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Informatics for Business Administration

-

The Informatics and Enterprise in Information Society. Virtual organization.

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Chapter 1: The Informatics and Enterprise in Information Society. Virtual organization	3
1.1 Introduction.....	3
1.2 Information Technology Areas.....	4
(a) Platforms	5
(b) Development	5
(c) Communications.....	5
(d) Data	5
(e) Applications.....	5
(f) Companies	12
(g) EAI	12
1.3 Virtual organization	13
Bibliography	14

Chapter 1: The Informatics and Enterprise in Information Society. Virtual organization.

1.1 Introduction

We live in an era of increasing use of diverse technologies in all aspects of life, from ingestible radio transmitters and fluorescent quantum dots for medical diagnosis and treatment, to multifunctional cell phones that take digital photographs and receive and transmit electronic mail. The central role of technology in shaping our society is not disputed by many since technology is considered the “primary driver of history” and for all competitors the only option is to adopt as soon as possible the technological innovations. The companies must race after each new wave of technology. Few phenomena characterize today’s fiercely competitive global economy more uniquely and powerfully than the rapid rise and influence of Information Technology (IT).

Information Technology, or IT, is one of the fastest growing industries in the world. The use of computers to process information has increased astronomically since the systems were introduced to the business world in the 1950s. eMail has augmented and replaced physical mail which is now referred to as “snail mail.” A luxury automobile now contains over 70 computers, providing functionality to make sure we know when to stop for gas—sometimes in audio. We pay bills and shop online, and answer questions and settle arguments over the Internet. Computers affect both our work and personal lives, but while there is certainly much overlap, the business world has additional systems, terms, and acronyms that are not used in personal computing. A basic knowledge of the technology, companies, IT groups, and IT software used in business computing has become a part of almost everyone’s job. Even perceived as very dynamic, with new systems appearing daily (hardware), the basics of computer technology have not changed since computers were first used for business in the 1960s.

The distinction between *data*, *information*, *knowledge*, and *wisdom* is essential to the informatics theory of informatics systems. Very briefly, data are the materialization, the representation of information or more simply a set of unconnected facts.

The information is equivalent to knowledge and has to do with the semantic aspect of the meaning of data so that it is data associated with meaning (*What?*, *Who?*, *When?*, *Where?*) and relates to description, definition and perspective.

Information in a work system can potentially take a variety of forms including numbers, text, sounds, pictures, video etc, and they can be created, modified or deleted with the system or other information can be simply received from other systems.

The information is not exactly knowledge. In fact knowledge is information associated with strategy or process (*How?*) and comprises strategy, practice, methods or approach flow. Wisdom embodies principle, insight, moral or archetype (*Why?*).

Figure 1.1 shows the relationships between data, information, knowledge, and wisdom considering the context independence and understanding.

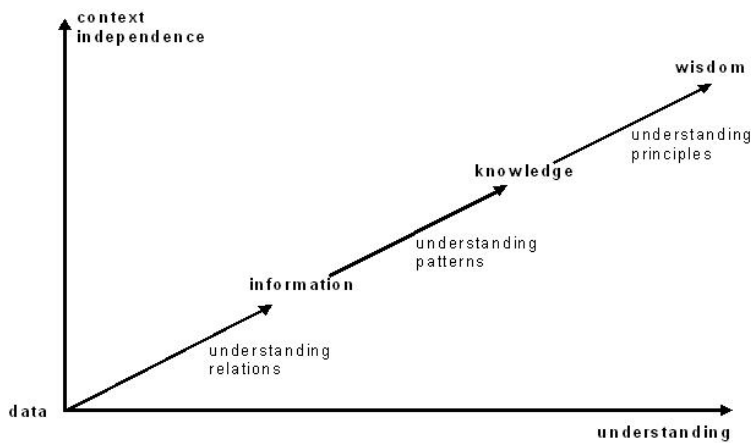


Figure 1.1 The relationships between data, information, knowledge, and wisdom considering the context independence and understanding

(Source: Neil Fleming, *Coping with revolution: Will the Internet change learning?* Lincoln University, Canterbury, New Zealand)

The distinction between data, information, and knowledge is very important and as a helpful way to distinguish them in the figure 1.2 are represented the relationships between them. The computer programs transform data into information (figure 1.2) by a process of formatting, filtering and summarizing (or any other kind of computations).

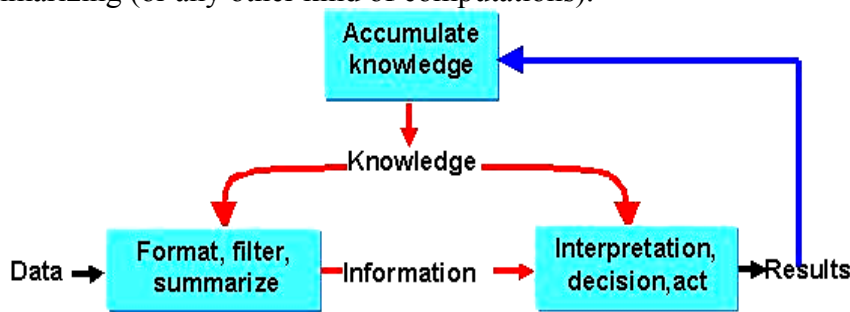


Figure 1.2 The relationships between data, information and knowledge

1.2 Information Technology Areas

IT includes both hardware and software. As you know hardware is the equipment, starting with the computers themselves and a variety of peripherals (communication devices such as modems, routers, and switches; I/O (Input/Output) devices such as monitors, printers, and speakers; and storage devices such as disks, tapes, and mass storage systems). Software could really be defined as everything that's not hardware, and is much more varied and complex. It is best understood by following the basic organization of IT, which includes both hardware and software.

Information Technology contains five definitive areas of skills and knowledge: platforms, development, data, communications, and applications (figure 1.3).

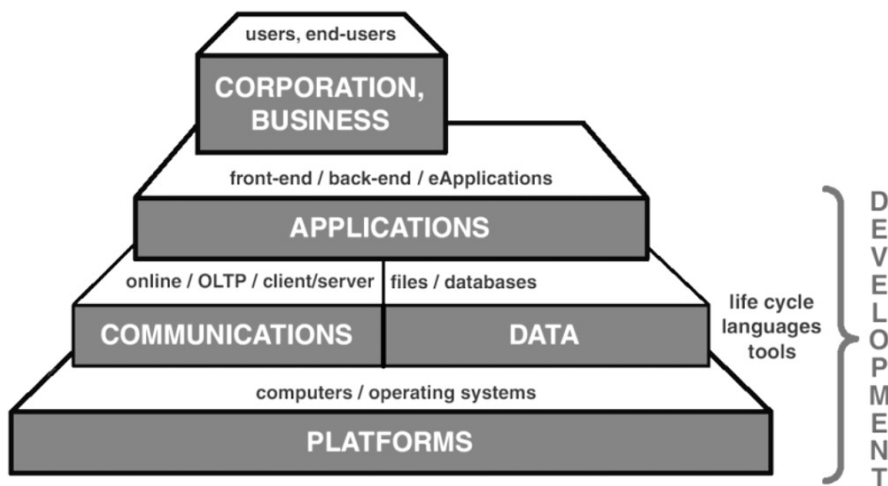


Figure 1.3 **Technology is defined by specific areas of products, skills, and knowledge that work together to support the corporation** (Source: Computers: Systems, Terms and Acronyms, by M. Susan Hodge, 16th edition, SemCo 2006)

(a) Platforms

A platform consists of a computer and the operating system that runs on it. Platforms are important because every program must be written for the platform, or platforms, it will run on, and if the platform changes, the program must be changed or you must use a virtualization solution (such as VMWARE).

(b) Development

Development, or system development, or software engineering (or any number of terms) refers to creating computer software systems and always follows the same cycle of activity: analysis, design, programming, testing, and implementation. The skills and knowledge used during development include programming languages, methodologies, and tools.

(c) Communications

Communications covers the on-line, or real-time world. Programming systems are made up of a combination of batch and on-line programs. On-line programs are those that operate by having a person at a terminal interact with the program in real-time, and more and more functions are being handled this way. Because online applications now consist of multiple tiers (or programs) middleware (software that manages program-to-program communication) is an important part of all online systems. This software builds and manages the messages that, e.g. the front-end program running on a PC sends to a back-end program that will interpret the message and send a reply.

(d) Data

If there were no data to be processed, Information Technology would not exist. In order to write the programs that process data, a programmer must understand the format of data, how it is stored, how it is accessed, and what processing is to be done. Data format can be defined in different ways, but is basically defined as structured (files and databases) or unstructured (documents). Data is stored in either files or databases, and there are many types of both, including data warehouses. Query tools provide access to the data, and there is a vast range of tools available to process both structured and unstructured data. Finally, the processing is one of two things—the data is updated (kept current), or it is used to build a report.

(e) Applications

Computer programs, or systems, fall into one of two categories: technical systems or applications. Technical systems support the computer function, and include operating systems, data management

systems, and communication systems. These systems do not reflect any industry or business, and the same systems are used by, e.g., banks, manufacturers, and the government.

There are several categories of application software:

1. Back-office systems;
2. Front-office systems;
3. ERP;
4. eApplications.

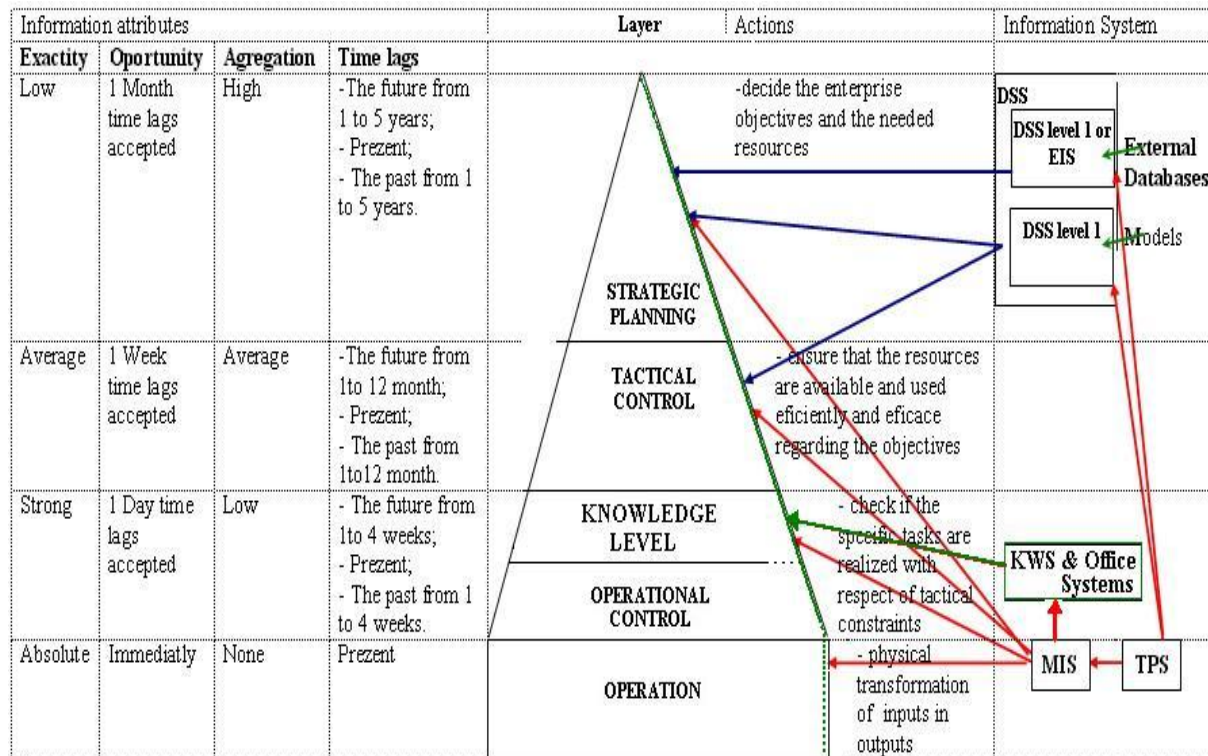


Figure 1.4 Information Systems Categories

1. Back-office: These systems run behind the scene and support the daily operation of the company (this software was developed as far back as the 1960s and includes accounting and payroll systems). Figure 1.4 suggests the information system categories considering the deserved level of management and the information required by those levels.

The system categories outlined in the figure 1.4 briefly described below.

I. Transaction Processing Systems (TPS) - build, generally, with databases (centralized and/or distributed) internal to the enterprise. This kind of system represents the infrastructure needed by all other kind of systems developed after. They are the basic business systems that serve the operational level of the organization. A TPS can be defined as an informatics system that performs and records the daily routine transactions necessary to conduct the business. Examples are sales order entry, hotel reservation systems, payroll, employee record keeping, and shipping. We found such TPS associated with every function inside the organization, such as:

- *Sales & Marketing* – Order tracking, Order processing etc. This systems include the business processes: Assembling the product, Checking for quality, Producing bills of materials etc;
- *Manufacturing* – Machine control, Plant scheduling, Material movement control etc. This systems include the business processes: Identifying customers, Making customers aware of the product, Selling the product etc;
- *Finance* – Securities trading, Cash management etc;
- *Accounting* – Payroll, Accounts payable, Accounts receivable etc;

Finance and accounting include the business processes: Paying creditors, Creating financial statements, Managing cash accountings, etc;

- *Human Resources* – Compensation, Training & Development, Employee Record Keeping et. This systems include the business processes: Hiring employees, Evaluating employees' job performance, Evaluating employees in benefits plans etc.

II. Knowledge Work Systems (KWS) and Office Systems (OfS) serve generally the information needs at the knowledge level of the organization. Generally KWS address to *knowledge workers* (peoples who hold formal universities degrees and who are members of recognized professions, such as engineers, doctors, lawyers, and scientists) while Office Systems address to data workers (generally have less formal, advanced educational degrees and tend to process rather than create information such as secretaries, bookkeepers, filling clerks or managers whose jobs are principally to use, to manipulate or disseminate information).

III. Management Information Systems (MIS) – build on the basis of TPS whose information summarizes as regular reports (as the “Balanța de verificare” – balance sheet, Commercial Balance etc) with a predefined format and difficult to modify (generally stipulated by law). As a rule this reports are designated, but not exclusively, to the intermediate levels of management. MIS are born from the existence of TPSs (that allow consulting the enterprise internal data) and from the necessity to obtain standard regular reports needed to control the internal functionality of the enterprise. MIS includes and provides managers with on-line access to the organization's current performance and historical data.

IV. Decision Support Systems (DSS) – build to offer relevant information, not offered by MIS, to decide at high level of management. DSS can be defined as “a system that uses models regarding the relationship between the decision and his result in order to be helpful in solving problems”¹. Many DSS in interaction with TPS, KWS and MIS can exist in an enterprise. DSS help managers to make decisions that are unique, rapidly changing, and not easily specified in advance. They are built explicitly with a variety of models to analyze data so that they have more analytical power than other systems.

V. Executive Information Systems (EIS) – build to supply information to top management. EIS can be defined as “a system that integrates the information from internal and external in order to permit to managers to control and request vital information, information presented in a personalized manner”².

This systems address to senior managers and serve the strategic level of the organization. The questions ESS assist in answering include the following³: What business should we be in? What are the competitors doing? What new

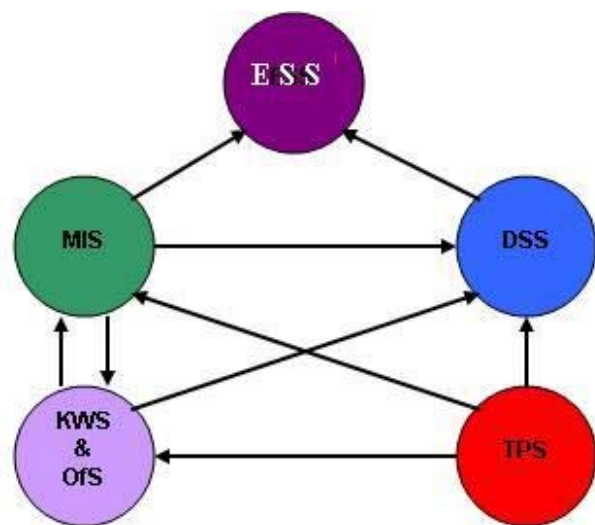


Figure 1.5 The interrelationships between the informatic system categories (Source: Kenneth & Jane Laudon – Essential of Management Information Systems, Fifth Edition, Prentice Hall, Pearson Education International, 2003)

¹ Mawhinney&Millet – Executive information systems: A critical perspective, Information and Management Nr. 23/1992 pages 83-84 - Adaptation

² Mawhinney&Millet – Executive information systems: A critical perspective, Information and Management Nr. 23/1992 pages 83-84 - Adaptation

³ Kenneth & Jane Laudon – Essential of Management Information Systems, Fifth Edition, Prentice Hall, Pearson Education International, 2003

acquisitions would protect us from cyclical business swings? Which units should we sell to raise cash for acquisitions?

The interrelationships between these informatics systems categories from a functional perspective can be represented as in figure 1.5.

2. Front-office: This software supports the interface with customers and didn't really come into use until the 1990s. This includes the automation of functions such as sales, marketing, help desk, and call center processing. CRM (Customer Relationship Management), call center systems, and SFA (Sales Force Automation) software all belong to this category;

CRM (Customer Relationship Management). Instead of treating customers as exploitable source of income, businesses are now viewing them as long-term assets to be nurtured through customer relationship management (CRM). CRM focuses on managing all of the ways that a firm deals with its existing and potential new customers. CRM is both a business and technology that uses information systems to coordinate all of the business processes surrounding the firm's interactions with its customers in sales, marketing and service.

3. ERP (Enterprise Resource Planning): Software combines both back- and front-office functions and is designed to support the entire company—one software package is all the company will need. SAP (pronounced S-A-P and based in Waldorf Germany) company is by far the major vendor in this area. The company name and product name (System, Applications, and Products in Data Processing or "Systemanalyse und Programmentwicklung" in German or simply SAP) are used generally interchangeably.

The SAP's company, founded in 1972, goal was to realize a software product "multilingual and multinational platform capable of easily changing internally (to enable flexible business processes) as well as from an information technology perspective"⁴. SAP is adapted to run on a variety of combinations of hardware, operating systems, and database systems (more than 20 such combinations). SAP supports today 40 languages, 50 currencies, and 30 business solutions. SAP's application software foundation is built on the concepts of *specialization* and *integration*.

Specialization means that each component or product within the SAP family of products and services meets a particular need, such as:

- providing web-based access to other SAP systems (SAP NetWeaver Portal);
- facilitating day-to-day financial and resource management (SAP ERP, or Enterprise Resource Planning – the core process of);
- addressing product lifecycle planning requirements (SAP PLM);
- supporting internal company procurement (SAP Supplier Relationship Management);
- interconnecting different systems to ease integration headaches (SAP NetWeaver Process Integration), and so on.

Integration means that individual SAP modules combine to form an SAP component, application, or product. SAP divides his products in two categories:

1st SAP Business Suite (comprising all business applications);

2nd SAP NetWeaver (comprising all components which enables SAP Business Suite).

In that way, from a business applications perspective, SAP can be all things to nearly all businesses that operate today.

⁴ Sams Teach Yourself in 24 Hours, Third Edition, by George W. Anderson, Tim Rhodes, Jeff Davis, John Dobbins, Andreas Jenzer, SAMS 2008

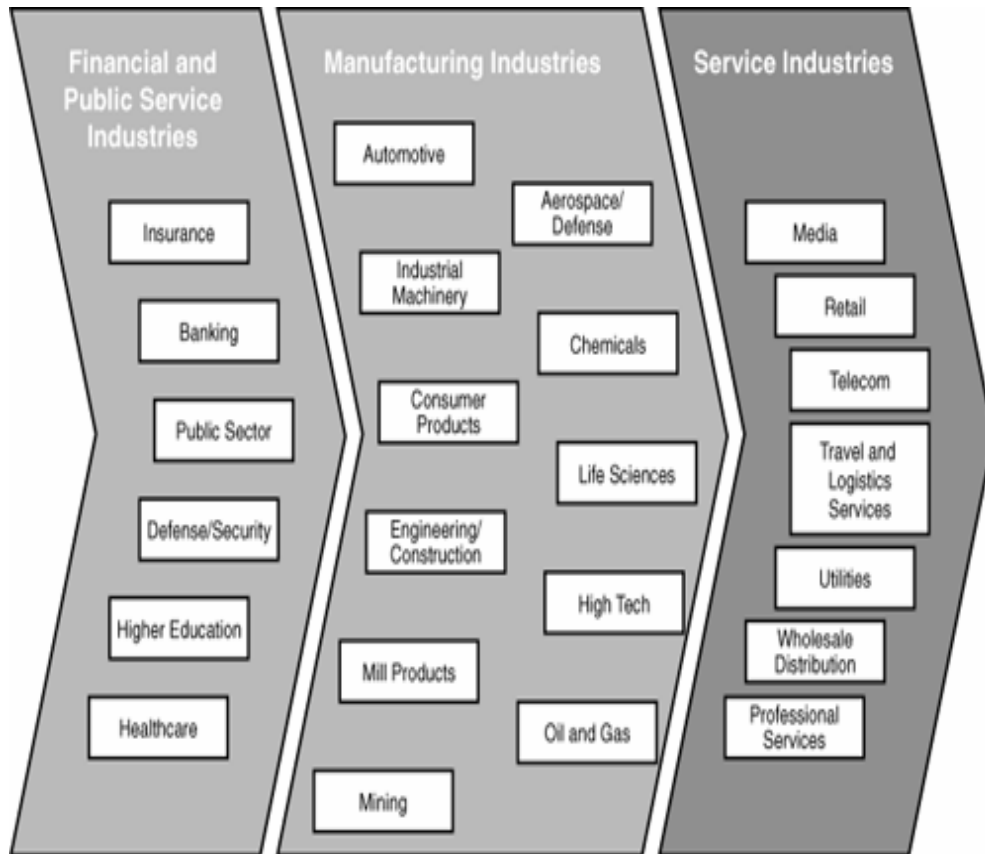


Figure 1.6 SAP provides a wide range of industry-specific solutions

(Source: Sams Teach Yourself SAP in 24 Hours, Third edition by George W. Anderson, Tim Rhodes, Jeff Davis, John Dobbins, Andreas , August 06 2008)

The SAP applications or components are formed by many modules which are business functionality. For example, SAP ERP includes the modules: Financials, Sales & Distribution, various Logistic functions, Human Resource Capital and more. SAP incorporates industry's best practices for the different business processes necessary to run a company and that is only one of the reasons SAP was and is so successful. A company can choose between two alternatives:

- to agree immediately to adopt those best practices, allowing to grow more efficient serving their customers, constituents, and other stakeholders, by implementing the SAP modules that incorporates these best practices;
- to seek to transform how they do business and to evolve their business model over time.

These industry solutions can be combined in turn to create broad platforms for conducting business. By combining solutions SAP can create cross applications or extended business process that might be initiated through SAP's Enterprise Portal (this allows to a broad category of users, including customers and suppliers, to access SAP systems). SAP industry solutions are currently divided into three core industry areas - Manufacturing, Service Industries, and Financial/Public Services - that in turn, include industries as Aerospace & Defense, Automotive, Banking, Chemicals, Consumer Products, Engineering & Construction, Healthcare, High Tech, Insurance, Media, Oil & Gas, Pharmaceuticals, Public Sector, Retail, Telecommunications, Utilities, and more (see figure 1.6).

Note. These industry solutions are simply "installed" atop SAP's core products such as ERP; a pharmaceutical company, for example, may deploy vanilla ERP to design and customize its own business processes, or it can deploy the SAP Pharmaceutical industry solution atop SAP ERP and gain the advantage of built-in best practices.

SAP solutions can be combined to create broad platforms for conducting business. By combining multiple SAP applications, a company can create what is called a cross-application or extended business process. These so-called cross-application business

processes might be initiated through SAP's Enterprise Portal, which allows a broad base of a company's users or even its partners and suppliers to access the company's SAP system. Once a user passes in (by intermediate of SAP Enterprise Portal) it can interact with other SAP Applications directly (by intermediate of their external interface) or indirectly by the processes chaining initiated by the business logic (see figure 1.7).

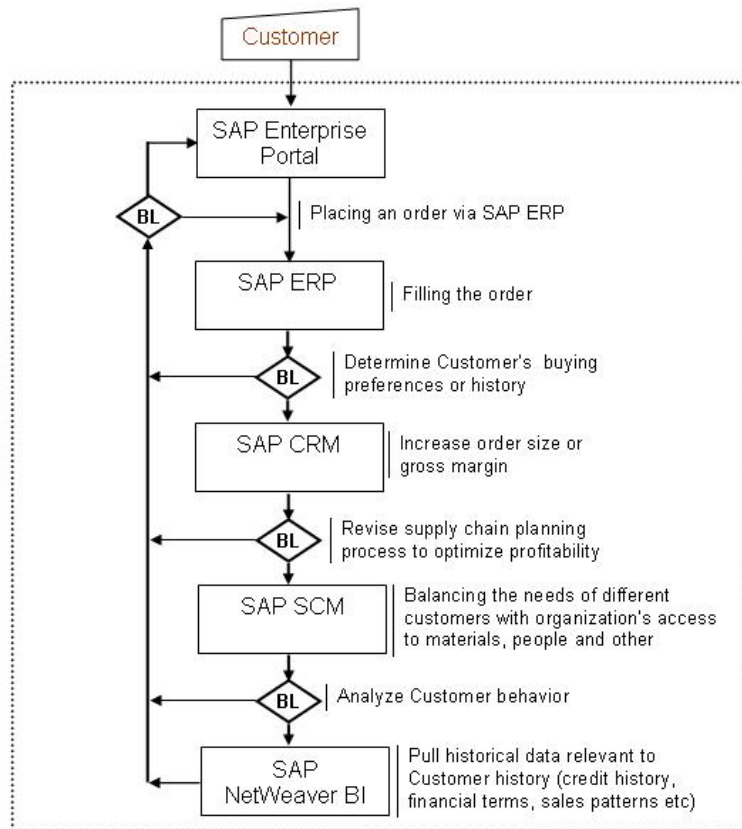


Figure 1.7 Example of automatic SAP modules chaining by business logic (BL)

For example (figure 1.7), if a customer places an order by using SAP Enterprise Resource Planning (ERP) the business logic enabled at business process level can pass the control to SAP Customer Relationship Management (CRM) which in turn can influence the business process in a particular way by increasing the order size or gross margin. Next SAP Supply Chain Management (SCM) might be accessed to revise a supply chain planning process for a set of potential orders looking to optimize profitability. Finally, the SAP NetWeaver BI (Business Intelligence) offering might be queried to pull historical data relevant to a customer's credit history, financial terms, and sales patterns within a particular geography or during a particular season. After these details are analyzed, control can be turned back over to SAP ERP or SAP NetWeaver

Portal to track warehousing, drive the pick-list process, track and manage the order-shipping process, and conclude with the accounts receivables portion of the overall business process. SAP is Enterprise Applications market leader, is listed to NYSE under SAP symbol, have 43,000 employees, over 2000 implementation and support partners, is sell in 50 countries, is used by one million users across more than 100,000 installations (reflecting 43,000 different customers).

Latest SAP products are built on a very powerful and highly standardized platform called Web Application Server (WebAS) that can be installed on a variety of platforms and databases releases. It support most popular computer programming languages and protocols including Web Services, XML, classic HTML, SAP's traditional ABAP/4 programming language, and the industry standard Java language.

4. eApplications: When the Web was created in 1990 online applications running over the Internet created a new category. E-Commerce and e-Business describe systems that support buying and selling over the Internet, and Web services use the Web to provide distributed processing for business systems

These information technologies have unleashed a tsunami of data that rolls over and flattens all in its wake and the companies are realizing that the new initiatives such as e-business, supply chain management (SCM), customer relationships management (CRM), business process

management (BPM), and business intelligence (BI) go hand-in-hand with the proven organization-wide EAI (Enterprise Applications Integration) strategy.

Figure 1.7 suggest the organization system faced to his e-commerce/e-business relationships with the consumers, as a sell side end, and suppliers, as a buy side front:

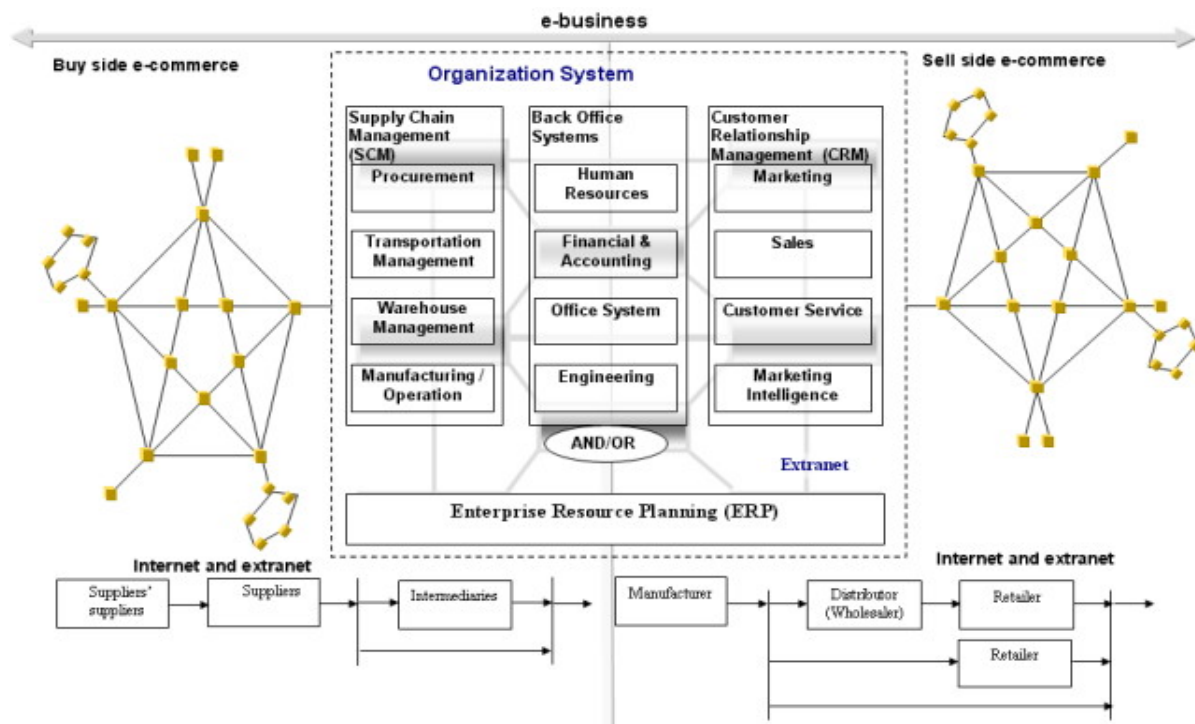


Figure 1.8 The extended company and management of customers and suppliers relationships (Source: Internet Technologies for Business - Business categories and models in Internet, Vasile Avram, <http://www.avrams.ro>)

1) Inside of the company's system boundaries suggested two situations:

- the usage of traditional support software systems grouped in so called back-office systems interfaced to the buy side by specialized software designated to the management of the relationships with suppliers (SCM-Supply Chain management) and to the sell side by the specialized software designated to the management of the relationships with the costumers (CRM-Customer Relationship Management). Bellow is a brief presentation of both SCM and CRM solutions;
- the usage of ERP (Enterprise Resource Planning) systems that provides a single informatic solution from a single software developer with integrated functions for major business functions such as production, distribution, sales, finance & accounting, and human resources management. The implementation of enterprise resource planning (ERP) systems allows enterprises to integrate and optimize their internal operations, such as production, Engineering, financial controlling and human resources. The enterprise resource planning systems are integrating web connections to leverage the speed and ubiquitous nature of the Internet (for example, SAP's R/3 system is Internet compatible and can be combined with other types of software under the enterprise).

Both situations suppose the existence of intranets and extranets support.

2) The buy side e-commerce suggest the e-commerce transactions between purchasing organization and its suppliers. These relationships are mapped across the support offered by both intranet and extranets so that is possible to realize Internet-based supply-chain management allowing all supply-chain participants receive and exchange information on purchasing, production, and shipping at real-time. The organization suppliers can deliver directly their products and/or services or by using intermediaries. In turn the organization suppliers can have relationships with their own suppliers (suppliers' suppliers). The usage of

SCM e-commerce is the source of disintermediation, defined as the removal of organizations or business processes layers responsible for certain steps in the value chain;

3) The sell side e-commerce suggests the e-commerce transactions between supplier organization (manufacturer) and its customers. This side includes the direct sell to customers by applying the disintermediation (the companies can obtain higher profit while charging lower prices) or the usage of different categories of intermediaries (Distributors and/or Retailers)

(f) Companies

While all companies use IT, the specific IT companies include computer manufacturers, hardware vendors, software vendors, application vendors, outsourcers and service providers, and consulting firms. There are a few full service vendors—notably IBM—that provide all of these functions.

- Computer manufacturers and hardware vendors both manufacture equipment and write software, and many companies fall into both categories;
- Application vendors write business applications to sell to other businesses. For many years, every company wrote its own software;
- Outsourcers and service providers (often a company is both) work with the execution of software systems rather than with creating the systems.
 - o Outsourcers will take over an IT function, such as Data Center, or computer operations, and perform that function for the company by providing the hardware, the support software including operating systems, DBMSs (DataBase Management Systems), and communications software and by running the application software (provided, in most cases, by the customer);
 - o Service providers are more recent, and most of them function over the Internet, and represented by ISPs, ASPs, Hosts etc. They provides both hardware and software and the customer can subscribe, or lease, the systems. Various functions are available this way including HR functions such as applicant tracking systems and time and attendance systems.
- Consulting firms provide IT professionals to businesses for a set contract, usually project based with an associated time period. The consulting firm uses its own employees and/or contracts with freelance IT professionals. Usually the consultants, or contractors, are intermingled with the staff of the company they are assigned to, so consultants need to be flexible and adjust to new environments and people with every assignment.

(g) EAI

It is clear that we now live in a world where one expects everything to be connected, or better, integrated. This, however, is easier said than done. Unfortunately, organizations have had a long history of creating systems that operate in isolation from other systems. The integration is not an entirely new problem. Many organizations have undertaken specific projects in the past where they had to integrate a number of different systems. The challenge faced by organizations today is to find scalable and economical solutions to the problem of large-scale integration (defined by the term enterprise integration (EI), which denotes the need to integrate a large number of systems that may be highly distributed across different parts of the organization). Integration cannot be achieved unless the information technology used by the organization is also integrated. “The goal of EAI is to integrate and streamline heterogeneous business processes across different applications and business units while allowing employees, decision makers, and business partners to readily access corporate and customer data no matter where it resides. More and more, EAI involves integrating information and processes not only across the enterprise but also beyond organizational walls to encompass business-to-business (B2B) integration supporting large scale value-added supply chains across the enlarged worldwide economy”⁵.

⁵ Semantic Web Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation by A. F. Salam and Jason R. Stevens IGI Publishing © 2007

EAI can be defined as “the use of software and architectural principles to bring together (integrate) a set of enterprise computer applications”. The goal of EAI is to integrate and streamline heterogeneous business processes across different applications and business units. Depending on who is the master of integrated parts the EAI can be categorized as:

- **Intra-organizational**, or application-to-application (A2A) integration, that specifies the automated and event-driven exchange of information between heterogeneous enterprise applications and systems operating within an organization or enterprise;
- **Inter-organizational**, or business-to-business (B2B) integration, that specifies the automated and event-driven information exchange between various systems of several collaborating organizations and enterprises.

EAI can take place at different layers (Bussler, 2003), such as:

- **data-oriented integration**, occurring at the database and data source level, either real time or non-real time, constituting the most widespread form of EAI today;
- **function or method integration**, involving the direct and rigid application-to-application integration of cross-platform applications over a network—it can be achieved using custom code, application program interface (APIs), remote procedure calls (RPCs) or distributed middleware and distributed objects (CORBA, RMI, DCOM);
- **user interface integration**, consisting on using a standardized user interface for accessing a group of legacy systems and applications. The new presentation layer is integrated with the existing business logic of the legacy systems or packaged applications; and
- **business process integration**, occurring at the business process level.

1.3 Virtual organization

As companies use electronic networks such as Internet or extranets it becomes difficult to delineate accurately their borders. The usage of such electronic networks allows outsourcing aspects of production, distribution, and even other core activities to third parties and the involved companies will move towards the virtual organization. Employee may work in any time zone and customers are able to purchase tailored products from any location. The absence of any rigid boundary or hierarchy within organization makes these more responsive and flexible company and with greater market orientation.

Davidow and Malone⁶ describe virtual organization as follow:

“To the outside observer, it will appear almost edgeless, with permeable and continuously changing interfaces between company, supplier and customer. From inside the firm, the view will be no less amorphous, with traditional offices, departments, and operating divisions constantly reforming according to need. Job responsibilities will regularly shift.”

The features of virtual organizations as suggested since 1998 by Kraut et al.⁷ are:

1. Process transcend the boundaries of a single form and are not controlled by a single organizational hierarchy;
2. Production process are flexible with different parties involved at different times;
3. Parties involved in the production of a single product are often geographically dispersed;
4. Given this dispersion, coordination is heavily dependent on telecommunications and data networks.

All companies tend to have some elements of the virtual organization (as these characteristics increase this is known as virtualization).

⁶ The virtual corporation. Structuring and Revitalizing the Corporation for the 21st Century by Davidow, W.H. and Malone, M.S. HarperCollins London 1992

⁷ Coordination and virtualization: the role of electronic networks and personal relationships by Kraut, R., Chan, A., Butler, B., Hong, A. in Journal of Computer Mediated Communications, 3(4) n1998

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