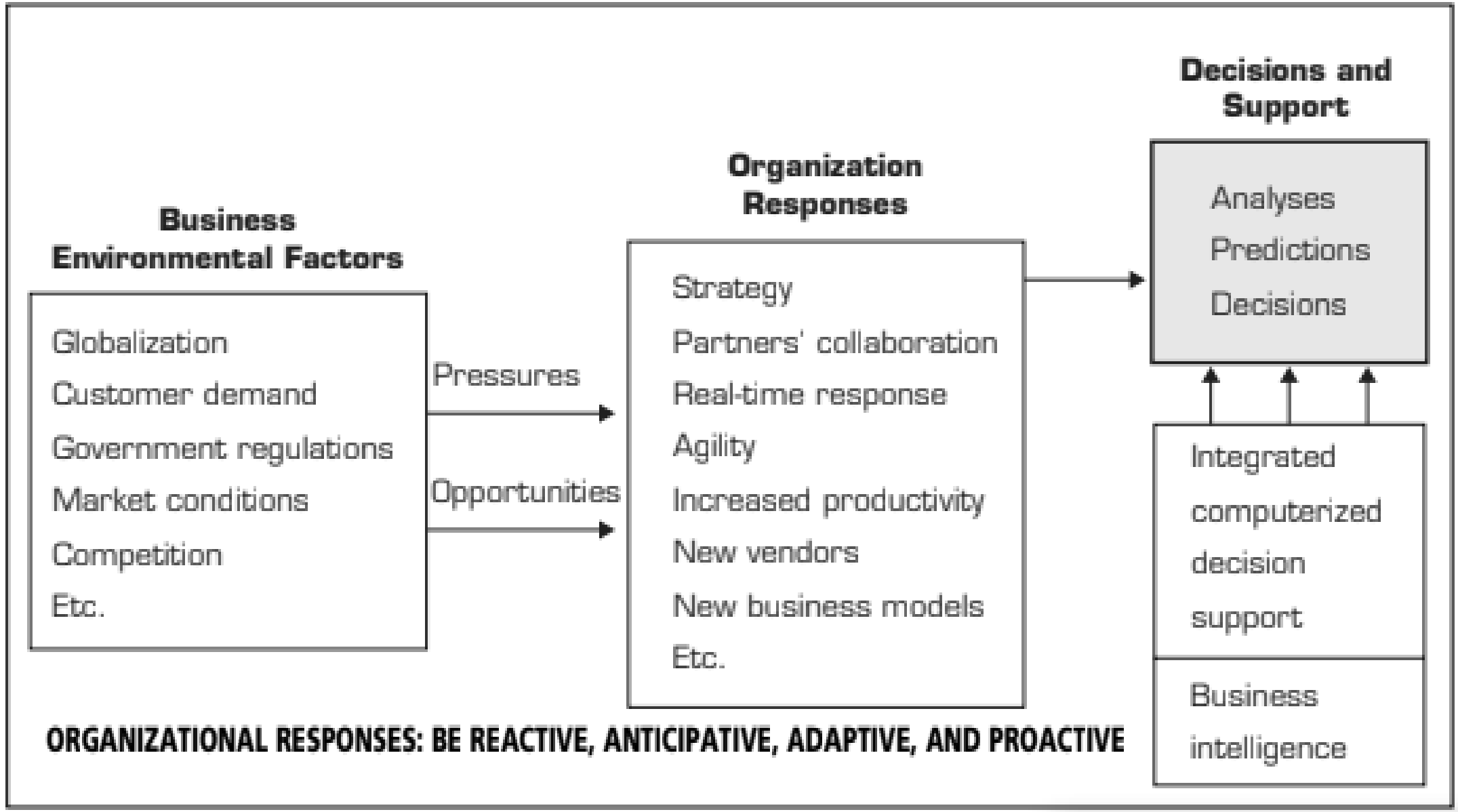
The goal of the BI discipline

This course aims to develop the intellectual skills of:

- inquiry
- analysis
- interpretation
- and synthesis

necessary for successful BI design, implementation and management

"***If you don't have a competitive advantage, don't compete!***" – Jack Welsh, CEO, General Electric



The Business Pressures–Responses–Support Model

Sharda, Delen and Turban, 2014

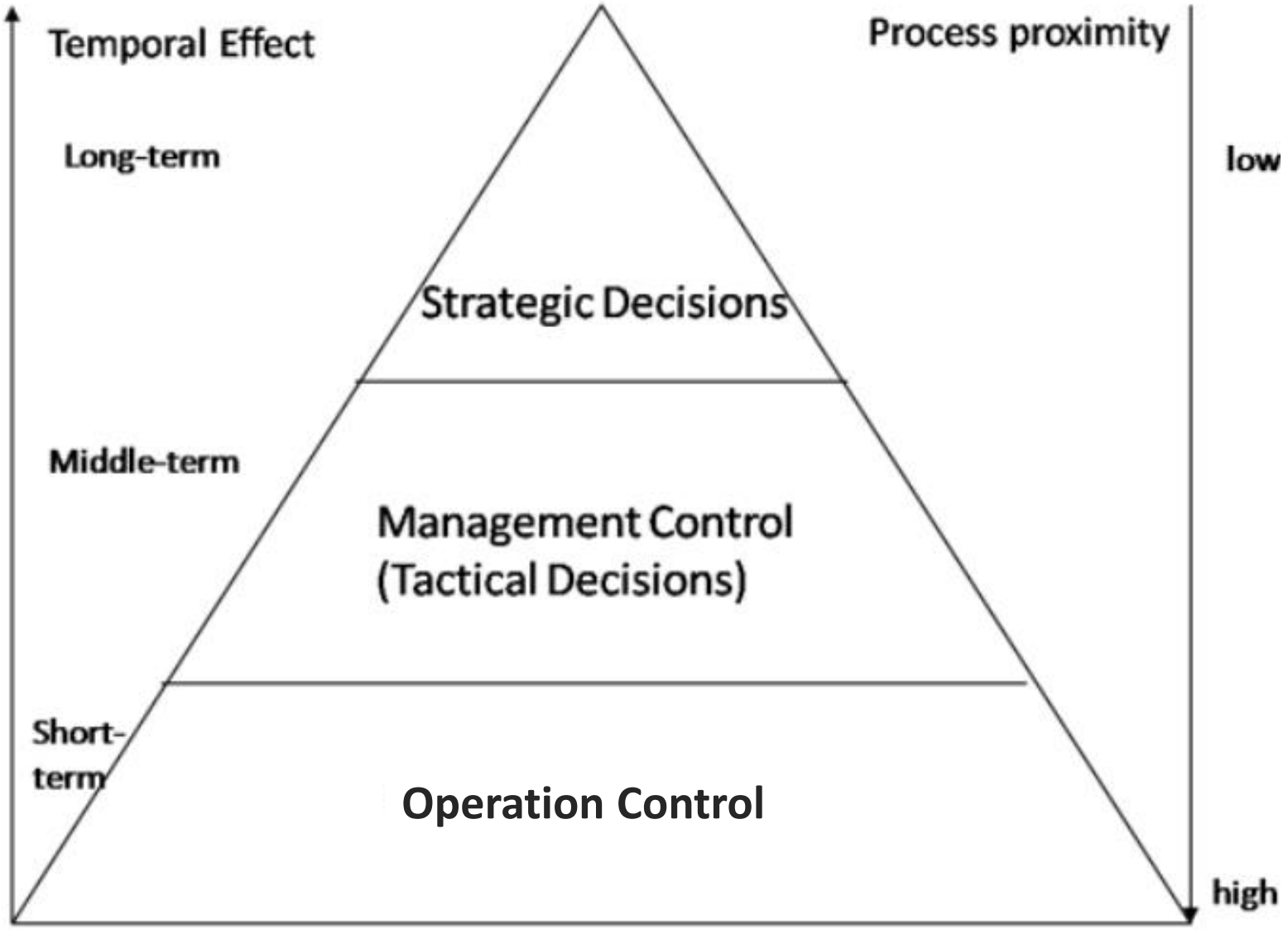


Fig. 1. Decision pyramid based on [1]

Anthony, R.N. Planning and Control Systems: A Framework for Analysis. Harvard University, Boston, USA, 1965

Mintzberg's 10 Managerial Roles

Role	Description
Interpersonal	
Figurehead	Is symbolic head; obliged to perform a number of routine duties of a legal or social nature
Leader	Is responsible for the motivation and activation of subordinates; responsible for staffing, training, and associated duties
Liaison	Maintains self-developed network of outside contacts and informers who provide favors and information
Informational	
Monitor	Seeks and receives a wide variety of special information (much of it current) to develop a thorough understanding of the organization and environment; emerges as the nerve center of the organization's internal and external information
Disseminator	Transmits information received from outsiders or from subordinates to members of the organization; some of this information is factual, and some involves interpretation and integration
Spokesperson	Transmits information to outsiders about the organization's plans, policies, actions, results, and so forth; serves as an expert on the organization's industry
Decisional	
Entrepreneur	Searches the organization and its environment for opportunities and initiates improvement projects to bring about change; supervises design of certain projects
Disturbance handler	Is responsible for corrective action when the organization faces important, unexpected disturbances
Resource allocator	Is responsible for the allocation of organizational resources of all kinds; in effect, is responsible for the making or approval of all significant organizational decisions
Negotiator	Is responsible for representing the organization at major negotiations

Sources: Compiled from H. A. Mintzberg, *The Nature of Managerial Work*. Prentice Hall, Englewood Cliffs, NJ, 1980; and H. A. Mintzberg, *The Rise and Fall of Strategic Planning*. The Free Press, New York, 1993.

Mintzberg's
10 Managerial Roles

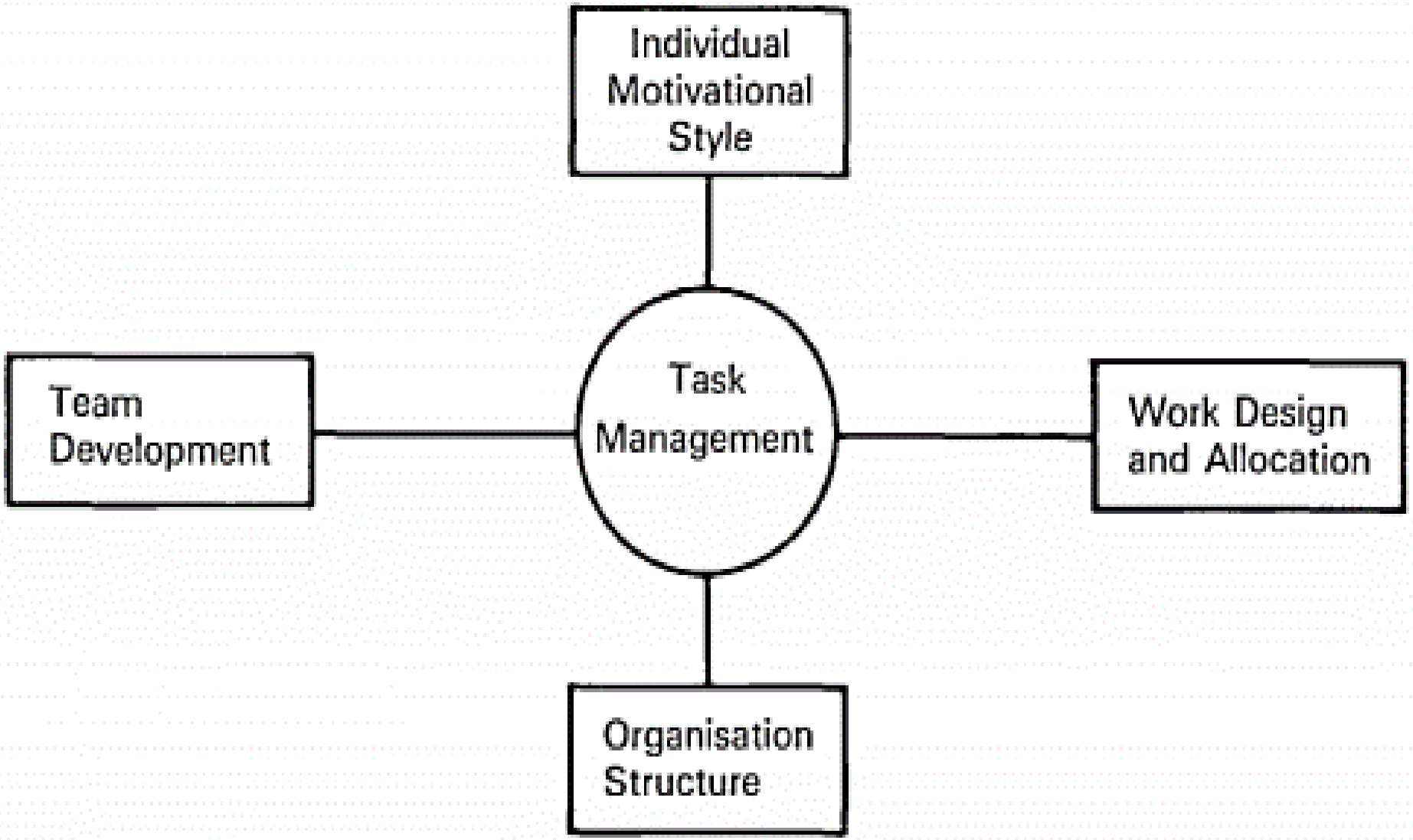
and the "4 stroke decision making engine" often reduced to: Intelligence, Design & Choice

To perform these roles, managers need information that is delivered efficiently and in a timely manner to personal computers (PCs) on their desktops and to mobile devices. This information is delivered by networks, generally via Web technologies.

Managers usually make decisions by following a four-step process

1. Define the problem (i.e., a decision situation that may deal with some difficulty or with an opportunity).
2. Construct a model that describes the real-world problem.
3. Identify possible solutions to the modeled problem and evaluate the solutions.
4. Compare, choose, and recommend a potential solution to the problem.

Managerial Styles – Margerison&Lewis (1981)



Managerial Styles – Margerison&Lewis (1981) Establishing Relationships

Extravert Approach	Introvert Approach
— Will often think things out by talking them through	— Prefers to think things out before speaking
— Enjoys meeting other people and often seeks social gatherings	— Does not have a high need to meet regularly with others
— Enjoys a variety of tasks and activities	— Likes to concentrate on few tasks at a time
— Stimulated by unanticipated interruptions	— Dislikes unanticipated interruptions
— When speaking publicly will often talk impromptu	— When speaking publicly will prepare in depth and speak to a plan
— Likely to contribute a lot at meetings	— May be more quiet at meetings
— Can be impulsive	— More likely to consider things before acting

Managerial Styles – Margerison&Lewis (1981) Generating Data

Sensing Approach	Intuitive Approach
— Prefers practical problems	— Enjoys ambiguous problems
— Prefers systems and methods	— Gets bored with routine problems
— Likes to work with tested ideas	— Regularly floats new ideas
— Likes to work with real things	— Sees possibilities and implications
— Patient with routine detail	— Frequently jumps beyond the facts
— Will test establish facts	— May get facts wrong
— Pays attention to facts and detail	— Has creative vision and insight
— Wants to see detailed parts	— Follows their inspirations
— Likes schedule of working	— Searches for the new innovation
— Searches for standard problem solving approach	— Likes complexity and searches for creative approaches

Managerial Styles – Margerison&Lewis (1981) Making Decisions

Thinking Approach	Feelings Approach
— Tries to establish objective decision criteria	— Has personal subjective decision criteria
— Measure decisions against payoffs	— Measure decisions against beliefs
— Can be seen as detached and cold	— Can be seen as over committed to a point of view
— Believes in deciding according to situation	— Believes in deciding on personal considerations
— Is likely to be flexible depending on situation	— Is likely to be nostalgic, holding to traditional ways
— Negotiates on the evidence	— Negotiation on rights and wrongs of the issues
— Concern for fairness based on the rules	— Believes fairness relates to values and beliefs
— Likes analysis and clarity	— Likes harmony based on common values
— Sets objectives and beliefs follow	— Objectives emerge from beliefs
— Task orientated	— Principles orientated

Managerial Styles – Margerison&Lewis (1981) Establishing Priorities

Judging Approach	Perceptive Approach
— Like clarity and order	— Enjoy searching and finding
— Concerned with resolving matters	— May procrastinate in search for even better information
— Dislike ambiguity and loose	— Can tolerate ambiguity
— Very orderly	— Concerned to know, not organise
— May rush to quick decisions	— Take in lots of data—maybe too much
— Can be somewhat inflexible once judgement is made	— Open minded and curious
— Concerned to work to a plan	— Work according to the requirements of the data
— Emphasise decision taking over information getting	— Emphasis on diagnosing over concluding and resolving
— Concern is to implement	— Concern is to know
— Like to get things resolved and operating	— Like to find out as much as possible before action.

Managerial Styles – Margerison&Lewis (1981)

Overall Profiles

E EXTRAVERT PREFERENCE Prefers to live in contact with others and things.	or	I INTROVERT PREFERENCE Prefers to be more self-contained and work things out personally.
S SENSING PREFERENCE Puts emphasis on fact, details and concrete knowledge.	or	N INTUITION PREFERENCE Puts emphasis on possibilities, imagination, creativity and seeing things as à whole.
T THINKING PREFERENCE Puts emphasis on analysis using logic and rationality.	or	F FEELING PREFERENCE Puts emphasis on human values, establishing personal friendships, decisions mainly on beliefs and likes.
J JUDGING PREFERENCE Puts emphasis on order through reaching decisions and resolving issues.	or	P PERCEIVING PREFERENCE Puts emphasis on gathering information and obtaining as much data as possible.

Change

Sensation types	—	present orientation
Intuitive types	—	future orientation
Feeling types	—	past orientation
Thinking types	—	time as a linear continuum

Creativity and Innovation

Sensing - Thinking	ST	Practicality
Sensing - Feeling	SF	Social Relations
Intuitive - Feeling	NF	Idealism
Intuitive - Thinking	NT	Theory

Managerial Styles – Margerison&Lewis (1981)

Full range of options

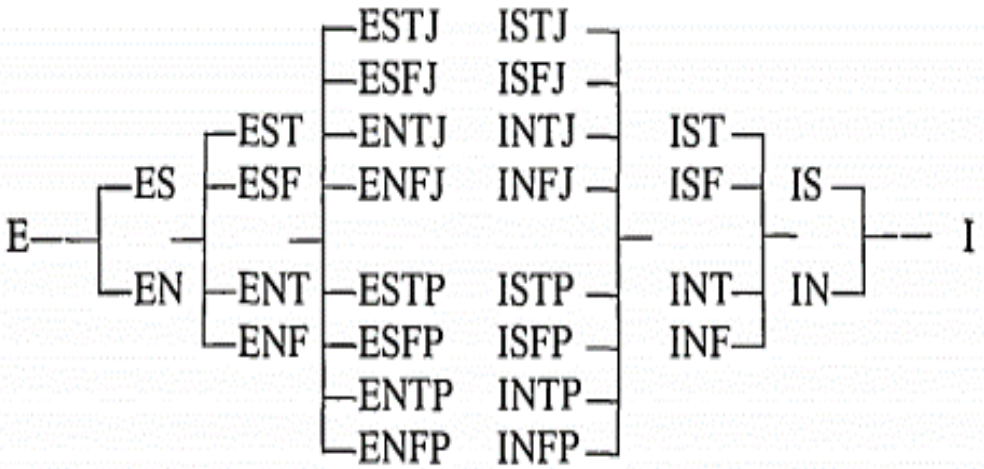
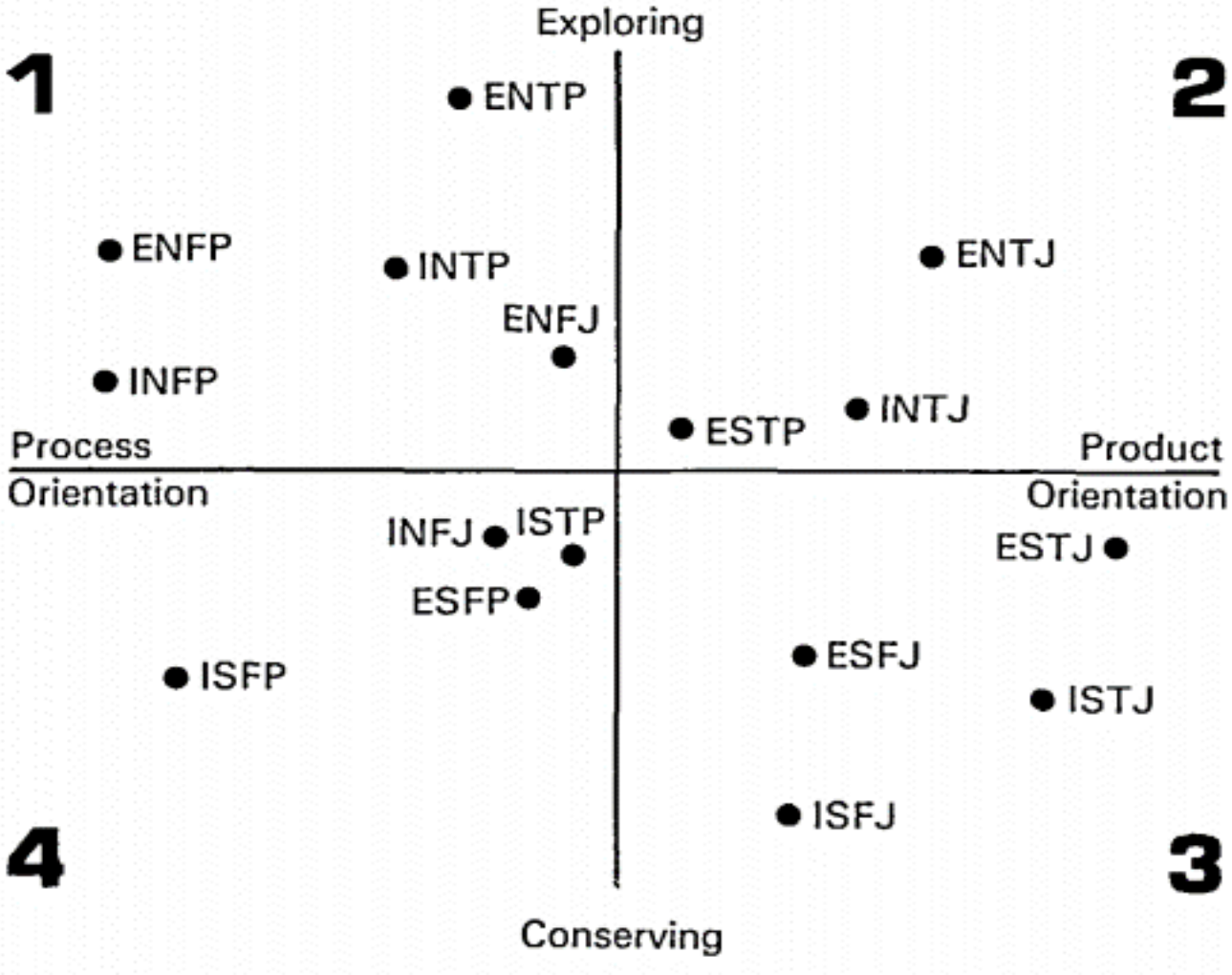


Figure 1. Plots of Jungian Types in Two Factors



Developments for the benefit of increasing decision-support needs

Computer applications have moved from transaction processing and monitoring activities to problem analysis and solution applications, and much of the activity is done with Web-based technologies, in many cases accessed through mobile devices. Analytics and BI tools such as data warehousing, data mining, online analytical processing (OLAP), **dashboards**, and the use of the Web for decision support are the cornerstones of today's modern management. Managers must have high-speed, networked information systems (wireline or wireless) to assist them with their most important task: making decisions. Besides the obvious growth in hardware, software, and network capacities, some developments have clearly contributed to facilitating growth of decision support and analytics in a number of ways, including the following:

- ***Group communication and collaboration.***
- ***Improved data management.***
- ***Managing giant data warehouses and Big Data.***
- ***Analytical support.***
- ***Overcoming cognitive limits in processing and storing information.***
- ***Knowledge management.***
- ***Anywhere, any time support.***

Sharda, Delen and Turban, 2014

- ***Group communication and collaboration.*** Many decisions are made today by groups whose members may be in different locations. Groups can collaborate 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 process of a group and enable its members to be at different locations (saving travel costs).
- ***Improved data management.*** Many decisions involve complex computations. Data for these can be stored in different databases anywhere in the organization and even possibly at Web sites outside the organization. The data may include text, sound, graphics, and video, and they can be in different languages. It may be necessary to transmit data quickly from distant locations. Systems today can search, store, and transmit needed data quickly, economically, securely, and transparently.

Sharda, Delen and Turban, 2014

- ***Managing giant data warehouses and Big Data.*** Large data warehouses, like the ones operated by Walmart, contain terabytes and even petabytes of data. Special methods, including parallel computing, are available to organize, search, and mine the data. The costs related to data warehousing are declining. Technologies that fall under the broad category of Big Data have enabled massive data coming from a variety of sources and in many different forms, which allows a very different view into organizational performance that was not possible in the past.
- ***Analytical support.*** With more data and analysis technologies, more alternatives can be evaluated, forecasts can be improved, risk analysis can be performed quickly, and the views of experts (some of whom may be in remote locations) can be collected quickly and 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, and assess diverse impacts quickly and economically. This, of course, is the focus of several chapters in the book.

Sharda, Delen and Turban, 2014

- ***Overcoming cognitive limits in processing and storing information.*** According to Simon (1977), the human mind has only a limited ability to process and store information. People sometimes find it difficult to recall and use information in an error-free fashion due to their cognitive limits. The term *cognitive limits* indicates that an individual's problem-solving capability is limited when a wide range of diverse information and knowledge is required. Computerized systems enable people to overcome their cognitive limits by quickly accessing and processing vast amounts of stored information

- ***Knowledge management.*** Organizations have gathered vast stores of information about their own operations, customers, internal procedures, employee interactions, and so forth through the unstructured and structured communications taking place among the various stakeholders. Knowledge management systems (KMS, have become sources of formal and informal support for decision making to managers, although sometimes they may not even be called *KMS*.
- ***Anywhere, any time support.*** Using wireless technology, managers can access information anytime and from any place, analyze and interpret it, and communicate with those involved. This perhaps is the biggest change that has occurred in the last few years. The speed at which information needs to be processed and converted into decisions has truly changed expectations for both consumers and businesses.

Sharda, Delen and Turban, 2014

The Gorry and Scott-Morton Classical Framework

Gorry and Scott-Morton (1971) proposed a framework that is a 3-by-3 matrix, as shown in Figure 1.2. The two dimensions are the degree of structuredness and the types of control.

	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 portfolio 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 a new plant Mergers & acquisitions New product planning Compensation planning Quality assurance HR policies Inventory planning
Unstructured	7 Buying software Approving loans Operating a help desk Selecting a cover for a magazine	8 Negotiating Recruiting an executive Buying hardware Lobbying	9 R & D planning New tech development Social responsibility planning

1,2 &4 – lower-level managers

6,8 &9 – top executives / highly trained specialists

Sharda, Delen and Turban, 2014

DEGREE OF STRUCTUREDNESS The left side of Figure is based on Simon's (1977) idea that decision-making processes fall along a continuum that ranges from highly structured (sometimes called *programmed*) to highly unstructured (i.e., *nonprogrammed*) decisions. Structured processes are routine and typically repetitive problems for which standard solution methods exist. *Unstructured processes* are fuzzy, complex problems for which there are no cut-and-dried solution methods.

An **unstructured problem** is one where the articulation of the problem or the solution approach may be unstructured in itself. In a **structured problem**, the procedures for obtaining the best (or at least a good enough) solution are known. Whether the problem involves finding an appropriate inventory level or choosing an optimal investment strategy, the objectives are clearly defined. Common objectives are cost minimization and profit maximization.

Semistructured problems fall between structured and unstructured problems, having some structured elements and some unstructured elements. Keen and Scott-Morton (1978) mentioned trading bonds, setting marketing budgets for consumer products, and performing capital acquisition analysis as semistructured problems.

Sharda, Delen and Turban, 2014

Computer Support for Structured Decisions

Computers have historically supported structured and some semistructured decisions, especially those that involve operational and managerial control, since the 1960s. Operational and managerial control decisions are made in all functional areas, especially in finance and production (i.e., operations) management.

Structured problems, which are encountered repeatedly, have a high level of structure. It is therefore possible to abstract, analyze, and classify them into specific categories. For example, a make-or-buy decision is one category. Other examples of categories are capital budgeting, allocation of resources, distribution, procurement, planning, and inventory control decisions. For each category of decision, an easy-to-apply prescribed model and solution approach have been developed, generally as quantitative formulas. Therefore, it is possible to use a *scientific approach* for automating portions of managerial decision making.

Sharda, Delen and Turban, 2014

Computer Support for Unstructured Decisions

Unstructured problems can be only partially supported by standard computerized quantitative methods. It is usually necessary to develop customized solutions. However, such solutions may benefit from data and information generated from corporate or external data sources. Intuition and judgment may play a large role in these types of decisions, as may computerized communication and collaboration technologies, as well as knowledge management

Computer Support for Semistructured Problems

Solving semistructured problems may involve a combination of standard solution procedures and human judgment. Management science can provide models for the portion of a decision-making problem that is structured. For the unstructured portion, a DSS can improve the quality of the information on which the decision is based by providing, for example, not only a single solution but also a range of alternative solutions, along with their potential impacts. These capabilities help managers to better understand the nature of problems and, thus, to make better decisions.

Sharda, Delen and Turban, 2014

Information Systems – Major Categories

When the support for decision making and coordination in a system with many levels are considered as major objectives of information systems,
most authors agree with the following classification:

- Transaction Processing Systems
  (TPS – transactions and op. control, **low** level);
- Management Information Systems
  (MIS – the same as above);
- Decision Support Systems
  (DSS – op. control and tactic control, **mid** level);
- Executive Information Systems
  (EIS – strategic planning, **high** level).

International Journal of Information Management 1994 Volume 14 Number 6

Information Systems – Major Categories

Functional taxonomy of CBIS: G Mentzas

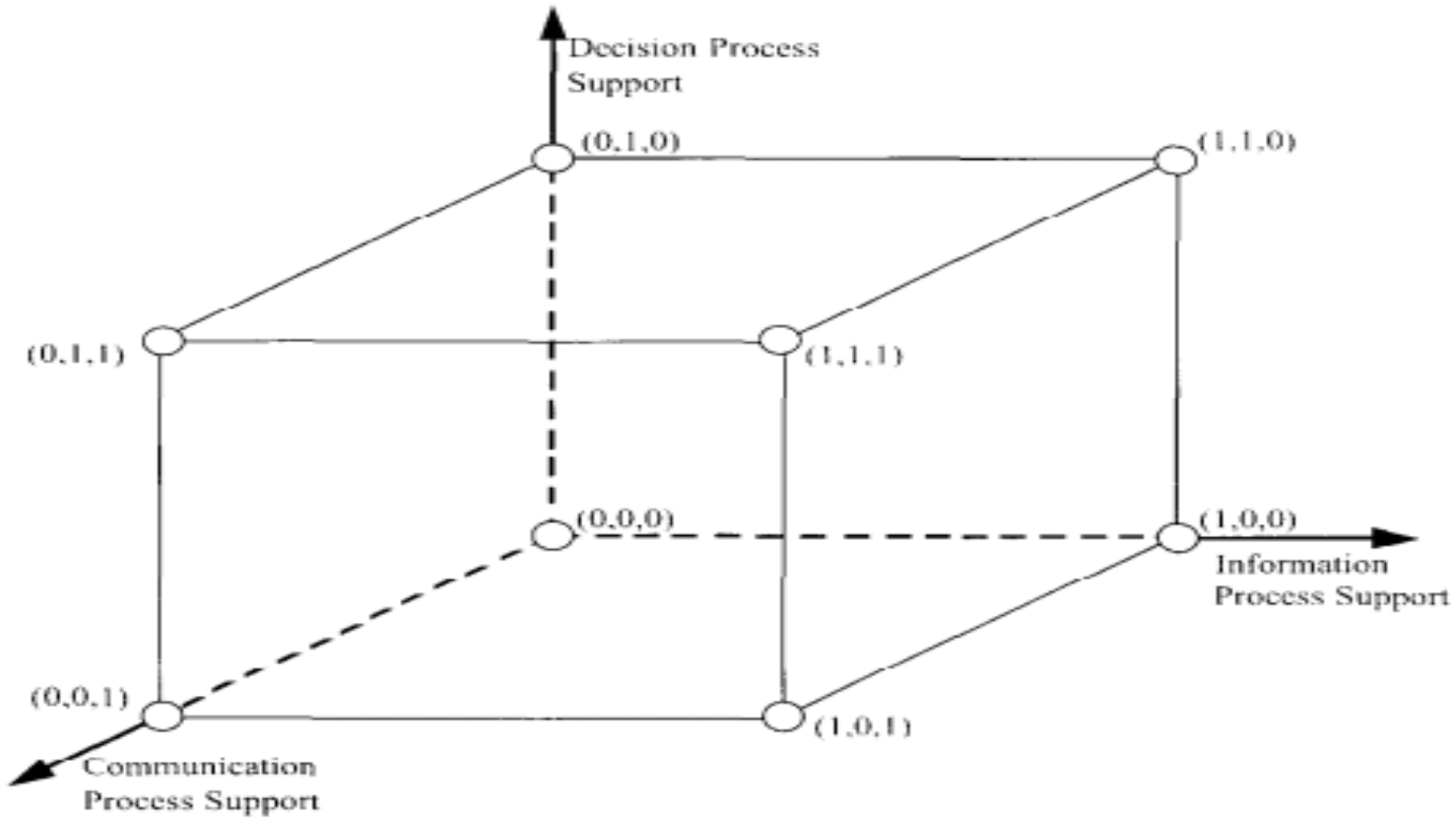


Figure 1 Classification of computer-based information systems

Information Systems – Major Categories

Functional taxonomy of CBIS: G Mentzas

Table 1 *Types of computer-based information systems*

Type of system	Role
Management information systems (MIS)	Analysis of information, generation of requested reports, solving of structured problems
Executive information systems (EIS)	Evaluation of information in timely analyses for top-level managerial levels, in an intelligent manner
Executive support systems (ESS)	Extension of EIS capabilities to include support for electronic communications and organizing facilities
Decision support systems (DSS)	Use of data, models and decision aids in the analysis of semistructured problems for individuals
Group decision support systems (GDSS)	Extension of DSS with negotiation and communication facilities for groups
Electronic meeting systems (EMS)	Provision of information systems infrastructure to support group work and the activities of participants in meetings
Organizational decision support systems (ODSS)	Support of organizational tasks of decision-making activities that affect several organizational units
Expert systems (ES)	Capturing and organization of corporate knowledge about an application domain and translation into expert advice
Office information systems (OIS)	Support of the office worker in the effective and timely management of office objects, the goal-oriented and ill-defined office processes and the control of information flow in the office
Intelligent organizational information systems (IOIS)	Assistance (and independent action) in all phases of decision-making, information and communication support in multi-participant organizations

Information Systems – Major Categories

Functional taxonomy of CBIS: G Mentzas

Table 2 *Types of support in computer-based information systems*

Information system	Information support	Decision support	Communication support
MIS	High	Low	Low
EIS	High	Low	Low
ESS	High	Low	Medium
DSS	Medium	High	Low
GDSS	Medium	High	High
EMS	Medium	Low	High
ODSS	Medium	High	High
ES	Medium	High	Low
OIS	High	Low	High
IOIS	High	High	High

MIS: management information systems; EIS: executive information systems; ESS: executive support systems; DSS: decision support systems; GDSS: group decision support systems; EMS: electronic meeting systems; ODSS: organizational decision support systems; ES: expert systems; OIS: office information systems; IOIS: intelligent organizational information systems

Information Systems – Major Categories

Table 3 *Elements of computer-based information systems*

Information system	DBMS	MMS	KBMS	CMS	DS
MIS	Basic				Basic
EIS	Basic	Optional			Basic
ESS	Basic	Optional		Basic	Basic
DSS	Basic	Basic	Optional		Basic
GDSS	Basic	Basic	Optional	Basic	Basic
EMS	Basic	Optional	Optional	Basic	Basic
ODSS	Basic	Basic	Optional	Basic	Basic
ES	Basic	Optional	Basic		Basic
OIS	Basic		Optional	Basic	Basic
IOIS	Basic	Basic	Basic	Basic	Basic

MIS: management information systems; EIS: executive information systems; ESS: executive support systems; DSS: decision support systems; GDSS: group decision support systems; EMS: electronic meeting systems; ODSS: organizational decision support systems; ES: expert systems; OIS: office information systems; IOIS: intelligent organizational information systems; DBMS: database management system; MMS: model management system; CMS: cooperation management system, KBMS: knowledge based management system; DS: dialogue system

Information Systems – Major Categories

Functional taxonomy of CBIS: G Mentzas

Table 4 *Degree of support to the individual, group and organization-level*

Information system	Support of individuals	Support of groups	Support of organizations
MIS	High		
EIS	High		
ESS	High		
DSS	High		
GDSS	Medium	High	
EMS	Medium	High	
ODSS	Low	Medium	High
ES	High		
OIS	Low		High
IOIS	High	High	High

MIS: management information systems; EIS: executive information systems; ESS: executive support systems; DSS: decision support systems; GDSS: group decision support systems; EMS: electronic meeting systems; ODSS: organizational decision support systems; ES: expert systems; OIS: office information systems; IOIS: intelligent organizational information systems

Information Systems – Major Categories

Table 5 *Classification of CBIS relative to the degree of support to the individual, group and organization-level and the three processes*

	Support of information process	Support of decision process	Support of communication process
Support of individuals	MIS, EIS, ESS	DSS, ES	ESS
Support of groups	EMS	GDSS, ODSS	GDSS, EMS
Support of organizations	OIS, IOIS	ODSS, IOIS	OIS, IOIS

MIS: management information systems; EIS: executive information systems; ESS: executive support systems; DSS: decision support systems; GDSS: group decision support systems; EMS: electronic meeting systems; ODSS: organizational decision support systems; ES: expert systems; OIS: office information systems; IOIS: intelligent organizational information systems

"History makes fun of those who do not know it, repeating itself."
Nicolae Iorga

"Those who do not learn history are doomed to repeat it."
George Santayana

"Those who don't know history are doomed to repeat it."
Edmund Burke

Concept of DSS (Decision Support System)

In the early 1970s, Scott-Morton first articulated the major concepts of DSS. He defined **decision support systems (DSS)** as "interactive computer-based systems, which help decision makers utilize *data* and *models* to solve unstructured problems" (Gorry and Scott-Morton, 1971). The following is another classic DSS definition, provided by Keen and Scott-Morton (1978):

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

Sharda, Delen and Turban, 2014

Note that the term *decision support system*, like *management information system* (MIS) and other terms in the field of IT, is a content-free expression (i.e., it means different things to different people). Therefore, there is no universally accepted definition of DSS.

Anthropocentrism=Philosophical conception that man is the center and purpose of the universe.

A *decision support system* (DSS) is an anthropocentric and evolving information system, which is meant to implement the functions of a human support team that would otherwise be necessary to help the decision-maker to overcome his/her limits and constraints that he/she may encounter when trying to solve complex and complicated decision problems that count.

Filip, F.,G., Zamfirescu, C., B., Ciurea, C., Computer-Supported Collaborative Decision-Making, Springer, 2017

DSS – Alter's Classifications (1977)

In embarking upon this research a definitional question arose immediately: What are decision support systems? How can they be recognized and distinguished from other systems? Taking the approach of looking first and defining later, the following general distinctions emerged. Business computer applications can be stereotyped into two categories: electronic data processing (EDP) systems and decision support systems (DSS). The main difference between DSS and EDP systems is related to their basic purposes. EDP systems are designed to automate or expedite transaction processing, record keeping, and business reporting; DSSs are designed to aid in decision making and decision implementation. While most DSSs are used to facilitate management, planning, or staff activities, EDP systems emphasize intrinsically clerical activities. Whereas the general orientation of EDP systems is toward mechanical efficiency, that of DSSs is more toward the overall effectiveness of individuals or organizations. The manner of usage is also quite different. Unlike the EDP user, who typically receives reports on a periodic basis, the DSS user often initiates each instance of system use, either directly or through a staff intermediary.

DSS – Alter's Classification (1977)

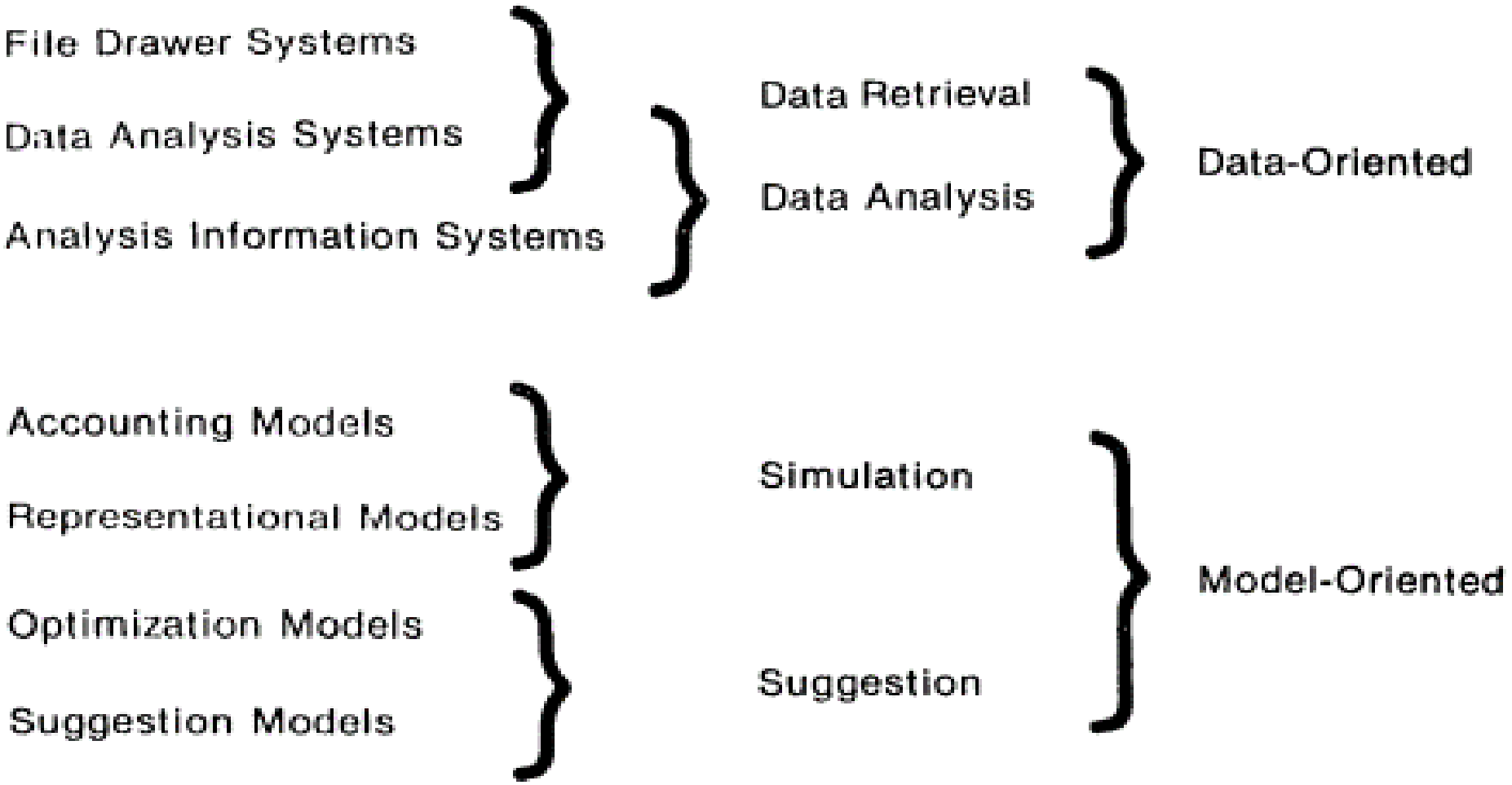


Figure 1 Data-Oriented vs. Model-Oriented Decision Support System Types

DSS – Alter's Classification (1977)

FIGURE 2 CHARACTERISTICS OF PARTICULAR DECISION SUPPORT SYSTEM TYPES

CHARACTERISTICS	DECISION SUPPORT SYSTEM TYPES						
	A FILE DRAWER	B DATA ANALYSIS	C ANALYSIS INFORMATION	D ACCOUNTING	E REPRESEN-TATIONAL	F OPTIMIZATION	G SUGGESTION
TYPE OF TASK	operational	operational or analysis	analysis	planning	planning	planning	operational
HANDS-ON USER	nonmanagerial line personnel	nonmanagerial line personnel or staff analyst	staff analyst	staff analyst or manager	staff analyst	staff or nonmanagerial line personnel	nonmanagerial line personnel
DECISION MAKER	nonmanagerial line personnel	nonmanagerial line personnel manager, or planner	manager or planner	manager, planner, or line personnel	manager	manager or nonmana-gerial line personnel	nonmanagerial line personnel
KEY ROLE	hands-on user	hands-on user	intermediary	intermediary, feeder	intermediary	intermediary	hands-on user

DSS – Alter's Classification (1977)

KEY USAGE PROBLEM	user motivation and training	can people figure out what to do with the system	how effective is the intermediary	integration into planning process	understanding	understanding	user motivation and understanding
SYSTEM INITIATOR	managerial	entrepreneurial	entrepreneurial	user or managerial	entrepreneurial	mixed	mixed
KEY DESIGN AND IMPLEMENTATION PROBLEM	defining the data; procedural changes	deciding how to use system; assessing impact on decisions	focusing usage and development; control mix of projects	getting people to participate seriously in planning process	richness vs. understandability	richness vs. linearity and understanding	designing rules sensibly
KEY CHANGE ISSUE	changing information sources and procedures	unfreezing job image and way of approaching problems	using system as a vehicle for change	unfreezing procedures people are familiar with	unfreezing ways of approaching problems	unfreezing ways of approaching problems	unfreezing standard procedures; avoiding a fear reaction
KEY TECHNICAL PROBLEM	system crashes; retrieval from large data base	flexible retrieval from broad data base; generality vs. power	flexible retrieval from broad data base	checking consistency of intention, meaning of numbers	modeling technology	modeling and solution technology	task modeling

DSS –Holsapple ’s Classification (1996-2008)

Text-Oriented Decision Support Systems

Hypertext-Oriented Decision Support Systems

Database-Oriented Decision Support Systems

Spreadsheet-Oriented Decision Support Systems

Solver-Oriented Decision Support Systems

Rule-Oriented Decision Support Systems

Compound Decision Support Systems

Multiparticipant Decision Support Systems

DSS –Holsapple ’s Classification (1996-2008)

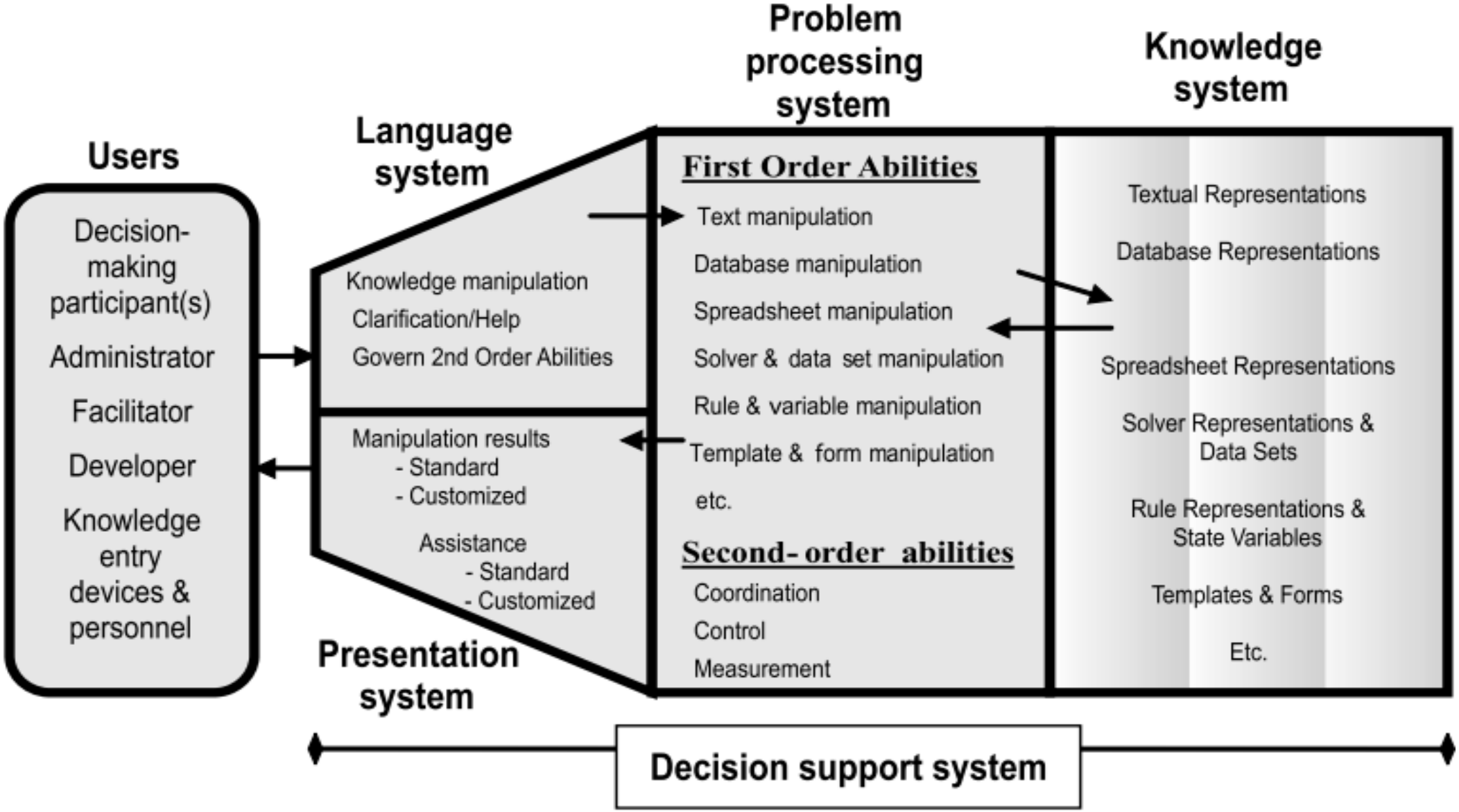


Figure 3. Example of a compound DSS with synergistic integration

DSS –Holsapple ’s Classification (1996-2008)

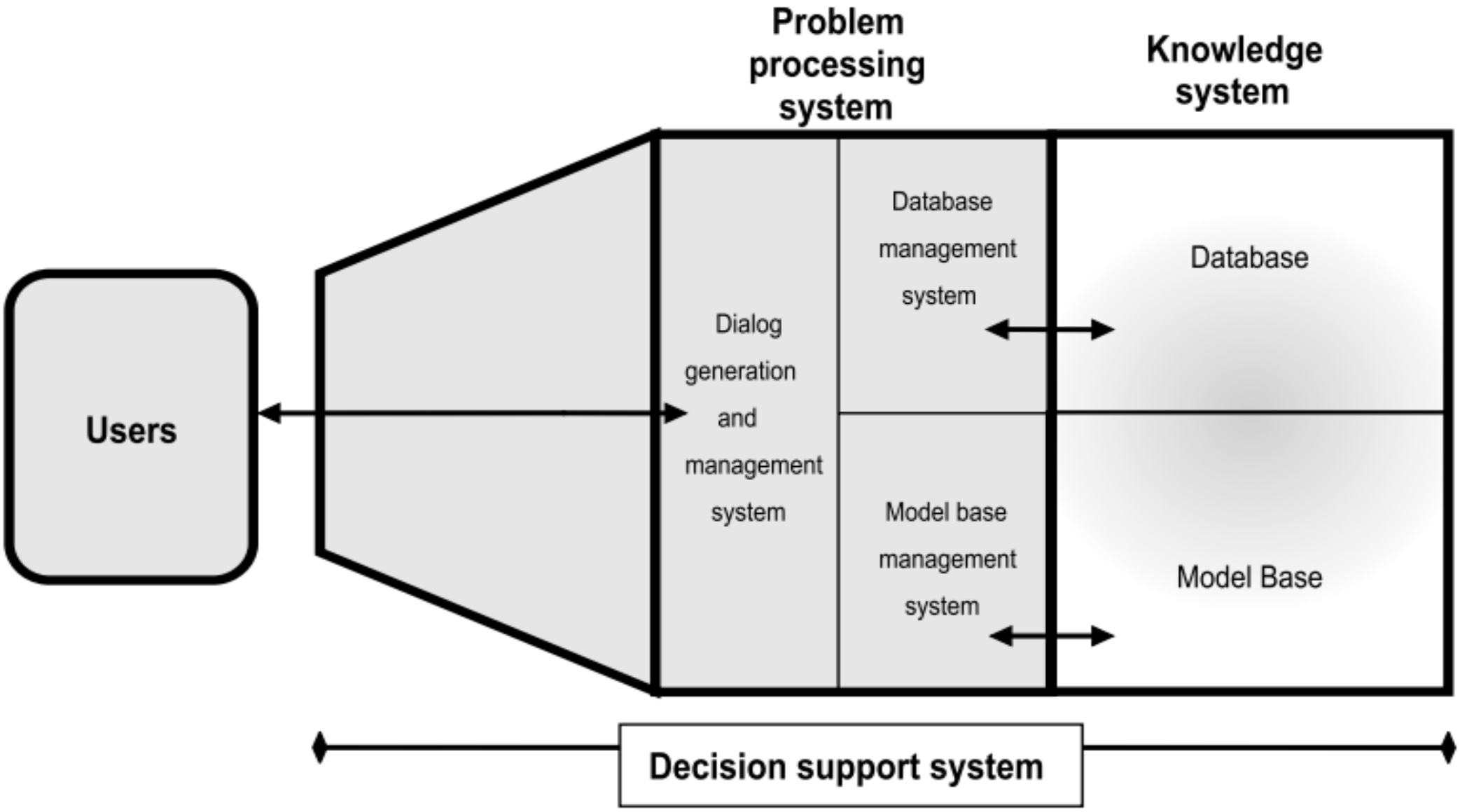


Figure 4. Combining database and solver techniques in a compound DSS

Business Intelligence and Analytics

???

The term *Business Intelligence* (BI) was proposed in 1989 by H. Dresner, an analyst of the Gartner Group, to name "all technologies that help business make decision on facts" (Nylund 1999). Negash and Gray (2008) define BI as a "data driven DSS that combines data gathering, data storage, and knowledge management with analytical tools to present complex and competitive information to planners and decision makers".

According to Gartner Group, *Business Intelligence* (BI) is defined as a software platform that delivers a set of capabilities organized into three classes of functions (Hagerty et al. 2012; Chen et al. 2012):

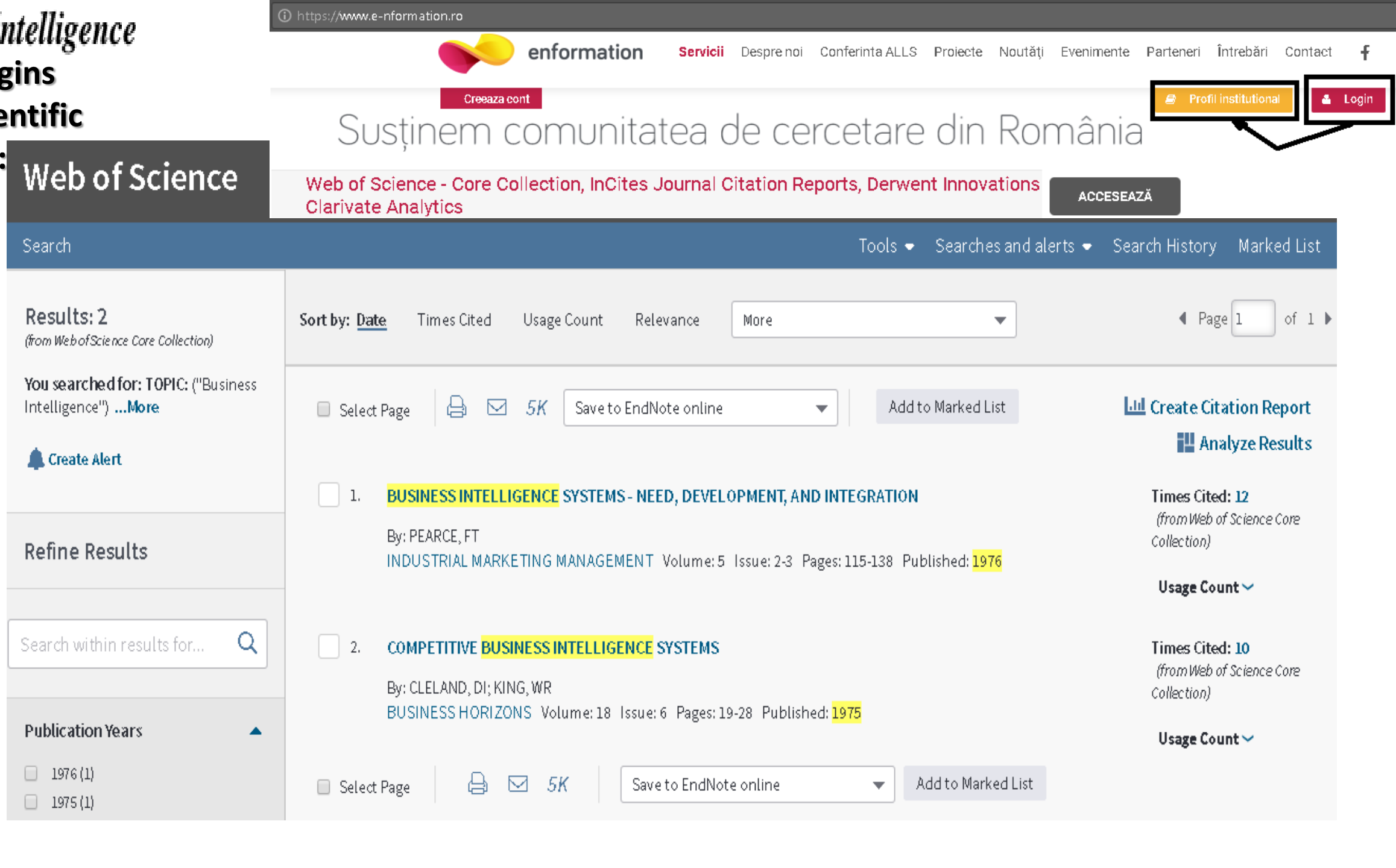
- *Integration*, that includes: BI infrastructure, metadata management, development tools and enabling collaboration;
- *Information delivery*, that includes: reporting, dashboards, ad-hoc query, Microsoft Office integration, search-based BI, and mobile BI;
- *Analysis*, that includes OLAP (Online Analytical Processing), interactive visualization, predictive modeling, data mining and scorecards.

What is Business Intelligence (BI)?
Hitachi Solutions Canada
Published on Jun 26, 2014 -
https://www.youtube.com/watch?v=hDJdkcdG1iA

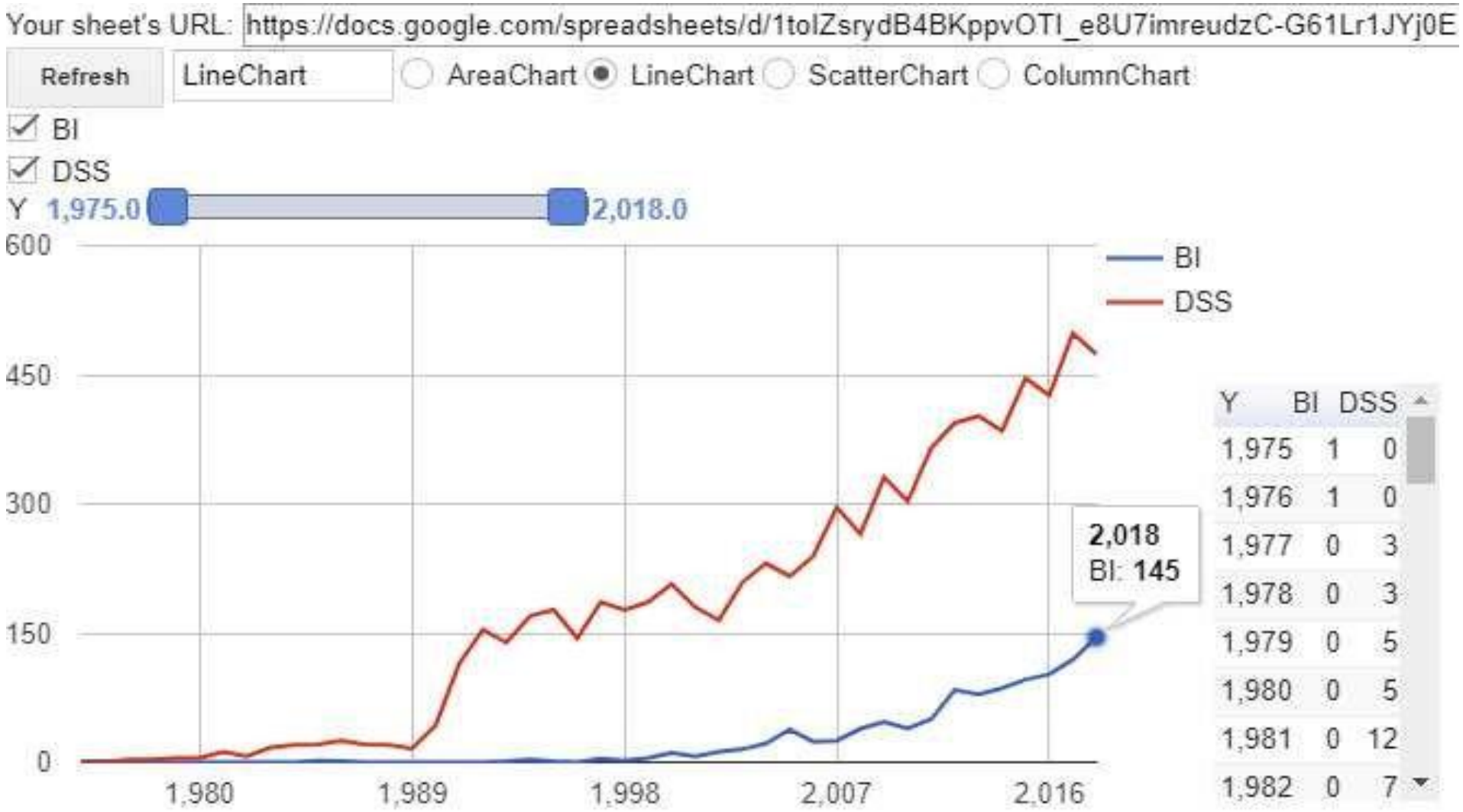
Filip, Zamfirescu and Ciurea, 2017

Business Intelligence

-older origins in the scientific literature: a gap of almost 15 years



Business Intelligence
-older origins in the scientific literature: a gap of almost 15 years



tinyurl.com/y2h7xu4l data represented using GiPlot

based on IBM Watson NLP engine & Clarivate WOS

An analysis of scientific publications on “Decision Support Systems” and “Business Intelligence” regarding related concepts using NLP tools - **www.researchgate.net/publication/333652260**

Business Intelligence

-older origins in the scientific literature: a gap of almost 15 years

Competitive Business Intelligence Systems

A plan for collecting, evaluating and disseminating information about a competing firm is presented, along with a model competitive intelligence system for implementing the plan.

DAVID I. CLELAND AND WILLIAM R. KING

Both authors are faculty members at the University of Pittsburgh, David I. Cleland in the School of Engineering and William R. King in business administration.

Few business firms have adequate information about their competitors. Many firms may be tempted to ignore this information void, and many are likely to pay severe penalties for doing so. Business people who have not dealt with a competitive business intelligence system (CBIS) tend to disparage its utility or feasibility, often believing that although some information about competitors may be useful, there is little need for a system to collect and analyze it. Others feel that although competitive intelligence would be useful, it is impractical to obtain. Still others recognize the practicality of obtaining such intelligence, but doubt that it can be done legally and ethically.

CBIS CONCEPTS

In this article, we seek to address these common myths by developing some basic CBIS concepts, describing a CBIS model which can be widely applicable and illustrating its use. In doing so, we hope to motivate business planners and managers to develop a CBIS, for we find that those who believe the myths are invariably those who have never attempted to develop and use competitive intelligence.

A "want list" of everything a business organization would like to know about a competitor would be almost endless. A representative list would include three categories of information: marketing, production and product, and organizational and financial. The details needed will vary from company to company, but these basic elements are required for most competitive analyses:

Marketing Information
- Pricing, discounts, terms and product specifications
- Volume, history, trend and outlook for a given product
- Market share and trend
- Marketing policies and plans
- Relations with customers
- Size and deployment of sales force
- Channels, policies and methods of distribution
- Advertising program

Production and Product Information
- Evaluation of quality and performance
- Breadth of line
- Processing and technology
- Product cost
- Production capacity
- Location and size of production facilities and warehouses
- Packaging
- Delivery
- Research and development capabiliity

Organizational and Financial
- Identification of key decision makers

Business Intelligence

-older origins in the scientific literature: a gap of almost 15 years

Industrial Marketing Management 5 (1976) 115–138
Elsevier Scientific Publishing Company, Amsterdam – Printed in The Netherlands

BUSINESS INTELLIGENCE SYSTEMS: THE NEED, DEVELOPMENT, AND INTEGRATION

F.T. Pearce

INTRODUCTION

This paper is a revised outline of presentations to the International Institute of Management Technology, Milan, to the European Association of Market Research, at Copenhagen, and to the University of Lund, Sweden. These presentations were developed from an original paper published in the first issue of this journal in 1971: "Intelligence: A Technology for the 1980s?" That paper suggested the time was ripe for academic development and wider business applications.

At Lund, academic work has now appeared in the research and teaching programme of Professor Stevan Dedijer, on Social Intelligence — of which Intelligence for business purposes is a major aspect.

The paper is divided into two parts: Part I: Intelligence Systems and Management Technology; Part II: Developing and Integrating Business Intelligence Systems.

This first part clarifies what we have in mind when speaking of "Intelligence Systems" for business purposes. There is inevitably emphasis on the marketing function because this is where some advanced information procedures are already well developed. However, there is much wider applicability to other business functions, and to other areas of management in central government, regional and urban government, the financial world, trade unions, defence, police and government/government interfaces such as those of the European Economic Community.

The term "Intelligence" has been used as convenient to describe procedures lying beyond basic data and information collection, storage, early processing, and retrieval. The study of Intelligence Systems deals also with integration, management, information politics, and concept creation. The objective is to support decision-making at its different levels, create and disseminate know-how, and develop information into more profitable or active use.

It is to be understood from the outset that Intelligence Systems as here described are concerned only with acceptable, overt, and legitimate procedures and not with covert work, espionage, subversion, and the like (except in security and defence against them). Secrecy, semi-legality, and actual illegality are *not* necessary production factors for business, government, or research. We merely use a convenient and traditional term, acceptable in English and in operation.

Part II offers examples of actual Business Intelligence activities, with especial reference to development, integration, and information politics.

Intelligence is the soul of all public business.
Daniel Defoe, 1703

Business Intelligence

-older origins in the scientific literature: a gap of almost 15 years

SMR Forum: Business Intelligence - The Quiet Revolution
Gilad, Tamar;Gilad, Benjamin
Sloan Management Review (1986-1998); Summer 1986; 27, 4; ProQuest Central
pg. 53

SMR Forum: Business Intelligence — The Quiet Revolution

Tamar Gilad
Benjamin Gilad

Gilad Associates
Rutgers University, Newark

In the face of escalating global competition, many corporations are turning to a tool that ultimately may prove to be indispensable for their survival — a business intelligence system. The authors describe the various approaches available to companies that are eager to implement an intelligence activity. However, they stress that the success of such a function hinges on one critical element, that the whole organization — from the CEO down to the secretary — accepi and commit themselves wholeheartedly to collecting competitive information. *Ed.*

A secret revolution is taking place in U.S. corporations and, for a change, it is not originating at leading business schools. With very few exceptions, it has received no acknowledgment in the more prestigious management journals. Nevertheless, in many large corporations, especially in the industrial sector, the revolution is spreading like fire. Word of mouth, executive seminars, and a growing number of consultants are introducing the new organizational innovation, the business intelligence system.

Before experts and management scholars dismiss the "news" as old hat, we should clarify what we mean by revolution. Business intelligence — whether or not it goes by that name — is central to many decisions made in the firm, and corporations have been collecting information about their competitors since the dawn of capitalism. The real revolution is in the efforts to *institutionalize* intelligence activities. Apart from a few that have already established formal business intelligence functions, most of the leading corporations are experimenting to varying degrees with various fledgling systems in the hope of establishing business intelligence as a legitimate organizational function.

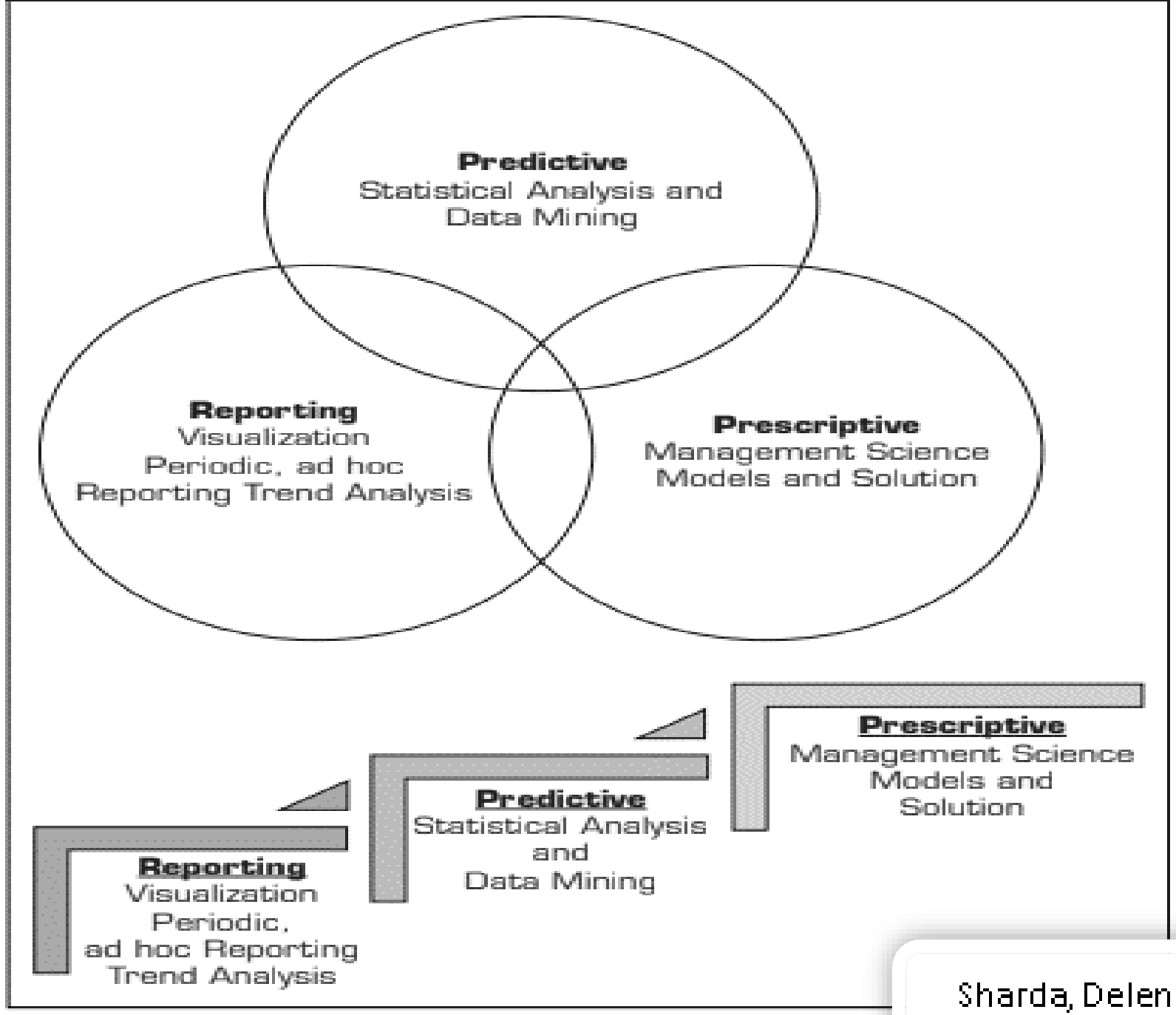
What Is Business Intelligence?

To understand the appropriate structure for vating employees or using computers effectively.

Business intelligence activities center on five tasks: (1) collection of data, (2) evaluation of data validity and reliability, (3) analysis, (4) storage of data and intelligence, and (5) dissemination. The purpose of these activities is to convert raw data about the environment into a form that decision makers can use to make important strategic decisions.

Thus, business intelligence is a process: its input is raw data, its end result is intelligence. The input consists of data about the external environment ranging from data on competitors to data on government employees, acquisition candidates, and industries the company would like to penetrate. The data is then evaluated for usefulness, a step that helps to reduce the large amount of available material to a relevant and reasonably reliable body of information. The information (i.e., evaluated data) is then stored in such a way as to enable the analyst quick retrieval for the next stage, analysis. At this stage the analyst uses information building blocks to put together a general picture of the situation, to answer a prespecified question, or to direct a further inquiry into a particular subject. The analyzed, digested, and interpreted information thus becomes intelligence. The intelligence is then disseminated in the organization.

Types of BI and analytics



Sharda, Delen and Turban, 2014

The DSS–BI Connection

By now, you should be able to see some of the similarities and differences between DSS and BI. First, their architectures are very similar because BI evolved from DSS. However, BI implies the use of a data warehouse, whereas DSS may or may not have such a feature. BI is, therefore, more appropriate for large organizations (because data warehouses are expensive to build and maintain), but DSS can be appropriate to any type of organization.

Second, most DSS are constructed to *directly* support specific decision making. BI systems, in general, are geared to provide accurate and timely information, and they support decision support *indirectly*. This situation is changing, however, as more and more decision support tools are being added to BI software packages.

Sharda, Delen and Turban, 2014

The DSS–BI Connection

Third, BI has an executive and strategy orientation, especially in its BPM and dashboard components. DSS, in contrast, is oriented toward analysts.

Fourth, most BI systems are constructed with commercially available tools and components that are fitted to the needs of organizations. In building DSS, the interest may be in constructing solutions to very unstructured problems. In such situations, more programming (e.g., using tools such as Excel) may be needed to customize the solutions.

Fifth, DSS methodologies and even some tools were developed mostly in the academic world. BI methodologies and tools were developed mostly by software companies. (See Zaman, 2005, for information on how BI has evolved.)

Sixth, many of the tools that BI uses are also considered DSS tools. For example, data mining and predictive analysis are core tools in both areas.

Sharda, Delen and Turban, 2014

The DSS–BI Connection

DSS and BI have so many related concepts in common (even for a restrictive TOP 30) for both. Such common concepts are: Decision Making, Decision Theory, Management, **Data Warehouse**, Scientific Method, Knowledge, Cognition, Risk, Machine Learning, Algorithm, &Decision Engineering.

s(DSS).accdb (Access 2007 - 2013 file format) - Access

Distinct_T_score_overall_plus_score

Concept	All_score
Decision theory	4428.26
Decision engineering	2394.22
Knowledge engineering	1839.91
Data warehouse	1175.8
Information systems	864.62
Self service software	857.43
Decision making	623.65
Medicine	586.79
Clinical decision support system	558.04
Management	447.42
Scientific method	442.79
Health care	412.6
Risk	353.54
Artificial intelligence	263.68
Cognition	257.93
Decision making software	223.79
Pharmacology	191.79
Operations research	191.75
Physician	171.12
Hospital	167.37
Electronic health record	166.56
Problem solving	166.31
Mathematics	165.68
Machine learning	161.81
Algorithm	161.78
Clinical trial	153.3
Agriculture	152.2
Water	148.66
Logic	148.31
Geographic information system	144.68

Record: 30 of 5147 No Filter Search

s(BI).accdb (Access 2007 - 2013 file format) - Access

_Distinct_T_score_overall_plus_score

Concept	All_score
Management	230.92
Data analysis	176.34
Scientific method	143.83
Data management	116.88
Data warehouse	115.66
Data mining	97.68
Decision making	72.67
Decision theory	72.19
Data	69.66
Strategic management	65.61
Decision support system	53.04
Economics	45.06
Competitive intelligence	44.48
Marketing	43.23
Knowledge	40.45
Analytics	39.38
World Wide Web	39.29
Knowledge management	36.18
Learning	33.83
Cognition	30.38
Internet	30.01
Risk	29.33
Research	28.97
Sociology	28.71
Supply chain managemen	28.7
Process management	28.6
Machine learning	25.3
Algorithm	24.74
Decision engineering	24.68
Organization	24.25

Record: 30 of 1795 No Filter

Figure 3. Top 30 most important concepts related to DSS and BI and resulting from the final aggregation

based on IBM Watson NLP engine & Clarivate WOS

An analysis of scientific publications on “Decision Support Systems” and “Business Intelligence” regarding related concepts using NLP tools - www.researchgate.net/publication/333652260

!!!BI is the fastest growing segment in the software market, but why is adoption so low!!!

BI roundtable discussion with Claudia Imhoff, Howard Dresner and Patrick Spedding:
https://www.youtube.com/watch?v=ztNERV_Lv5Y

BI generations

BI&A 1.0, that was adopted by industry in the 1990s, is characterized by the predominance of structured data which are collected by existing legacy systems and stored and processed by RDBM (Relational Data Base Management Systems). The majority of analytical techniques were using well established statistical methods and data mining tools developed in the 1980s. The ETL (Extract, Transformation and Load) of data warehouses, OLAP (On Line Analytical Processing) and simple reporting tools are common aspects of BI&A 1.0.

BI&A 2.0 is the next stage triggered by advances in Internet and Web technologies, in particular text mining and web search engines, and the development of the e-commerce in the early 2000s. Text and web mining techniques associated with social networks, Web 2.0 technology, and crowdsourcing business practice allow making better decisions concerning both product and service offered by companies and recommended applications for the potential customers.

BI&A 3.0 is a new stage characterized by the large-scale usage of mobile devices and applications such as iPhone and iPad (see Sect. 4.4). Another characteristic feature of BI&A 3.0 is the effective data collection enabled by the *Internet of Things* (Atzori et al. 2010; Gubbi et al. 2013).

Filip, Zamfirescu and Ciurea, 2017

Instead of the pres.'s end…

Herbert Alexander Simon (June 15, 1916 – February 9, 2001) was an American economist and political scientist whose primary interest was decision-making within organizations and is best known for the theories of "bounded rationality" and "satisficing". He received the Nobel Prize in Economics in 1978 and the Turing Award in 1975. His research was noted for its interdisciplinary nature and spanned across the fields of cognitive science, computer science, public administration, management, and political science. He was at Carnegie Mellon University for most of his career, from 1949 to 2001. tinyurl.com/y5o2ktqr

Notably, Simon was among the pioneers of several modern-day scientific domains such as artificial intelligence, information processing, decision-making, problem-solving, organization theory, and complex systems. He was among the earliest to analyze the architecture of complexity and to propose a preferential attachment mechanism to explain power law distributions.

Gerd Gigerenzer (born September 3, 1947, Wallersdorf, Germany) is a German psychologist who has studied the use of bounded rationality and heuristics in decision making.
Gigerenzer is director emeritus of the Center for Adaptive Behavior and Cognition (ABC) at the Max Planck Institute for Human Development and director of the Harding Center for Risk Literacy, both in Berlin, Germany.

tinyurl.com/y366fb5n

+ John NASH known for:
Nash Equilibrium
https://www.youtube.com/watch?v=MHS-htjGgSY
https://www.youtube.com/watch?v=2d_dtTZQyUM

Bibliography:

-Airinei, D., Depozite de date, Polirom, Iaşi, 2002

-Airinei, D., Dopspinescu, O., Huiban, A., Aplicatii practice cu sisteme OLAP si Depozite de date, Editura Sedcom Libris, Iaşi, 2008

-Clark, D., Beginning Power BI with Excel 2013. Self-Service BI using Power Pivot, Power View, Power Query, and Power Map, Apress, 2014

-Filip, F.,G., Zamfirescu, C., B., Ciurea, C., Computer-Supported Collaborative Decision-Making, Springer, 2017

-Grossmann, W., Rinderle-Ma, S., Fundamentals of Business Intelligence, Springer, 2015

-Homocianu, D., DSS in the context of knowledge society, (ssrn.com/abstract=2384380), UAIC Publishing, Iasi, 2009, tinyurl.com/y6zn8kh9

-Homocianu, D., The Habilitation Thesis: Technologies for supporting decision making, Iasi, June 2019, tinyurl.com/y2gsptt4

-https://drive.google.com/drive/folders/0B6qmI5LYdWSeS3AwbmhILXZBdVU or tinyurl.com/yyw9t7rs

-https://drive.google.com/drive/folders/0B6qmI5LYdWSeM1ZXcm04VHJBc2M or tinyurl.com/yxwhhavq

-http://www.nesstar.com/export/sites/default/doc/nesstar_cubes.pdf

Bibliography:

-Inmon,W.H.,Linstedt, D., Data Architecture: A primer for the data scientist, MK, MA, 2015 (tinyurl.com/h7dcq66)

-Kimball, R., Ross, M., The Data Warehouse Toolkit Third Edition. The Definitive Guide to Dimensional Modeling, John Wiley & Sons, New York, 2013 (tinyurl.com/jogo5uy)

-Kimball, R., Ross, M., The Kimball Group Reader. Relentlessly Practical Tools for Data Warehousing and Business Intelligence – ReMastered Collection, Second Edition, Wiley, New York, 2016 (tinyurl.com/johox4v)

-Krishnan, K, Data Warehousing in The Age of Big Data, Morgan Kaufmann (MK), MA, 2013 (tinyurl.com/zrjo75j)

-Loshin, D., Business Intelligence, The Savy Manager's Guide, Morgan Kaufmann, 2013

-Mcpherson, B., Going GAS. From VBA to Google Apps Script, O'Reilly, 2016

-**Microsoft, Power BI MVP Book, 2019**

-Nutt, P., C., Wilson, D., C., Handbook of Decision Making, Wiley, 2010

-Powell, B., Mastering Microsoft Power BI, Expert techniques for effective data analytics and business intelligence, Packt, 2018

-Power, D., J., DSS History

Bibliography:

-Reeves, L.L., A Manager's Guide to Data Warehousing, Wiley, New York, 2009 (tinyurl.com/htsslk8)
-Sarka, D., et. al., Implementing a Data Warehouse with Microsoft SQL Server 2012. Training Kit, O'Reilly Media, Sebastopol, 2012 (tinyurl.com/jk6lclk)
-Sauter, V.L., Decision Support Systems for Business Intelligence (2nd Ed.), John Wiley & Sons, 2010
-Sharda, R., Delen, D., Turban, E., Business Intelligence and Analytics: Systems for Decision Support, Pearson, 2014
-Sheldon, B., et. al., Professional Visual Basic 2012 and .NET 4.5 Programming, John Wiley & Sons, Indianapolis, 2013 (tinyurl.com/hrb6j9u)
-Sherman, R., Business Intelligence Guidebook. From Data Integration to Analytics, Elsevier, 2015