MANAGEMENT INFORMATION SYSTEMS

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COURSE OBJECTIVES

- Identification of the main management information systems, their components, their features, methods of building, and tools supporting this process,
- Pointing of the main directions of the systems development, new trends, and new architectures of the systems,
- Analyzing of e-commerce as one of the modern ideas of management information systems,
- Presentation of modern MIS applications in specific areas in Poland

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COURSE BRIEF CONTENTS (1)

1. Management Information System: creation, typology and characteristic (Transaction Processing Systems, Management Information Systems, Decision Support Systems, Expert Systems, Executive Information Systems, Artificial Intelligence Systems, Management Support Systems),
2. The role of integration in management information system development
2.1. Benefits resulting from linking systems of different structures: MIS and ES, ES and DSS, EIS and DSS, ES and EIS, EIS and MIS, links between systems of the same type,
2.2. Integration with unified universal systems,
2.3. Changes in MIS typology caused by integration (Integrated Management Support Systems, Dedicated expert systems, Telecommunication (Internet) Systems),

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COURSE BRIEF CONTENTS (2)

3. Problems with implementation and changes management information systems of MRPII/ERP (material resource planning/enterprise resource planning) class –
3.1. Principles of MIS selection in the firm development and information problems connected with the process
3.2. The concept of elimination of barriers to the implementation of integrated systems with the use of I-Case tools

4. E-Commerce and e-Banking
4.1. E-commerce brief characteristic
4.2. The place and role of the Internet in the development of Polish companies,
4.3. E-Banking brief characterictic
4.4. Electronic and internet banking applications for small companies

To complete successfully this lecture :

1. **Theoretical test – point 1., 2.4.1.,4.3.**
   (15 questions, four possibilities of reply, only one is true) with me

This lecture will be continued… with Jakub Leszczyński - computer laboratory – Design of Websites

2. The second element of credit achievement – website construction

3. The final mark (grade) will be average from our evaluations

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MODERN MANAGEMENT INFORMATION SYSTEM

Information system - which can support adaptative process of decision making under deterministic and probabilistic conditions, where computerization of all problem isn't possible or desired, full internal and external integrated, implemented in interactive process of user and creator training

[Turban E., et all, ... 1998]

TWO MAIN APPROACHES TO MIS:

- **Wide - all computerized systems, which supported management of companies in economy**

> Transactional Data Proceesing,
> Management Information Systems,
> Decision Data Systems, Expert Systems,
> Executive Support Systems, Executive
> Information Systems, Artificial
> Information Systems ans so on

- **Narrow – only that which are supported by Data Base and data Based Management System – previously called:**
- **- Management Information Systems now Data Based Systems**

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DEFINITIONS

- *System* – group of elements integrated with common purpose of achieving an objective (...) by transforming input resources to output resources [Mc Leod ...,2001]
- *Information system* – group of programs integrated in three areas: programme, logical and technical [Chmielarz..., 1996]
- *Data* – facts and figures relatively important for users, *information* – is processed, meaningful data [Mc Leod ...,2001]
- **Management Information System – information producing system that support managers** [Mc Leod ...,2001]

SYSTEMS METHODOLOGIES

- **Model – abstraction of economic reality, representation problems to be solved (physical – three-dimensional reprezentation of reality, narrative – spoken of written describtion, graphics – reprezentation with an abstraction of lines, symbols, shapes, mathematical – reprezentation as a shape of logical connected mathematical formulas)**
- **Construction of the information system – transformation logical model of reality to phisical model in programming way**
- **Stages of the construction – system development life cycle.**

PHASES OF THE SYSTEM CONSTRUCTING PROCCESS (1)

- **Planning phase: recognize the problem, define the problem, set systems objectives, identify system constraints, conduct a feasibility study, prepare and approve a system study proposal, establish a control mechanism**
- **Analysis phase:**
- ✓ **acceptation of the system study,**
- ✓ **organize the project team,**
- ✓ **define information needs – engaging in a variety of information-gathering activities, observations, record searches, surveys**
- ✓ **define system performance criteria – exact terms what the system should accomplish**
- ✓ **preparation the design proposal,**
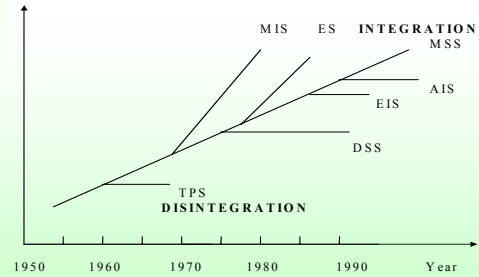- ✓ **approval the design project.**

PHASES OF THE SYSTEM CONSTRUCTING PROCCESS (2)

- **The design phase: prepare the detailed system design, identify alternative system configuration, evaluate alternative system configuration, select the best configuartion, prepare the implementation proposal, system implementation approval.**
- **Implementation phase – plan of implementation, hardware resources, software resources, database preperation, phisical facilities preparation, participants and users education, starting new system preparation, approval the new system, new system starting,**
- **The use (executive) phase – audit the system, maintain the system, reengineering proposal preparation, changes approval,**

COMPUTERIZED TOOLS OF IS

- **Transaction Processing Systems (TPS) 1965**
- **Management Information Systems (MIS) 1970**
- **Decision Support Systems (DSS) 1975**
- **Expert Systems (ES) 1980**
- **Executive Information Systems 1980**
- **Artificial Neural Networks 1985 (?)**
- **Integrated Management Support Systems 1990**
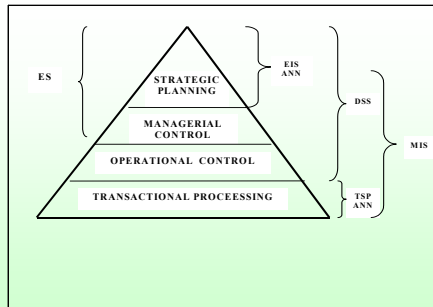

MIS Development Stages

MIS ES **INTEGRATION**
M S S
A I S
E I S
D S S
T P S
DISINTEGRATION

1950   1960   1970   1980   1990   Y e a r

ATTRIBUTES OF THE IS

Dimension	TPS	MIS	DSS	ES	EIS	AIS
Application	Payroll, inventory, record keeping, production and sales	Production control, sales forecasting, monitoring	Long-range strategic planning, complex integrated problems areas	Diagnosis, strategic planning, internal control planning, maintenance strategies	Support to top management, decision environmental scanning, controlling	Strategic planning, (investment, location, allocation resources etc.)
Goal	Data transactions	Information	Decisions, flexibility, userfriendliness	Inferencing, Transfer of expertise	Tracking, control, drill down	Drawing conclusions, experiences
Database	Unique to each application	Interactive access by programmers	Database management systems	Procedural and factual knowledge base	External and corporate	Natural pattern knowledge, Knowledge Base
Decision capabilities	No decision or simple	Structured routine problems	Semistructured problems or integrated OR models	The system makes complex decisions unstructured	None	Decisions in environment of lack of information, heuristics
Manipulation	Numerical	Numerical	Numerical	Symbolic	Numeric some symbolic	Numeric some symbolic
Type of information	Summary reports, operational	Scheduled and demand reports	Information to support specific decisions	Advice and explanations	Status access exception reporting	Diagnosis, prognosis, explanations
Supported organization level	Low management	Middle management	Top management	Top management and specialists	Senior executives	Top management and specialists
Destination	Expediency	Efficiency	Effectiveness	Effectiveness and Expediency	Timeliness	Knowledge gaining

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PHASES OF SUPPORT IN DECISION MAKING

- **Early – compute, summarize, organize: calculators, early computer programs, statistical models, simple operation research, models,**
- **Intermediate – find, organize and display decision relevant information: database management systems, MIS,**
- **Current – perform decision-relevant computations on decision relevant information, organize and display results, query-based and user-friendly approach, „what if..." analysis: financial models, spreadsheets, operation research models, DSS, ES, EIS,**
- **Future – complex and fuzzy decisions situations, expanding to collaborative decision making and to machine learning: second generation of expert systems, group DSS, neural computing.**

IS AND COMPANY MANAGEMENT

ES

EIS
ANN

STRATEGIC
PLANNING

MANAGERIAL
CONTROL

DSS

OPERATIONAL CONTROL

MIS

TRANSACTIONAL PROCEESSING

TSP
ANN

DECISION SUPPORT FRAMEWORK

Type of Control			
Type of Decision	Operational Control	Managerial Control	Strategic Planning	Support Needed
Structured	Accounting, orders	Budget analysis, short-time forecasting	Financial management (investment), warehouse location	MIS, Operations Research Models, TSP
Semistructured	Production scheduling, inventory control	Credit evaluation, project scheduling, reward systems design	Building new plant, new product planning, quality assurance planning	DSS
Unstructured	Buying software, approving loans	Negotiating, recruiting, buying hardware	R&D planning, new technology development	DSS, ES, ANN
Support Needed	MIS, Management science	Management science, DSS, ES, EIS	EIS, ES, ANN	

TRANSACTIONAL (DATA) SYSTEMS PROCESSING (TSP)

Definition:

- **Transaction Processing Systems (TSP) perform the frequent routine external and internal transactions that serve the operational level of organisation.**

TRANSACTIONAL (DATA) SYSTEMS PROCESSING (TSP)

Data processing – manipulation or transformation numbers and letters for the purpose of increasing their usefulness (data gathering, data manipulation – classifying, sorting, selecting etc).

TSP, DPS or AIS – the first single simple systems made mainly for gathering and processing data not for decision making, operating separately in the frames of the firm; in the beginning often without common data-base

What's systems: distribution with subsystems: fill customers orders (inventory, billing account receivable), order replenishment stock (purchasing, receiving, accounts payable)

Example:

- **Distribution System**

parts - subsystems: customer, suppliers, fill orders, order replenishment stock, maintain general ledger, management, material stockroom

functions: sale orders, rejected sales orders notices, invoices, statements, payments by customers, inventory ledger data, payables ledger data, budget reports, balance sheet, purchasing data, supplier invoices, payments to suppliers etc.

CHARACTERISTICS OF MIS AND DSS

MIS
- The main impact on structured tasks, where standard operating procedures, decisin rules and information flows can be predefined
- Tha main payoff – improving efficiency by reducing costs, turaround time, and so on.
- The relevance for managers' decisionsmaking – indirect – for example by providing reports and access to data

DSS
- The main impact on decisions in which there is sufficient structure for computer and analytic aids to be of value but where managers' judgement is essential
- The payoff – extending the rangeand capability of computerized managers'decision processes to help them improve their effectiveness,
- The relevance for managers is the creation of a SUPPORTIVE TOOL, under their own control, that does not attempt to automatic the decision process, predefine objectives, or impose solutions

MIS – MANAGEMENT INFORMATION SYSTEMS

Definition: MIS - as a computer-based system that makes information available to users with similar needs

The information describes the firm or one of its major system in terms of what has happened in the past and is happening now (sometimes in the future)

Consist of: user interface, data base, data base system managemnt.

DEFINITION OF DSS

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 decisin makers who deal with semi-structural problems.

CAPABILITIES OF DSS

- DSS provides support for decisions makers mainly in semistructured and unstructured situations.
- Support is provided for various managerial levels
- Support is provided to individuals as well as to groups, for several independent or sequential decisions, to all phases of the decision making process,
- Supports a variety of decision-makers processes and styles,
- DSS is adaptive over time,
- DSS is easy to use (userfrendliness, flexibility, strong graphic capabilities)
- DSS attempts to improve the effectiveness of decision making (accuracy, timeliness, quality) rather then its efficiency (cost, including the charges for computer time)
- The decision maker has z control over all steps the decisin-making process in solving the problem.
- DSS leads to learning, which leads to new demands and the refinement of the system, which leads to additional learning (continuos process)
- DSS is relatively easy to construct (with user assistance),
- DSS usually utilizes models (standards, custom-made)
- Advanced DSS are equiped with the knowledge component – enables the efficient and effective solution of very difficult problems

THE MAJOR BENEFITS OF DSS

1. Abbility to support the solution of complex problem
2. Fast response to unexpected situations that result in changed conditions. A DSS enables a thorough, quantitative analysis in a very short time. Even frequent changes in a scenario can be evaluated objectively in a timely manner
3. Ability to try several different strategies under different configurations
4. New insights and learning. The user can be exposed to new insights through the composition of the model and an extensive sensitivity „what-if" analysis. Training inexperiencedmanagers and other employees as well.
5. Facilitated communication. Data collection and model construction experimentations are being executed with active users' participation.
6. Improved management control and performance. DSS can increase management control over expenditures and improve performance of the organization,
7. Cost savings. Routine applications of a DSS may result in cost reduction or reducing the cost of wrong decisions
8. Objective decisions – more consistent and objective than decisions made intuitively
9. Improving managerial effectiveness, allowing managers to perform a task in less time and less effort.

COMPONENTS OF DSS

1. Data Management – includes the database, which contains relevant data for the situation and is managed by software called database management system (DBMS).
2. Model Management – includes financial, statistical, management science or other models that provide the system's analytical capabilities and an appropriate software management.
3. Communication Subsystem (dialog subsystem). The user can communicate with and command the DSS through this subsystem. It provides the user interface.
4. Knowledge management. This optional subsystem can support any of the other subsystem or act as an independent component.

Components constitute the software portion of the DSS.

THE DATA MANAGEMENT SUBSYSTEM

1. DSS database
2. Database management system
3. Data directory
4. Query facility

The Database – collection of interrelated data organized in such a way that it corresponds to the needs and structure of an organization and can be used by more than one person for more than one application.

DBMS – to screen each request for information and determine that the person making the request is indeed an autorised user, user - has access to the requested file, and to the requested data items in the file. Administrator can obtain reports about that activity of users. An effective DBMS can provide support for many managerial activities, general navigation among records, support for a diverse set of data relationships, and report generation are typical examples.

Data directory – is a catalog of all data in database. It contains the data definitions, its main functions is to answer questions about the availibility of data items, their source or their exact meaning.

Query facility – provides the basis for access to data. It accepts request for data, determines how these request can be filled, formulates the detailed request,returns the results to user

MODEL MANAGEMENT SUBSYSTEM

- Model base
- Model base management system
- Model language
- Model directory
- Model execution, integration and command

Model base – contains routine, standard and special statistical, financial, managerial and other models that provide the analysis capabilities in the DSS. The ability to invoke, run, change, combine and inspect models. The models in the Model base can be divided into four main blocks: strategic, tactical, operational and basic (model buiding blocks and subroutines)

Model base management – contains all tools for model management: modeling commands – creation, maintenance-update, database interface, modeling language

Model language - special set of commands which can make possible to conctruct the model

Model directory – catalog of all models in the system, whenever used

Model execution, integration and command – rules of data management, dialog management and knowledge management

INFORMATION SYSTEM for „MANAGING DIRECTORS"

Definition:

EIS - provide senior managers with a system to assist them in taking strategic and tactical decisions.

Their purpose is to analyse, compare and highlight trends to help govern the strategic direction of a company

There are commonly integrated with operational systems, giving managers the facility to „drill down" to find out further information on a problem

INFORMATION SYSTEM for „MANAGING DIRECTORS"

Two categories:
- **Executive Information Systems (EIS) – is a computer-based system that serves the information needs of top executives. Rapid access to timely information and direct access to management reports. Very user-friendly, supported by graphics, and provides exceptions reporting and drill-down capabilities (break down data for details: daily report corporate rates can be drilled down to find the daily sales in a region, or by product, or by salesperson.**
- **Executive Support System (ESS) – is a comprehensive support system that goes beyond EIS to include communications, office automation, analysis support and intelligence issues resolving.**

EXECUTIVE INFORMATION SYSTEM - CHARACTERISTICS

Quality of information:
- **Is flexible**
- **Produces correct information, timely informaton, relevant information, complete information, validated information.**

User interface:
- **Includes sophisticated graphic user interface**
- **Allows secure and confidental access to information**
- **Includes a user friendly interface**
- **Has a short response time**
- **Is accessible from many places**
- **Minimizes keyboard use**
- **Provides quick retrieval of desired information**
- **Is tailored to management styles of individual executives**
- **Contains self-help menu**

EIS - TECHNICAL CAPABILITY

- **Access to aggregate information**
- **Extensive use of external data**
- **Written interpretation**
- **Highlights problem indicators**
- **Ad doc analysis**
- **Information presented in hierarchical form**
- **Incorporates graphics and text in the same display**
- **Provides management by exception reports**
- **Shows trends, ratios and deviations**
- **Provides access to historical and most current data**
- **Organized around critical success factors**
- **Provides often forecasting capability**
- **Produces information at variuos levels of details**
- **Filters, compresses and track critical data**

EIS - BENEFITS

- Facilitates the attainment of organizational objectives
- Facilitates accesss to information
- Allows the user be more productive
- Increases the quality of decision making
- Provides a competetive adventage
- Saves time for the user
- Increases communication quality and capacity
- Provides better control in the organization
- Allows the anticipation of problems/opportunities
- Allows planning
- Allows finding the cause of a problem
- Meets the needs od executives

EIS – BENEFITS – from the other side

External
- Increased competition
- Rapidly changing environment
- Need to be proactive
- Need to access external databases
- Increasing goverment regulations

EXPERT SYSTEMS

Definition:

Expert systems – used to represent the knowledge decision-making skills of specialist so that non-specialists can take decisions

EXPERT SYSTEMS – STRUCTURE AND COMPONENTS (1)

Components:
- Knowledge acquisition subsystem
- Knowledge Base
- Inference Engine
- Blacboard (workplace)
- User
- User Interface
- Explanation justifier
- Knowledge Refining Subsystem

- **Knowledge acquisition subsystem** – accumulation, transfer and transformation of problem solving expertise from some knowledge source to a computer program for constructing or expanding the knowledge base. Sources: human experts, textbooks, databases, special research reports and pictures.

EXPERT SYSTEMS – STRUCTURE AND COMPONENTS (2)

Knowledge Base – contains knowledge necessary for understanding, formulate and solving problem.Two basic elements: facts, such as the problem situation and theory of the problem area and special heuristics, or rules that direct the use of knowledge to solve specific problems in a particular domain,

Inference Engine – brain of the ES, control structure or the ruler interpreter; a computer program that provides a methodology for reasoning about information in the knowledge base and in the „blackboard" and for formulating conclusions.

It has three major elements:

- **An interpreter** – (rule interpreter) – which executes chosen items, by applying the corresponding knowledge rules base,
- **A scheduler** – which maintains control over the agenda. It estimates thw effects of applying inference rules in light of item priorities or other criteria,
- **A consistency enforcer** – which attempts tp maintain a consisytent representation of the emerging solution.

EXPERT SYSTEMS – STRUCTURE AND COMPONENTS (3)

Blackboard – is an area of working memory set aside for the description of a current problem, as specified by the input data; used also for recording internediate results

User Interface – expert system contain a language processor for friendly, problem-oriented communication between the user and the computer.Could be carried out in natural language or supplemented by menus or graphics

Explanation Subsystem (Justifier) – can trace responsibility for conclusions and explain the ES behaviour by answering:

- **Why was a certain question asked by the expert system?**
- **How was a certain conclusion reached?**
- **Why was a certain alternative rejected?**
- **What is a plan to reach the solution?**

Knowledge Refining System - - can analyse their performance, learn from it and improve it for future consultations

EXPERT SYSTEMS AREAS (1)

- **Interpretetion systems** – infer situation descriptions from observation: srveillance, speech understanding, image analysis, signal interpretation and many types of intelligence analysis
- **Prediction systems** – include weather forecasting, demographic predictions, economic forecasting, traffic predictions, crop estimates, military, marketing or financial forecasting
- **Diagnosytic systems** – include medical, electronic, mechanical and software diagnosis
- **Design systems** – develop confogurations of objects that satisfy the constraints of the design problem: circuit layout, building design, plant layout
- **Planning systems** – problems like automatic programming, deal with short- and long-term planning in areas: project management, routing, communication, product development, military applications and financial planning.
- **Monitoring systems** – compare the observations of system behaviour with standards that seem crucial for successful goal attainment.

EXPERT SYSTEMS AREAS (2)

- **Debugging systems** - rely on planning, design and prediction capabilities to create specifications or recommendations for correcting a diagnosed problem
- **Repair systems** – develop and execute plans to administer a remedy for some diagnosed problem.
- **Instruction systems** – incorporate diagnosis and debugging subsystem that specifically address the student as the focus of interest.
- **Control systems** – adaptively govern the overall behaviour of a system: repeatedly interpret the current situation, predict the future, diagnose the causes of anticipated problems, formulate a remedial plan and monitor its execution to ensure success.

COMPARIZON OF CONVENTIONAL SYSTEMS AND ES

TSP and MIS	Expert Systems
Information and its processing are usually combined in one sequential program	Knowledge base is clearly separated from the processing (inference) mechanism (i.e knowledge rules separated from the control).
Programs do not make mistakes (programmers do)	Program may make mistakes
Do not (usually) explain why input data are needed or how conclusions were drawn	Explanation is a part of most ES
Changes in the program are difficult and unconvienient	Changes in the rules are easily to accomplish
The system operates only when it is completed	The system can operate with only a few rules
Execution is done on a step-by-step (algorithmic) basis	Execution is done by using heuristics and logic rules
Effective manipulation of large databases	Effective manipulation of large knowledge bases
Representation and use of data	Representation and use knowledge
Efficiency is a major goal	Effectiveness is main goal
Easily deal with quantitative data	Easily deal with qualitative data
Capture, magnify, and distribute access to numeric data or to information	Capture, magnify, and distribute access to judgment and knowledge

COMPARIZON OF DSS AND ES

Difference	DSS	ES
Objective	Assistant human decision maker	Replicate human advisers and replace them
Who makes decisions?	The human and the system	The system
Major orientation	Decision making	Transfer of experience and rendering of advice
Major query direction	Human queries the machine	Machine queries the human
Nature of support	Personal, group and institutional	Personal (mainly)
Manipulation method	Numerical	Symbolic
Characteristics of problem area	Complex, integrated	Narrow domain
Type of problems	Ad hoc, unique	Repetitive
Content of database	Factual knowledge	Procedural and factual knowledge
Reasoning capability	No	Yes, limited
Explanation capability	Limited	Yes

BENEFITS OF EXPERT SYSTEMS

- Increasd Output and Productivity,
- Increased Quality
- Reduced Downtime
- Capture of Scarce Expertise
- Flexibility
- Easier Equipment Operations Ability to Solve Complex Problem
- Knowledge Transfer to Remote Locations
- Elimination of the Need for Expensive Equipment
- Operations in Hazardous Environments
- Accessibility to Knowledge and Help Desk
- Reliability
- Increased Capabilities of Other Computerized Systems
- Integration of Several Experts' Opinions
- Ability to Work with Incomplete or Uncertain Information
- Provision of Training
- Enhancement of Problem Solving

ARTIFICIAL INTELLIGENCE SYSTEMS

„... AIS are like YETI, nobody, never has seen it, but everybody has heard about them ..."

Artificial Intelligence Systems – behaviuor by a machine that, if performed by a human being, would be called intelligent; is the study of how to make computers do things at which, at the momment, people are better

Three objectives of AIS:
- Make machines smarter (primary goal),
- Understand what intelligence is (Nobel laureate purpose),
- Make machines more useful (the entrepreneurial purpose).

Meanings of intelligent behaviour:
- Learn or understand from experience
- make sense out of ambigous or contradictory messages
- Respond quickly and successfully to a new situation
- Use reason in solving problems
- Deal with perplexing situations
- Understand and infer in ordinary, rational ways
- Apply knowledge to manipulate the environment
- Acquire and apply knowledge, think and reason
- Recognize the relative importance of diffrerent elements in a situation

AIS – EXAMPLES OF APPLICATION (1)

Patern recognition
- Speech generation
- Data transmission
- Motion detection for military applicationa
- Robot learning
- Automation of operations in hazardous environment
- Character recognition and voice recognition systems
- Diagnosis of defective equipment

Interpretation of data
- Financial services – identification of patterns in stock markets
- Loan application evaluation
- Jet and rocket engine diagnostics
- Medical diagnosis
- Credit card information
- DNA sequencing
- Airline forecasting
- Evaluation of personnel and job candidates

Optimization
Resource allocation based on historical, experimental data
Standard statistical analyses

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AIS – SELECTED EXAMPLES OF APPLICATION (2)

- **Computer Vision and Scene Recognition** – the addition of some of computer intelligence and decision making to digitized visual information received from a machine sensor.Combined information is then used to perform, or control such operations as robotic movement, conveyor speeds and production-line quality
- **Intelligent Computer-Aided Instruction** – refers to machines that can tutor humans. Such a machine can be viewed as an expert system. But expert system is to render advice, purpose of ICAI is to teach
- **Automatic Programming** – goal is to create special programs taht acts as „intelligent"tools to assist programmers and expedite each phase of the programming process. Computer system that could develop programs by itself, in response to and accordance with the specifications of a program developer.
- **Summarizing news** – computer programs „read" stories in newspapers or other documents and make summaries.
- **Translation from One Language to Another** – programs are able to translate words and simple sentences.

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AIS – SELECTED EXAMPLES OF APPLICATION (3)

- **Natural Language Processing** – computers users have the ability to communicate with computer in their native language, allows for a conversational type of interface, in contrast with programming language.
- **Natural languages processing** – divided into two fields:
- natural language *understanding* investigates methods of allowing the computer to comprehend instructions – so that computers can understand people more easily,
- Natural languages *generation* – so that people can understand computers more easily.
- **Speech (Voice) Understanding** - - recognition and understanding by a computer of spoken language. Recognition – without interpreting; understanding – meaning of the speech.
- **Robotics and Sensory Systems** - - such a vision systems, tactile systems and signal processing systems; reprogrammable multifunctional manipulator designed tomove materials, parts, tools or specialized devices through variable programmed motions for the performance of a variety of tasks. Robots combine sensory systems with mechanical motion to produce machines of widely varying intelligence and abilities.

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AIS – SELECTED BENEFITS

- **Usefulness for pattern recognition , learning classification, generalization and abstraction and the interpretation of incomplete data**
- **Pattern recognition for character, speech and visual recognition**
- **Systems that learn are more natural interfaces to the real world than systems that must be programmed**
- **Potential to provide some of human characteristicsof problem solving of problem solving that are difficult to simulate using the logical, analytical techniques od expert system and standard software technologies**
- **Hihg fault tolerance**
- **Generalization – in work with noisy, incomplet or previously unsen input – generates reasonable response**
- **Adaptivity – learns in new environment.**

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COMPARIZON ES AND AIS

Characteristics	Expert Systems	Artificial Intelligence Systems
Approach	Symbolic (mainly)	Numeric
Reasoning	Logical	Associative
Operations	Mechanical	Biological-like
Explanation	Available	Not available
Processing	Sequential	Parallel
System	Closed	Self-organizing
Validation and verification	Slow, difficult	Fast
Driven by	Knowledge	Data
Maintenance	Difficult	Easy

TRENDS IN MANAGEMENT INFORMATION SYSTEMS DEVELOPMENT AND NEW CLASSIFICATION

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...Aphorismus Book...

...Wisdom is nontransferable. The sage' knowledge which he try to transfere, sounds always like nonsense...
(... Mądrości nie można przekazać. Wiedza, którą próbuje przekazywać mędrzec, brzmi zawsze jak głupota...),

...Study period is the time when you are instructing by somebody you don't want to know, about something you don't want to know...
(... Okres nauki to czas gdy jesteś pouczany przez kogoś kogo nie chcesz znać, o czymś czego nie chcesz wiedzieć ...

COURSE BRIEF CONTENTS (1)

1. Management Information System: creation, typology and characteristic (Transaction Processing Systems, Management Information Systems, Decision Support Systems, Expert Systems, Executive Information Systems, Artificial Intelligence Systems, Management Support Systems),
2. The role of integration in management information system development
2.1. Benefits resulting from linking systems of different structures: MIS and ES, ES and DSS, EIS and DSS, ES and EIS, EIS and MIS, links between systems of the same type,
2.2. Integration with unified universal systems,
2.3. Changes in MIS typology caused by integration (Integrated Management Support Systems, Dedicated expert systems, Telecommunication (Internet) Systems),

COMPUTERIZED TOOLS OF MSS

- Transaction Processing Systems (TPS) 1965
- Management Information Systems (MIS) 1970
- Decision Support Systems (DSS) 1975
- Expert Systems (ES) 1980
- Executive Information Systems 1980
- Artificial Neural Networks 1985 (?)
- Integrated Management Support Systems 1990

ABSTRACT

- The main aim of this study is analysis of new trends in development of management support systems.
- It deals with the formulation on a new method of typology management support systems, as regards the integration processes in the development of the structure of the system.
- Described three main groups of MSS systems: integrated MSS, specialized expert systems and telecommunication system.
- In the presented discussion observations are presented on the tendencies of the development of creation and sales of IS at Poland.

ECONOMICAL TRANSFORMATION PHASE IN POLAND

Features:
- Privatization of major companies or bankruptcy of unprofitable major companies
- Increasing (despite protected duty barriers, contingents and concessions) competition on the market (internal and external)
- Including regional, international business/trade markets

And need to simplify new and often contradictory challenges of the market:
- Satisfying customer expectations (price minimization, maximizing utility) and "owners" (minimization of costs),
- Creating profit against satisfying consumption requirements
- Investment in research and development against the widening of regular production.

Need new type of systems!

ECONOMICAL TRANSFORMATION PHASE IN POLAND

To balance these needs the following types of business integration are necessary:
- Data and processes – on all the components of management: controlling, operational and execution level,
- The range of functional companies – on all levels of creation and development: designing, investment exploitation.
- Decision center – in the framework of the company contradictory decisions can't be undertaken.

Business integration - through:
- Analysis of net income – creating and composing gross income plans and sales plans
- Production and sales planning
- Planning material needs (analysis of demand, timetables, supply plans)
- Analysis of consistent processes (cost-income, supply-production, sales-demand,)

Need new type of systems!

ECONOMICAL TRANSFORMATION PHASE IN POLAND

To integrate processes we must separate, define and transform:
Main processes including:
- development a product and services
- distribution of product and services
- planning of operations categories and delegation planning,
- customer relations/contract etc.

- Supporting processes
- personnel
- finance
- administration.

Need new type of systems!

THE INTEGRATION IN THE DEVELOPMENT OF MIS

The relationship between the basic IS can be presented as:
- Perceiving them through a perspective of separate IS,
- Alternating meaningful and alter,
- Tendency to evolution and adaptation as regards reality,
- Interaction and coordination between systems as regards concrete applications.

We pay special attention to the installed systems which support office work and production, and also a complete lack in the shown typology very essential network area. None the less, already drawn conclusion that the main direction of development of most systems is their complex integration to MSS.

BENEFITS RESULTING FROM LINKING SYSTEMS OF DIFFERENT STRUCTURES – MIS & ES

Expert Systems:
•oversee the process of registration, retrieve and realize information,
•simplify correct base management for operators,
•optimize questions and search paths as well as the amount of transfer data,
•operate like intelligent interfaces in commercial deposition structured databases.

MIS - in the architecture - provides information for ES as well as ES simplifying data manipulation.
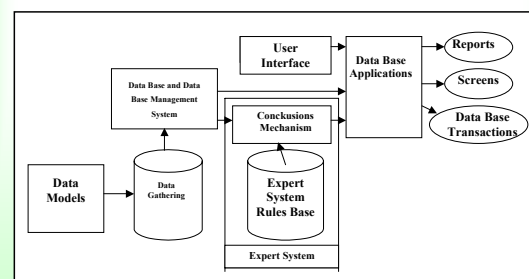
INTEGRATION: MIS & ES

Fig.1. Combinaton Architecture Expert System and Management Information System (Intelligent Data Base)

INTEGRATION ES & DSS

Cooperation gives the following effects:
- the possibility of logical explanation of undertaken decisions and results collected,
- the faster accomplishment of operations, when the acquired results of the DSS are input data for ES,
- proper identification of the reverse situation,
- an increase in possibility of choice for the user – using a system of two types of compound databases as regards the required needs of the logical decision process,
- generation of variant solutions (DSS) and linking to them alternative functions, which should be undertaken for their retrieval.

There are four possibilities:
- Expert System as supplement of Decision Support System,
- Expert System as independent component of Decision Support System
- Expert System expanding decision making process in Decision Support System
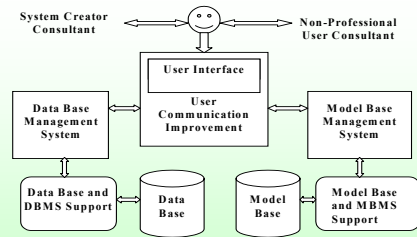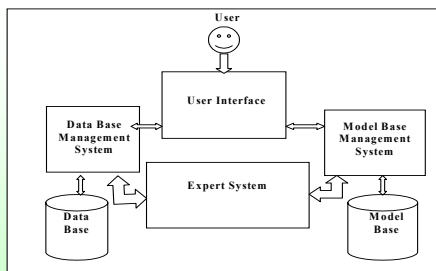- Expert System unified with Decision Support System

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INTEGRATION ES & DSS

Fig.2. Expert System as Supplement of Decision Support System

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INTEGRATION ES & DSS

Fig.3. Expert System as Independent Component of Decision Support System

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INTEGRATION ES & DSS

Fig. 4. Expert System Expanding Decision Making Process in Decision Support System

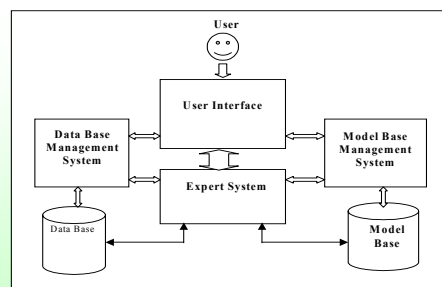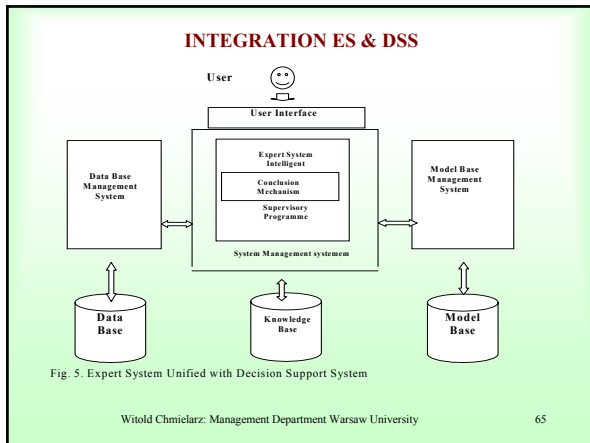Witold Chmielarz: Management Department Warsaw University 64

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INTEGRATION ES & DSS

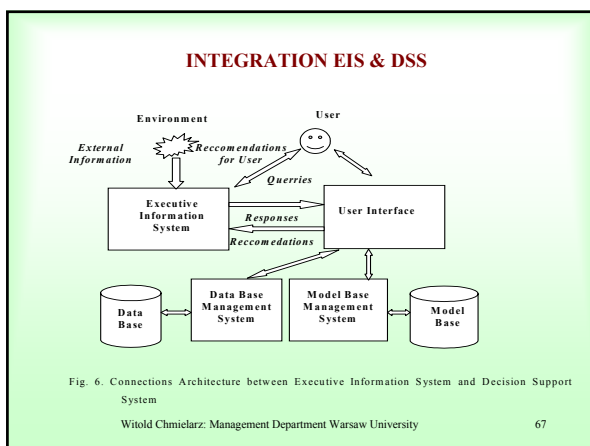Fig. 5. Expert System Unified with Decision Support System

INTEGRATION EIS & DSS

The basic method of integrating systems, which inform management and DSS is using them with the recent information generated by EIS as input information. In more complicated cases we expect to see a loop of the reverse compound through a special intelligent interface, which from the side of EIS will allow for the creation of questions to DSS, and in the opposite direction it will send interpretations and recommendations obtained from DSS. In short we can split this process into two parts:

- data after introductory treatment in EIS will be used as input data to DSS,
- EIS is used for further interpretations of solutions achieved with the help of DSS.

INTEGRATION EIS & DSS

Fig. 6. Connections Architecture between Executive Information System and Decision Support System

INTEGRATION ES & EIS

- It seems that linking these two systems in practice is done very seldom
- EIS can return with questions to the ES in the hope of solving particular, specialist problems which they have and changes of obtaining appropriate solutions.
- EIS can also call up to knowledge base or procedures base of ES in situations when their user interface is equipped with communication mechanism, which allow them such a function.
- Now and again ES acts in the role of a regular provider of reports (with a substantial grade) generated on the basis of data sent from EIS.
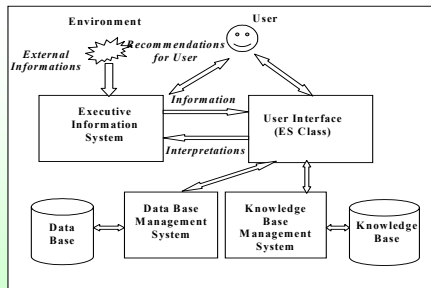
INTEGRATION ES & EIS

Fig. 7. Connection Architecture between Executive Information System and Expert System

INTEGRATION EIS & MIS

It is the oldest and most natural system of linking two IS. It makes use of, in full, all the database mechanism and at the same time only extracts of information, which is needed in the given moment by the management. In this way there arises an extra method independent of the user interface on a management level. Its basic characteristics:

- makes possible the detection of events happening in the company and its surroundings (EIS - as an intelligent interface to the database system),
- reverse memory of the interpretation of the EIS in the database.
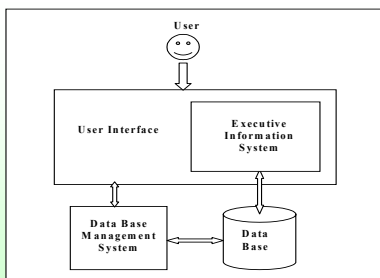
INTEGRATION EIS & MIS

Fig. 8. Executive Information System Architecture Connected with Management Information System

INTEGRATION BETWEEN SYSTEMS OF THE SAME TYPE

This kind of linking applies mainly to ES (information exchange between systems from various categories) or DSS (strengthening of the functions of humble systems through specialized transformation systems).

INTEGRATION WITHIN UNIFIED UNIVERSAL SYSTEMS

These are hugely complicated programs (about fifty thousand instructions), very expensive and include a maximum possible range of organizational functionality. In the case of systems having complex inclinations their range of functionality includes at least:

- planning material needs
- planning production and sales (as well as marketing)
- time tabling the final production flow
- time tabling product scaling and sub-products of the final products
- demand management
- the running of material transaction flows
- the running of production
- the running of the work place
- planning production capabilities
- material purchase
- distribution planning
- planning of tools purchasing control
- financial and accountancy management (or interfaces for them)
- assessment of results
- simulation of production variants.

INTEGRATION WITHIN UNIFIED UNIVERSAL SYSTEMS

Therefore the basic characteristics of such systems are:

- Functional complexity – i.e. the inclusion of its whole range of functions and processes going on in the organization (that does not disturb the selling of one part of the system in practice)
- Structural compound – from one side a complex functional stimulation (the size of the system would be enough!), from the other a joining of various types of system as a whole one, finally making use of various technological integration.
- The considerable ease of use – all new technical gadgets are quickly added to existing systems or new versions are created which differ by, for example a more attractive user interface. A common imposed idea about solving office problems with Windows put big pressure on systems creators, in the direction of building "Windows-style" interfaces - i.e. such that ensured ease of use for users who are accustomed to it.
- Common usage – all companies who want to survive on the ever narrowing more competitive market look for salvage in cost minimization. Such salvage is provided by the management and production support computer system. If it is used in the correct way, the substantial effects cause an increase of technological interest, and with this comes an increase in common usage of such systems.

REASONS OF CHANGES IN SYSTEM TYPOLOGY

- Organizational (reengineering, outsourcing, virtualization of processes and organizations)
- Social-psychological (world wide, public/state integrated structured, behavioral similarities),
- Technical (development of global networks, internal networks, electronic documents and services, universal access to the newest technology).

Types of integration:

- functional integration – integrated management systems
- technological integration:
- ✓ by embedding - through the installation of office packages,
- ✓ by access - multiprocessor - specialized expert systems,
- ✓ by access - networking – telecommunication systems

NEW CLASSIFICATION PROPOSAL

- Integrated Management Information (or Support) Systems of:
- ✓ company – in the most advanced form represented by MRPII/ERP systems (e.g. SAP, BAAN, ICL, IFS etc.),
- ✓ office packages – (e.g. Microsoft Office, Lotus Smart Suite etc.)

- Professional Expert Systems - dependent upon statistical - econometric and heuristic methods and the ever more used neuron networks and artificial intelligence

- Telecommunication (Internet) Systems – dependent upon development of network technologies

INTEGRATED MANAGEMENT SUPPORT SYSTEMS

Benefits:
- More productive than forming a whole system (faster in construction and correction),
- Eliminates completely manual handling of information,
- Owning a larger functionality than the simple sum of the applications functions (synergy).

Scenarios:
- Integration already existing applications,
- Building new applications integrated with existing ones,
- Creation so called "data warehouse" – which make use of existing methods.

Typical problems:
- Cooperation needs a common language,
- There are various levels/platforms:
  - hardware – Digital, HP, Sun, IBM,
  - operation systems – MS-DOS, Windows, NT Windows, UNIX, VMS, AXI,
  - networks – DecNet, TCP/IP.
- Organizations have various structures and development strategies and therefore functional applications,
- During application connection a complicated structure arises as regards the application2application connection

INTEGRATED COMPANY SYSTEMS

For this building the following must be realized:
- common information handling for the whole organization, without a dispensable surplus, which denotes, that the information about every thing is collected only once, ideally from the source, and sent to every processes which is ready to use it,
- unique collection system, transforming and information sending,
- unique media collection and information handling,
- common tools and system development procedures,
- unique user dialogue procedures.

Creating tendencies:
- standard vertical systems,
- component systems.

STANDARD VERTICAL SYSTEMS

Standard, vertical systems show a return to the idea of sector/branch systems launched in the nineteen seventies. This causes a "slimming" of universal systems and on the other hand qualifies them for specific functions characterized by specific branches.

The reasons for a return to such a system and its advantages are:
- A rich (abundance)complexity of the universal systems, causing ever, in the case of the cost increase of the major costs rather than the sector system, a large ease of learning for the system through the users, less necessity to transform the whole system, especially its communication media etc.,
- easier adaptation of the sector system to the conditions in individual companies in specific lines of business than in universal systems,
- similarity of individual companies (plants) in given lines (branches) of business creates hope of the effects of scales of sales.

COMPONENT SYSTEMS

Component systems appear through establishing an integrated system from existing components (subsystems, modules, elements, functions, processes) taking under consideration acceptance of a standard common communication.

The main advantages such approach are:
- making use of components through many users, which causes a reduction in their costs,
- reducing the complexity of the system (purchase of only necessary components, cost reduction, faster and simpler testing and correcting),
- the possibility of abstracting the realized technology,
- treating (activation, service) the telecommunication component as one of the remaining elements,
- possibility of mixing the same components coming from various supplies, under the condition of agreeing on standard communications.

SELECTED EXAMPLES OF INTEGRATED SYSTEMS

Table 1. Chosen integrated management system on the Polish market

Programme	Producer	Made in:	Hardware level	Functional range
BPCS	SSA (System Software Associates Inc.)	USA	AS/400, HP9000, RS/6000, DEC	FK, RK, SD, ZP, GM, PP, PC, GR, QM, TR, HR, PR, PL
IFS Applications	IFS Industrial and Financial Systems	Sweden	RS/6000, ICL, DEC VAX, Motorola, DEC Alpha, AXP	FK, RK, SD, ZP, GM, PP, PC, PR, QM, TR, HR
MAX	MCS Ltd. (Manufacturing Control Systems)	Great Britain	ICL, RS/6000, HP9000	FK, RK, SD, ZP, GM, PP, GR, QM
Oracle Applications	Oracle Corporation	USA	Almost all	FK, RK, SD, ZP, GM, PP, PC, PR, QM
R/3	S.A.P. AG	Germany	Almost all	FK, RK, SD, ZP, GM, PP, PC, PR, QM, TR, HR, GR
Teta	Teta sp. z o.o.	Poland	HP, RS/6000, DEC, PC	FK, RK, SD, ZP, GM, PP, PL
Baan IV	Baan	Holland, USA	RISC, HP, DEC	FK, RK, SD, ZP, GM, PP, PC, PR, TR, GR

FK - finance and accounting	PP – discrete production	QM – quality management
RK – cost management	PC – continual production	GR – reconditioning
SD – distribution management	GM – material administration	PR – management of enterprise
ZP – provision management	TR - transport	PL - salary
HR - personnel		

SELECTED ARCHITECTURE OF INTEGRATED „IDEAL" – (PERFECT) MIS
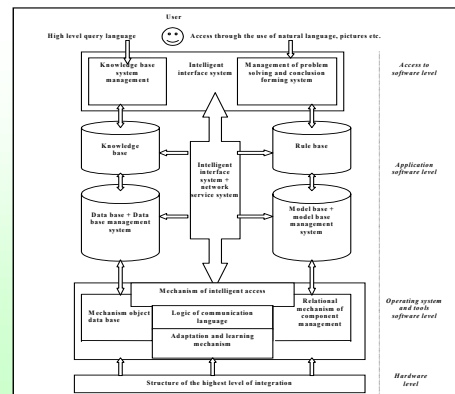
INTEGRATED OFFICE PACKAGES

In the functional range of such packages are programs like:
- **text editors - Microsoft Word, Word Pro, WordPerfect,**
- **spreadsheets – Excel, Lotus,**
- **data bases – Access,**
- **graphic presentation systems – PowerPoint, Harvard Graphics,**
- **desk top publishing programs – Corel Ventura, Page Maker, Quark Xpress,**
- **timetables – inside packages, WordPerfect Office, CaLANdar,**
- **document libraries – ProShare,**
- **electronic mail – Outlook Express, GroupWise, Outlook Express,**
- **automatic document circulation – WorkMan, WordPerfect InForms,**
- **specialist software serving office equipment – external faxes, scanners, modems, pagers, multimedia, voice and picture recognition – WinFax, OmniPage etc.**

INTEGRATED OFFICE PACKAGES

Additional characteristics of this software group are:
- **a smaller function scale than MRPII/ERP: they are limited to widely comprehensive "offices",**
- **homogeneous programs (a similarity itself), also taking into consideration the offered functions as a method of communication with the user through various programming producers,**
- **cyclic development; the next step is assured - integration of package systems to the next - adding applications,**
- **accepting previous functions offered by the integrated programming created for small companies.**

Table 2. Comparison Analysis of Integrated Bureau Packages

Criteria\Package	Lotus Notes	Microsoft Office	Uniplex
Hardware Platform	PC, Macintosh, Workstations	PC	Workstations
Operation System	DOS, Windows, Novell, Unix, OS/2	DOS, Novell, Windows	Unix
Documents Library	X	X	X
E-mail	X	X	X
Graphics	X	X	X
Text Editors	X	X	X
Worksheet	X	X	X
Data Base	X	X	X
Distributed Data Base	X		X
Security	X	X	X
Schedule	X	X	X
Embedding Objects from the Other Applications	X	X	X
Discussin Groups	X	X	
Trasowanie dokumentów	X	X	
Cooperation with Other Facilities (fax, scanner, modem etc.)	X	X	X
Cooperation with Net	Own Drivers	Own Drivers	Operation System Mechanism

DEDICATED EXPERT SYSTEMS

Include specialist knowledge on the subject of the stated human activity range. Knowledge is organized in a way that makes possible entrance with the user into an interactive dialogue connected with this range, resulting that, the system can offer advice or propositions or explaining the method of comprehension, also with the basis of contemporary expert systems including the following extra characteristic features:

- functioning in specific non-standard categories: medicine, meteorology, and space research,
- a lack of standard programming possibility,
- the creation of specific packages dependent upon unique solutions,
- strong equipment, precision, reliability and program user safety requirements,
- integration through network mechanisms allowing for example, making use of resources collected for controlling other systems.

DEDICATED EXPERT SYSTEMS- IDEAS & PROBLEMS

- Contemporary expert systems are linked with artificial intelligence systems.
- It is not sure that together with the spread of neuron computers the expert system will be transferred to a neuron level of activity.
- The system shown in figure integrates components of the expert system: neuron network and part-related database (with the database management system) in a dispersed environment.
- Through checking the collection of economic indicators the system can generate recommendations for the user or optimally, by his recommendations/suggestions with the intermediate network do a market operation based on the systems own solutions.
- With the help of indicators numbered and stored in the database we can deduce the level of rise or fall in production volume, motion and market trends.
- The rules base situated in the artificial intelligence server includes all analytical procedures to count average regression analysis and probability analysis (risk analysis).
- The neuron network is used to create sample behavior, which allows for the creation of speed and price change direction prognoses.
- Furthermore the system server allows faster communication and a more substantial database and management system.
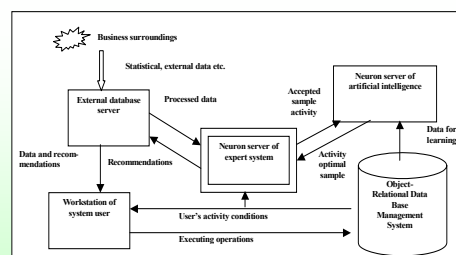
DEDICATED EXPERT SYSTEMS

Fig. 10. Data-flows in the special neuron expert system

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TELECOMMUNICATION SYSTEMS

Telecommunication systems entered into system types that aid management from the side of technological assurance of integrated management environments. This is not a single role effect including:

- electronic data exchange,
- internal networks,
- global networks.
  Problems:
- set up the basis for the integration of most systems of dispersed area,
- there is a lack of standards, unification possibilities and technological uniqueness:
- from one side telecommunication programming is really only a technical programming and is only for safe guarding the links between already existing systems,
- but from the other side it can offer a new quality of management, e.g. through the elimination of the use of direct traditional transaction connection channels, e.g. using a cycle of transfer transactions for electronic document circulation

TELECOMMUNICATION SYSTEMS - SCOPE

- electronic data exchange (EDI) between business contractors,
- electronic transfer of documents and payments between banks, electronic transmission of documents and messages to interactive databases,
- transactions done by people and for people: e-commerce, e-business, e-government, e-mail, e-banking, e-learning etc.

CONCLUSIONS

- The shown new trends in system development are still not completely formed.
- The biggest controversions are caused by telecommunication systems, whose understanding requires various matters starting from pure tool systems after serious applications. Their role in the market over the last few years has heavily increased and it is difficult not to notice their existence. Creating also own languages, procedures, protocols, management systems and conceptions (Java, hypertext etc.) and even own subculture and connecting with its social problems. A type of organization or service arises whose services are suitable for this class of system – virtual organizations, Internet passages, e-commerce.
- Creating modern MIS is not static and every typology will be adequate in one set moment in time. The presented architectonic changes depend on multidirectional universal integration taking on board technological conditions, which are point and limit apprehended like operating system, tools programs and maybe above all application programs.

THANKS FOR YOUR ATTENTION!

Witold Chmielarz - Wydział Zarządzania UW

THE CONCEPT OF ELIMINATION OF BARRIERS TO THE IMPLEMENTATION OF INTEGRATED SYSTEMS WITH THE USE OF I-CASE TOOLS

Prof. Witold Chmielarz, PhD

Management Faculty Warsaw University

Paper purpose:

- analysis and identification of the possibilities of overcoming barriers to the implementation of integrated systems with the use of specialised software supporting the implementation process (I-CASE class)

Brief contents:
- **identification of the basic implementation problems**
- **discussion the possible steps to overcoming these barriers with the use of I-CASE tools and knowledge contained in reference models**
- **introduction the first concept of a knowledge management system supporting implementation process**
- **summary**

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Delays in the process of implementation
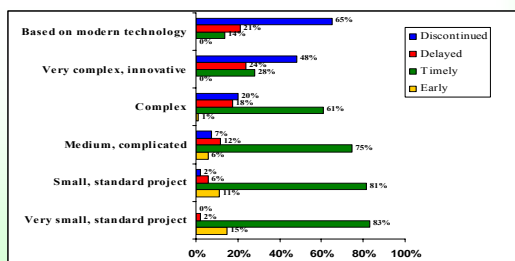
- Empirical research shows that there is a simple relationship between the complexity and innovativeness of a project and the feasibility of its implementation.
- The more innovative and complex a project is, the more likely it is that its implementation will be delayed or even discontinued. In the case of integrated systems, this rule applies now to as many as 70% - 80% of the projects.

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The procedure in order to overcome barriers and threats to the system implementation: :

- to identify the areas where such barriers appear, and the reasons why they appear
- to define the methods of removing these barriers
- to identify the barriers which can be eliminated or at least significantly reduced using the methods of knowledge management contained in the intelligent tools
- to identify the tools and methods used to assist the designer and implementator in this respect
- to create a concept of automation of the process of preventing barriers to integrated systems implementation

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Organisational barriers
Role of I-CASE tools in solving them

1. *Problems with the correct assessment of a company's condition*
   Preliminary training of end-users in CASE methodology helps them understand the consultants' expectations as to the scope and quality of the required data

2. *Problems with the correct analysis of the needs*
   In-depth training of end-users in CASE methodology is recommended. Subsequently, the main procedures describing the elementary business processes at the client's company should be prepared by the client in cooperation with the consultants. Ideally, the client should develop such procedures using its own resources (as much as possible) with as little assistance from the consultants as possible. In this way, end-users are forced to get to know the tool well and, first and foremost, study the existing and planned procedures in depth. This approach has the following advantages: involvement of the client in the implementation from the very beginning, understanding of the main ideas and assumptions of the implementation – a common platform of understanding, making the client partly responsible for the implementation and reduction of involvement of the consultants

   (on the base of my own research of implementation of IFS in 12 locations and branches in Poland)

Organisational barriers
Role of I-CASE tools in solving them

3. *Problems with preparation of a reliable implementation schedule (plan)*
   CASE is used indirectly – the use of this tool for problems 1 and 2 has resulted in obtaining good quality „as is" and „to be" analyses and ensured compliance with the methodology

4. *Problems with defining the necessary conditions of efficient implementation*

5. *Problems with application of implementation methodology*

6. *Problems with correct preparation of documentation*
   Problems with preparation of documentation – the application of CASE has measurable advantages – the whole processes are automatically documented as they are developed. All changes to the processes introduced during the implementation are also documented. Moreover, the tools of certain vendors allow automatic configuration of the system for end-users. As a result, a considerable part of the documentation is automated.

7. *Problems with users and their selection*

Organisational barriers
Role of I-CASE tools in solving them

8. *Problems with consultants and their selection*
   The use of CASE allows significant reduction of the time needed for implementation and the time of work of the consultants. As a result, the existing resources (the consultants) are utilised better

9. *Problems with training*
   Problems with training. In this case, the use of CASE tools may be the best solution. On the basis of the previously developed business processes (item 2), the training needs of the client are defined, and the end-user training is focused on the aforementioned processes only. In this case, it is sufficient to study the implementation plan and determine when end-users should be trained in the particular processes. Training is based on previously prepared (item 2) models of business processes. This approach allows elimination of unnecessary elements from training, thus increasing the absorption of the remaining material. As a result, training becomes more effective and can be shorter.

10. *Problems with project execution*

Psychological barriers
Role of I-CASE tools in solving them

11. *Problems with reaching understanding between the consultants and end-users*
    Problems with understanding – end-users and other employees of the client involved in the implementation, including the management (items 1 and 2), obtain knowledge about the CASE tool used. Subsequently, a ready-made (predefined) solution is presented and discussed. In this way, the existing and modified business models containing all basic processes functioning at a given company become a platform of understanding

12. *A lack of understanding of the implementation needs*
    Presentation of processes subject to changes with the use of CASE helps the employees understand the objectives and needs of the implementation

13. *Hostile attitude of employees*
    If the implementation process becomes faster and more efficient, the results are achieved earlier, which has an encouraging effect and increases faith in success.

Financial and technological barriers
Role of I-CASE tools in solving them

14. A lack of financial means

15 . Pseudo-savings

16. Excessive customisation – tailoring of the system to the client's needs

   Excessive customisation – presentation of the existing and planned business processes allows end-users to understand their nature and find the optimum solution, which increases the chances for avoiding unnecessary and costly customisations
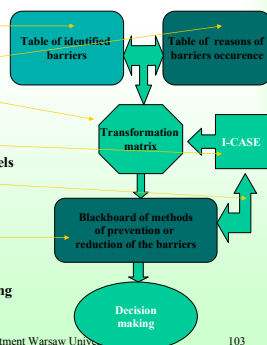
17. A lack of security

Some conclussions

The analysis presented above shows that there are several important factors which allow elimination of problems occurring during system implementation:
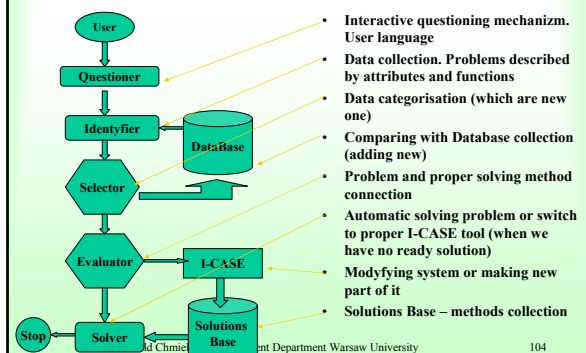
- the main one is the use of CASE tools, which is useful in 10 out of 17 cases.
- the second important element is the application of the remaining part of implementation methodology (which is often integrated with a CASE tool).
- the third factor concerns the HR issues to be considered during the implementation.
- the fourth one is finance

Transformation data into knowledge process

- Data accumulation in database
- Next by preliminary processing, it is stored in data warehouses
- The data undergoes transformation to prepare it for a detailed analysis
- Analysis is performed with the use of automatic search tools
- A comparison of data found with models (of behaviour, reactions) stored in intelligent systems
- The ultimate outcome of such comparisons is an assessment of usefulness of generalised information for management purposes and accumulation of such information, along with data, in the knowledge base

Table of identified barriers

Table of reasons of barriers occurence

Transformation matrix

I-CASE

Blackboard of methods of prevention or reduction of the barriers

Decision making

Architecture of system- concept

User

Questioner

Identyfier

DataBase

Selector

Evaluator

I-CASE

Stop

Solver

Solutions Base

- Interactive questioning mechanizm. User language
- Data collection. Problems described by attributes and functions
- Data categorisation (which are new one)
- Comparing with Database collection (adding new)
- Problem and proper solving method connection
- Automatic solving problem or switch to proper I-CASE tool (when we have no ready solution)
- Modyfying system or making new part of it
- Solutions Base – methods collection

Summary

It's still work in progress

The first part:

- **identification of basic limitations of integrated system implementation,**
- **identification reasons of the problems,**
- **identification methods of their solving**

is over

The second part:

The conception is in the state of construction.

Development of this concept:

- **will lead to construction of a tool supporting the decision-making process for the end-user**
- **allowing automatic selection of a method minimising the limitations of the integrated systems implementation process.**

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Thank you for your attention!

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INFORMATION PROBLEMS IN THE EVALUATION OF IT SYSTEMS IMPLEMENTED IN SMALL AND MEDIUM ENTERPRISES

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PURPOSES

- a logical continuation of the work on the comparison and evaluation of the IT systems implemented at an organisation
- as a result of the previous studies, the formal methodology of IT system selection was created and its practical use for the purposes of comparative evaluation of different classes of systems was presented
- this time, the main goal is development of previous procedure and presentation the dangers associated with the use of preferential ratios for the assessment of applicability of the same class of systems for the computerisation of small and medium enterprises.

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STAGES OF REGULAR PROCEDURE IT SELECTION

1. **Appointment of the project team**
2. **Development of approximate project schedule**
3. **Preparation of the project development concept**
4. **Analysis of the market of project suppliers**
5. **Preparation and sending of the call for bids**
6. **Evaluation and analysis of offers**
7. **Organisation of exhibitions and reference visits**
8. **Final selection**
9. **Concluding contracts for project execution and preparation of preliminary installation schedule**

5. PREPARATION AND SENDING OF THE CALL FOR BIDS

Characteristics	Selection opportunity
• Preparation of formal and legal requirements • Development of the mechanism for the evaluation of bids • Preparation of the call for bids • Sending the call for bids	• The call for bids should include: formal requirements; description of the existing system; the future system assumptions (scope, size, algorithms, bottlenecks, data conversion, changes in the organisation, computer and telecommunication hardware typology); • Evaluation mechanism – highly explicit and universal
Type of criteria used	**Making a decision**
Criteria: •organisational •economic •technological •psychological: •functional: the system's functions	• All criteria can be divided into groups • The criteria can be evaluated in terms of value or points – not all criteria can be compared in terms of value. • Evaluation criteria can be equivalent or preferential (criteria regarded as fundamental are assigned bigger weights)

ASSUMPTIONS

- the horizontal structure of the valuation model is typical for functional modules of a financial and accounting system, personnel and payroll system, warehouse system, sales system etc.
- the hierarchical model can be analysed in two ways: in terms of the materiality level and in terms of the level of detail.
- the criteria are analysed in order from the most important to the least important one (some criteria, which are present in all systems with the same intensity, can even be omitted).
- depending on the user's needs, the order of importance of the criteria may be changed. The criteria are also analysed with regard to the level of detail.
- this analysis may also be adopted to the individual needs of the system's user. It is recommended to analyse the most important criteria in more detail and decrease the level of detail gradually as the level of importance decreases. On the other hand, such an operation can be performed indirectly by assigning preferential weights (including also e.g. nil weights) to the individual criteria or groups of criteria.
- depending on the context and situation, the individual metaindicators can be divided into a bigger or smaller number of levels depending on the size of the firm and the needs of the user.

EVALUATION CRITERIA

- The comparability of the quantitative and qualitative criteria may be achieved in two similar ways. The first one is based on a scoring method. Different classifications are possible, from the (0, 1) scale to the 20- or even 100- point scale.
- Here the following scale is adopted:
- "0" – when a given characteristic is absent or highly insufficient,
- "0.5" – when the requirements attached to a given characteristic are satisfied partly,
- "1" – when a given characteristic is satisfied completely.
- However, sometimes one of the systems is clearly better and therefore should not be put on the same level with another one. Therefore, in order to differentiate between different software, the scores can be modified by 0.25 points. Moreover, some solutions can occasionally receive more than "1" point.
- Moreover, the quantitative characteristics can be evaluated in terms of value using symbolic or real money. The problem that appears here is the clash of real cost categories (in financial indicators) with the subjective (estimated, assessed by experts) values of other characteristics. Unlike the evaluations, scores are usually not continuous.

GENERAL MODEL FORMULA

$$W_{og} = \sum_{i=1}^{n}\sum_{j=1}^{m} x_{ij}$$

- where:
- Wog – general IT system evaluation ratio,
- xij – „j" ratio of level „i" from among *n* levels considered
- i = 1...n – number of levels of evaluation ratios,"
- i = 1...m – number of indicators on level *i*.

$$x_{i+1} = \sum_{j=1}^{m} x_{ij}$$

where:
x i – evaluation of the criterion on the *i* level of detail, out of *m* criteria,
xi+1 – evaluation of the criterion on the next (i+1) level.

MODEL OF PREFERENCE RATIOS

User may attach greater or lesser importance to some of criteria, depending on the adequacy of a given attribute to his concept of the system.

This phenomenon may be captured by assigning preference weights to e.g. specific groups of criteria:

$$x_{i+1} = \left(\alpha_1 x_{i1} + \alpha_2 x_{i2} + ... + \alpha_m x_{im} \right)$$

where:
alpha - preference ratio assigned by the user to *j* type of criterion, on *i* level in the hierarchy.

SIMPLIFIED VERSION OF MODEL FOR SELECTION OF IT APPLICATION

- Five selected management support systems for small and medium enterprises were studied.
- The basic selection criterion was the number of licences sold by the firm and the availability of detailed source information about the system – most popular on market
- The functionality of the selected packages was an additional selection criterion These were integrated, universal systems, based on the financial and accounting module.
- The analysis was limited to the firms which offer accounting systems for companies maintaining full accounting.
- Only ready-made, standard applications available on the market were considered.

SIMPLIFIED VERSION OF MODEL FOR SELECTION OF IT APPLICATION

- a medium or small enterprise does not have sufficient resources at its disposal to create an independent system
- in the case of small and medium enterprises, standard applications usually cover the whole functionality of the system, whereas the cost of a dedicated system would be much higher
- the whole packages were analysed rather than their components
- it was assumed that the company either does not use an IT system or, if a system is in place, the components of the existing system will not be used
- the comparison does not take into account the industry in which the company operates
- the selected systems were universal, so all their characteristics were treated as significant

SET OF CRITERIA

- **Functional**
- **Entry/exit function criteria**
- **Education and help criteria**
- **Database criteria**
- **Technological criteria**
- **Financial criteria**
- **Organisational criteria**

FUNCTIONAL CRITERIA

Functional criteria	Insert	DGCS	WAPRO	Altkom	Varico
Finance and accounting	1	1	1	1	1
Human resources and payroll	1	1	1	1	1
Warehouse	1	1	1	1	1
Simplified books of account	1	1	1	1	1
Transfers	1	1	1	1	1
Cash	1	1	1	1	1
Invoices	1	1	1	1	1
Record of costs of using a car	1	1	1	1	1
Fixed assets register	1	1	1	1	1
Elements of management accounting	1.5	1	0.75	1.25	0.75
Production	1	0	0.25	0	0
Total	11.5	10	10	10.25	9.75

ENTRY/EXIT FUNCTION CRITERIA

Entry/exit function criteria	Insert	DGCS	WAPRO	Altkom	Varico
Context help	0	0.5	1	1	0.75
System of prompts and ad-hoc explanations	0.75	1.25	0.75	1	1
System of warnings and messages	0.75	0.75	0.75	1	1
Full-screen edition	1	1	1	1	0.75
User-friendly interface	1	0.75	0.5	0.75	0.75
Easy handling of data	0.5	0.25	0.25	0.5	0.25
Verification of input data	1	0.5	0.5	1	0.25
Well organised and logical menu	1	1	0.75	1	0.75
Uniform system of shortcut keys	0.75	0	1	0.25	0
Clear reports	0.75	0.75	0.75	0.75	1
Compatibility with external devices	1	0.75	1	0.5	0.75
Total	8.5	7.5	8.25	8.75	7.25

EDUCATION AND HELP CRITERIA

Education and help criteria	Insert	DGCS	WAPRO	Altkom	Varico
Context help and user's manual	0,5	0,75	0,5	1	1
Emergency help	1	0	1	1,25	1
Training version of the software	1,25	0,5	1	0,5	1
Total	2,75	1,25	2,5	2,75	3

DATABASE CRITERIA

Database criteria	Insert	DGCS	WAPRO	Altkom	Varico
Working environment of the system	1	1	0.75	0.5	0.75
Type of database used	0.5	0.5	0.75	0.5	0.5
Data access management	1	0	1	0	0.25
Administration of database users	0	0	0.5	0	0.25
Data export	0.25	0	0.5	0.5	0.5
Data import	0.25	0	0.5	0.25	0.25
Archiving	0.5	0.5	0.75	0.5	0.5
Metadata management	0.5	0.5	1.25	1	0.5
Independent data management devices	1	1	1	1	1
Total	5	3.5	7	4.25	4.5

TECHNOLOGICAL CRITERIA

Criteria of IT functions	Insert	DGCS	WAPRO	Altkom	Varico
System platform	0.75	0.75	0.5	0.25	0.5
Hardware platform	1	0.5	1	0.25	0.75
Compatibility with system modules and other applications	1	0.25	0.75	0.5	0.25
Administrative support	0	0	0.25	0	0
Archiving	0.75	0.5	0.75	0.5	0.5
Software speed	1	1	1.25	0.75	1
System security	1	0.25	0.75	0.5	0.25
System transferability (e.g. to other system platforms)	0	0	0	0	1
System reliability	1	1	0.75	1	1
System configurability	1	0.25	1.25	1.25	0.5
Multi-access	1.25	0.75	1	0.75	1
Total	8.75	5.25	8.25	5.75	6.75

FINANCIAL CRITERIA

Financial criteria	Insert	DGCS	WAPRO	Altkom	Varico
Cost of implementation work	0.25	0.25	1	0.75	0.5
Software installation cost	0.25	0.25	0.75	1	1.25
Purchase cost of hardware	0.75	0.5	1	0.5	0.75
Service cost	0.75	0.75	1	1	1
Training cost	0.5	0	1	0.75	0.75
Licence cost	0.75	1	1	0.5	1
Cost of updates	0.5	0.75	1	0.75	1
Extension cost	1	0.5	1	0.5	1
Cost of configuration changes	1	1	0.5	0.5	1
Cost of using the system	1	0.75	1	1	1
Cost of business process disruption	0	0	0	0	0
Total	6.75	5.75	9.25	7.25	9.25

ORGANISATIONAL CRITERIA

Organisational criteria	Insert	DGCS	WAPRO	Altkom	Varico
Implementation budget	0.5	0.75	1	0.75	1
Implementation time	1	1	0.5	0.5	1
Vendor's market position	1	0.75	0.75	0.5	0.25
Vendor's reliability	1	0.75	1	1.25	0.5
Technical documentation of the software	1	0.75	0.75	1	0.5
System implementation methodology	0	0	0	0	0.5
Pre- and post-implementation support offered by vendor	0.5	0.25	0.75	1	1.25
System flexibility	1	0.75	1.25	1.25	0.75
System universality	1	1	1	1	1
System reliability	1	0	0.5	0	0.5
Possibility of subsequent software development by the buyer	0.5	0.5	1	1	0.5
Guarantee and post-guarantee service	1	1	1	1	1
Training organisation	0.25	0	1.25	1	0.75
Total	9.75	7.5	10.75	10.25	9.5

Practical aspects of the evaluation of IT - summary

Total score	Insert	DGCS	WAPRO	Altkom	Varico
Functional criteria	11.50	10.00	10.00	10.25	9.75
Database criteria	5.00	3.50	7.00	4.25	4.50
Entry/exit function criteria	8.50	7.50	8.25	8.75	7.25
Education and help criteria	2.75	1.25	2.50	2.75	3.00
Criteria of IT functions	8.75	5.25	8.25	5.75	6.75
Financial criteria	6.75	5.75	9.25	7.25	9.25
Organisational criteria	9.75	7.50	10.75	10.25	9.50
Direct sum	53.00	40.75	56.00	49.25	50.00
Standardisation based on the number of criteria in the group	5.44	3.97	5.68	5.08	5.23
% of satisfaction of the maximum number of criteria	77%	59%	81%	71%	72%

Evaluation for groups of the financial and non-financial criteria

Total score	Insert	DGCS	WAPRO	Altkom	Varico
Non-financial criteria	54.41	41.88	57.65	50.63	51.54
Financial criteria	6.75	5.75	9.25	7.25	9.25
Sum of non-financial criteria/ number of criteria in the group	0.80	0.60	0.81	0.72	0.70
Financial criteria/ number of criteria in the group	0.61	0.52	0.84	0.66	0.84
Direct sum	1.41	1.13	1.65	1.38	1.54

Application of preferential weights to the "in-between" variant – a small firm

Standardised score	Weight	Insert	DGCS	WAPRO	Altkom	Varico
Functional criteria	0.1	1.15	1	1	1.02	0.97
Database criteria	0.05	0.25	0.17	0.35	0.21	0.22
Entry/exit function criteria	0.1	0.85	0.75	0.82	0.87	0.72
Education and help criteria	0.1	0.27	0.12	0.25	0.27	0.3
Criteria of IT functions	0.05	0.43	0.26	0.41	0.28	0.33
Financial criteria	0.3	2.02	1.72	2.77	2.17	2.77
Organisational criteria	0.3	2.92	2.25	3.22	3.07	2.85
Weighted sum	1	7.91	6.29	8.84	7.93	8.19

Application of preferential weights to the financial variant – a small firm

Standardised score	Weight	Insert	DGCS	WAPRO	Altkom	Varico
Functional criteria	0.20	2.30	2.00	2.00	2.05	1.95
Database criteria	0.03	0.13	0.09	0.18	0.11	0.11
Entry/exit function criteria	0.05	0.43	0.38	0.41	0.44	0.36
Education and help criteria	0.05	0.14	0.06	0.13	0.14	0.15
Criteria of IT functions	0.03	0.22	0.13	0.21	0.14	0.17
Financial criteria	0.60	4.05	3.45	5.55	4.35	5.55
Organisational criteria	0.05	0.49	0.38	0.54	0.51	0.48
Weighted sum	1.00	7.74	6.48	9.01	7.74	8.77

Application of preferential weights to the functional variant – a small firm

Standardised score	Weight	Insert	DGCS	WAPRO	Altkom	Varico
Functional criteria	0.60	6.90	6.00	6.00	6.15	5.85
Database criteria	0.03	0.13	0.09	0.18	0.11	0.11
Entry/exit function criteria	0.10	0.85	0.75	0.83	0.88	0.73
Education and help criteria	0.03	0.07	0.03	0.06	0.07	0.08
Criteria of IT functions	0.03	0.22	0.13	0.21	0.14	0.17
Financial criteria	0.20	1.35	1.15	1.85	1.45	1.85
Organisational criteria	0.03	0.24	0.19	0.27	0.26	0.24
Weighted sum	1.00	9.76	8.34	9.39	9.05	9.02

TOTAL VALUATION FOR SMALL FIRM (place in ranking)

Standardised score	Insert	DGCS	WAPRO	Altkom	Varico
In-between (average)	4	5	1	3	2
Financial	3	5	1	3	2
Organizational	1	5	2	3	4
Sum of points	8	15	4	9	8

TOTAL VALUATION FOR MEDIUM FIRM (place in ranking)

Ocena znormalizowana	Insert	DGCS	WAPRO	Altkom	Varico
In-between (average)	1	5	2	3	4
Financial	3	5	1	4	2
Organizational	3	5	1	2	4
Sum of points	7	15	4	9	10

INSTEAD OF CONCLUSIONS

- This paper presents and evaluates the selected characteristics of the IT systems on the basis of the simplified methodology
- Depending on the variant chosen, different results were obtained
- The fact that the points were allocated to the individual criteria based on the author's subjective opinion is a certain disadvantage, which should be considered in making the final decision
- However, the main aim of this comparison is to organise the system selection process rather than indicate a specific package as the solution for a given organisation.
- The analysis presented here does differ from the mathematical model presented at the beginning, but it is a consequence of the need to overcome the psychological barrier that the users feel when they are confronted with a more complex mathematical model.
- The institutions that face a similar problem may use both the model and the algorithm presented here and allocate the points at their own discretion.
- Other types of systems can be evaluated using this method, too - but the list of characteristics analysed must be modified.
- The scenarios presented in the last chapter can also be changed to adapt the system of weights to the situation of a specific firm.
- If needed, the procedure can be modified on the basis of the proposed models in accordance with the user's preferences, by introducing additional elements, such as e.g. a risk ratio.

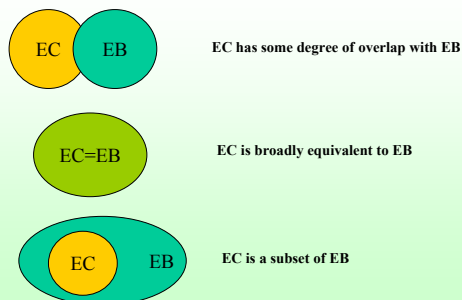# E-COMMERCE

Witold Chmielarz

E-COMMERCE DEFINITIONS

- ...An emerging coccept that describes the process of buying and selling or exchanging of products, services, and information via computer networks including the Internet ... (Turban, at all 2000),
- ... To include only business transactions that deal with customers and suppliers, and it is often described in terms of the Internet, implying that there are no other communications alternatives ... (McLeod,...2001)
- ... The sharing of business information, maintainin business relationships, and conducting business transactions by means of telecommunications networks (Zwass, 1998),
- ... E-commerce – exchange the information across electronic networks, at any stage in the supply chain, whether within an organization, between businesses (B2B), between businesses and consumers (B2C), or between the public and private sector, whether paid or unpaid... (UK government),

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ELECTRONIC COMMERCE AND ELECTRONIC BUSINESS

EC has some degree of overlap with EB

EC is broadly equivalent to EB

EC is a subset of EB

E-COMMERCE FROM PERSPECTIVES:

- **Communication perspective** – EC is delivery of information, product/services, or payments over telephone lines, computer networks, or any other electronic mesns,
- **Business process perspective** – EC is the application of technology toward the automation of business transactional and work flow,
- **Service perspective** – EC – is a tool that addresses the desire of firms, consumers, and management to cut service costs while improving the quality of goods and increasing the speed of service delivery,
- **An online perspective** – the buying and selling of products and information online.
  (Kalakota and Winston, 1997)

CLASSIFICATION OF THE EC (by NATURE OF TRANSACTIONS)

- Business-to-Business (B2B) – interorganizational systems and electronic market transactions between organizations,
- Business-to-Consumer (B2C) – retailing transactions with individual shoppers,
- Consumer-to-Consumer (C2C) – consumer sells directly to consumer (selling residential property, cars, advertising personal services, selling knowledge, several auction sities ...),
- Consumer-to-Business (C2B) – individuals who sell products or services to organizations, as well as individuals who seek sellers, interact with them, and conclude a transaction,
- Nonbusiness EC (B2P) – increased number of nonbusiness institutions (academic, religious, social, government agencies) are using various types of EC to reduce their expences or to improve their operations and customer services,
- Intrabusiness (organizational) EC – all internal organizational activities, usually performed on intranets, that involve exchange of goods, services and information (activities from selling corporate products to employees to online training)

IOS and e-Market Features

- Customer relationship is determined in advance with anticipation it will be an ongoing relationship based on multiple transactions
- IOS may be built around private or publicly accesible networks
- Advance arrangements result in agreements on the nature and format of business documents that will be exchanged and payments
- Advance arrangements are made so both parties know which communication networks will be integral to the system
- Joint guildelines and expectations of each party are formulated so each knows how the systemis to be used and when transactions will be submited and received by each business partner

- Two types of relationships may exist:
- ✓ Customer/seller linkage is established in time of transactions and may be for one transaction only (just purchase),
- ✓ Customer/seller purchase agreement is establish for a defined period (a subscribtion transaction)
- Electronic markets are built around publicly accesible networks
- Sellers determine, in conjunction with the market maker which business transactions they will provide
- Customers and sellers independently determine which communication networks they will use in participating in the electronic market. The network used may vary from transaction to transaction,
- No joint guideliness are drawn in advance

THE BENEFITS OF EC (TO ORGANIZATIONS)

- Expands the marketplace to national and international markets. With minimal capital outlay, a company can easily and quickly locate more customars, the best suppliers and business partners worldwide,
- Decreases the costs of creating, processing, distributing, storing and retriving paper-based information (administrative costs to 85%, electronic payments are 95% cheaper and so on),
- Allows reduced inventories and overhead by facilitationg current („pull") type supply management. In the system process starts from customer orders and uses just-in-time manufacturing
- This processing enables expensive customization of the products and services which provides competitive advantage to its implementers.
- Diminishing telecommunication cost (internet much cheaper than commerce nets
- Improved image, improved customer service, newfound business partners, simplified processes, increased productivity, eliminating paper, expending access to information, reduced transportation costs, increased flexibility.

THE BENEFITS OF EC (TO CONSUMERS)

- Enables customers to shop or do other transactions 24 hours a day, all yer around, from almost any location,
- Provides customers with more choices, they can select from many vendors and from mare products,
- Frequently provides customers with less expensive products and services by allowing them to shop in many places and conduct quick comparison,
- In some cases, especially with digitized products, EC allows quick delivery,
- Makes it possible to participate in virtual auctions,
- Allows customers to interact with other customers in electronic communities and exchange ideas as well as compare experiensces,
- Facilitates competition, which results in substantial discounts

THE BENEFITS OF EC (TO SOCIETY)

- Enables more individuals to work at home and to do less traveling for shopping, resulting in less traffic on the roads and lower air pollution,
- Allows some merchandise to be sold at lower prices, so less affluent people can buy more and increase their standard of living,
- Enables people in Third World countries and rural areas to enjoy product and services that othervise are not available for them,
  This includes opportunities to learn professions and earn college degrees.
- EC facilitates delivery of public services – health care, education, distribution of government social services (cost reduction, improved quality)

THE LIMITATIONS OF EC - TECHNICAL

- There is a lack of system security, reliability, and some communications protocols,
- The software development tools are still evolving and changing rapidly,
- It's difficult to integrate the Internet and EC software with some existing applications and databases,
- Vendors may need special Web servers and other insfastructures, in additions to the network servers,
- Some EC software might not fit with some hardware or may be incompatible with some operating systems or other components

THE LIMITATIONS OF EC – NON-TECHNICAL

- Costs and justifications – in house it may be very high, and mistake due to lack of experience may result in delays (34, 8%),
- Security and privacy – specially important in B2C area, especially security issues which are perceived to be more serious then they really are (17, 2%),
- Lack of trust and user resistance – customers do not trust an unknown faceless seller, paperless transactions and electronic money (4,4%).
- Other limiting factors:
- Many legal issues are as yet unresolved, and government regulations and standards are not refined enough for many circumstances,
- EC, as a discipline, is still evolving and changing rapidly. Many people are looking for more stable area before they enter into it,
- There are not enough support services (clearance centers for EC transactions, tax centers etc.),
- In most applicationss there are not yet enough sellers and buyers for profitable EC operations,
- EC could result in a breakdown of human relations,
- Access to the Internet is still expensive and/or inconvenient for many potential customers.

E-COMMERCE - some numbers and figures

- IV quarter 2003 USA 17,8 mld US$ (18% growth), I quareter 2004 USA 21,3 mld US$ (16 % growth),
- There (USA) are 81,2 mln customers (6,5% growth); 86,1 mln - 2004 (foresee 6% growth);
- USA 2003 turnovers in EC 55 mld US$; 2004 year – 72,6 mld US$
- In Poland 2003 - about 70 mln US$; 2004 – 81 mln US$
- During next five years may be about 95% or more users wide frequency band connections (DSL);

Internet in Poland - percent of population

Year	Percent
1997	5%
1998	7%
1999	9%
2000	13%
2001	19%
2002	23%
2003	24%
2004	26%
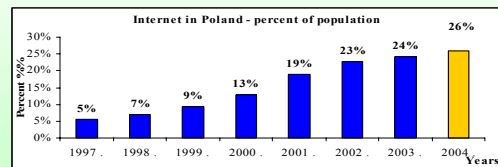
E-COMMERCE INFRASTRUCTURE IN POLAND
some numbers and figures

- Approximately 91% of Polish companies have access to Internet and over half have their own websites.
- Now in Poland we have about 800 (650 two; 850 four years ago) companies sell goods on the Internet (dotcoms) and the value of business-to-consumer Internet sales is about 300-330 mln zl (about 80 mln US$); with ~20% a year growth *(eCard)*
- The average turnover of a Polish e-shop amounts to approximately 80 thousand zlotys (20 th US$).
- As only 6,3% of households have access to Internet, this data should be regarded as promising (now more then 9 mln Poles has access to Internet; 6,1 mln – 2003; 3,5 mln in 2000)
- We have still very small development in B2B transactions. Remember that B2C transactions will constitute only 8% of the value of B2B transactions - we will not participate in over 80% of e-commerce transactions.

SOME STATISTICS
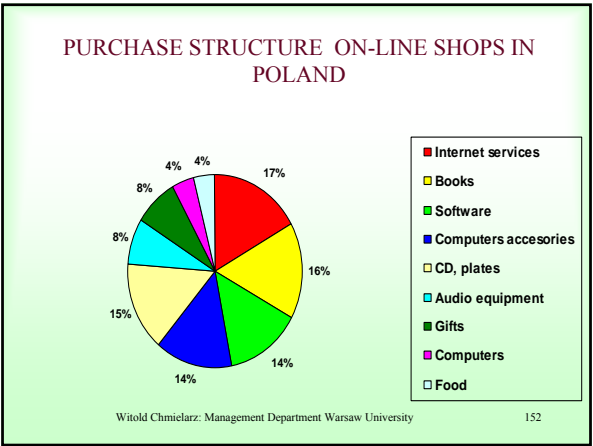

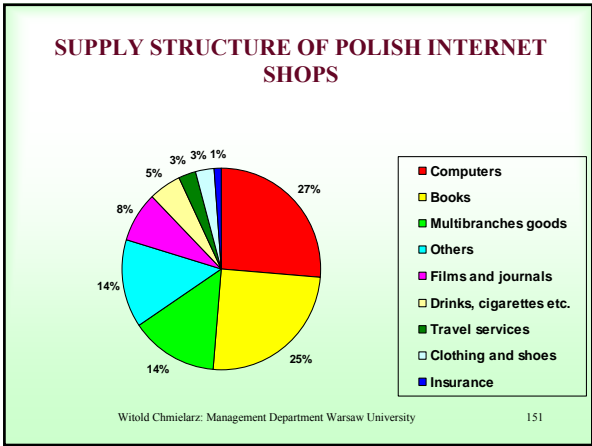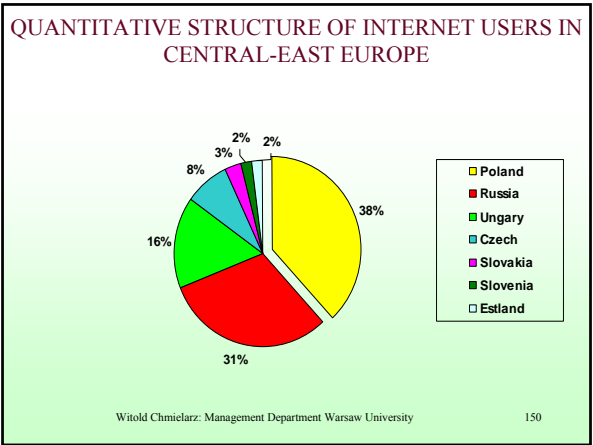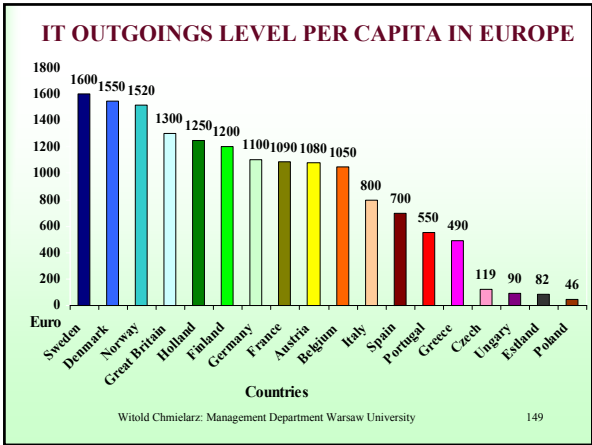Access to Internet in selected social groups in Poland

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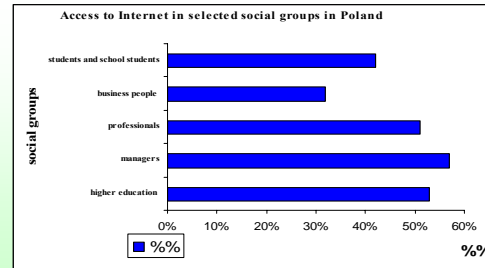
STATISTICS E-COMMERCE DEVELOPMET IN CENTRAL-EAST EUROPE

- IT-Market development 2002 – about 6% (8% in 2001; 11% in 2000), telecommunication market – 11% (12% in 2001; more then 15% in 2000).
- All IT market of Central-East Europe value is about 28 mld euro (4% Europe market)
- Hardware infrastructure is still main direction of the development – in supply structure 56%

E-COMMERCE MARKET IN POLAND GROWTH STATISTICS

- Polish IT market is about 7 mld euro, more than 30% regional market and 1,5% world market
- We are the second market (in value) in our region (Russia is the first)
- In outgoings to relations with PKB we are in the lowest area of results of our region (Poland – 1,49%, Estland – 3,21%, Czech – 2,74%, Ungary –1,9%, Slovakia – 1,9% of PKB)
- So, in comparison with Western Europe we are probably lower then Portugal and more then Greece

  Very bad situation is in IT outgoings per capita (46 –51 euro). More then twicehas Slovenia (123 euro) and Czech Rep. (110 euro), almost twice Ungary (90 euro) and Estland (82 euro)

IT OUTGOINGS LEVEL PER CAPITA IN EUROPE

Bar chart showing IT outgoings per capita (Euro) by country:
- Sweden: 1600
- Denmark: 1550
- Norway: 1520
- Great Britain: 1300
- Holland: 1250
- Finland: 1200
- Germany: 1100
- France: 1090
- Austria: 1080
- Belgium: 1050
- Italy: 800
- Spain: 700
- Portugal: 550
- Greece: 490
- Czech: 119
- Ungary: 90
- Estland: 82
- Poland: 46

X-axis: Countries; Y-axis: Euro

Witold Chmielarz: Management Department Warsaw University   149

QUANTITATIVE STRUCTURE OF INTERNET USERS IN CENTRAL-EAST EUROPE

Pie chart:
- Poland: 38%
- Russia: 31%
- Ungary: 16%
- Czech: 8%
- Slovakia: 3%
- Slovenia: 2%
- Estland: 2%

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SUPPLY STRUCTURE OF POLISH INTERNET SHOPS

Pie chart:
- Computers: 27%
- Books: 25%
- Multibranches goods: 14%
- Others: 14%
- Films and journals: 8%
- Drinks, cigarettes etc.: 5%
- Travel services: 3%
- Clothing and shoes: 3%
- Insurance: 1%

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PURCHASE STRUCTURE ON-LINE SHOPS IN POLAND

Pie chart:
- Internet services: 17%
- Books: 16%
- Software: 14%
- Computers accesories: 14%
- CD, plates: 15%
- Audio equipment: 8%
- Gifts: 8%
- Computers: 4%
- Food: 4%

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FACTORS DIMINISHING POLAND'S DEVELOPMENT IN E-COMMERCE

- Continuing domination of TP S.A. in the area of fixed and switched lines, which affects the speed, variety, quality and prices,
- A limited number of fully professional Internet providers,
- Poor quality of the services offered by Internet providers,
- Low quality (too slow links) of the connection between Poland and the world,
- A lack of trust and tradition of Internet shopping, enhanced by the exaggerated reports about dangers related to such transactions,
- A still existing (although changing rapidly now) belief that companies do not need Internet,
- A too big competitive advantage of the leading Internet portals (Onet, WP) over numerous other portals.

FACTORS INCREASING DEVELOPMENT OF E-COMMERCE IN POLAND

- Mergers of large Internet firms,
- Cheap Internet connections (switched lines) – without the need to buy accounts,
- Growing expenditure on Internet services by TP S.A., associated with growing competition,
- Expected entry of big companies creating portals to the Polish market,
- Growing acceptance of the Internet among managers,
- Functional specialisation of services in different areas and constant improvement of quality.

FACTORS DISCOURAGE POLES FROM INTERNET SHOPPING

Factor	Percentage
A poor choice of goods	10,1%
A lack of personal contact	13,2%
uncertainty as to whether the order will be executed	22,3%
The requirement to disclose personal data	22,5%
A small number of Polish companies offering their goods through the Internet	23,1%
The need to have a credit card	32,6%
Low safety level	32,8%
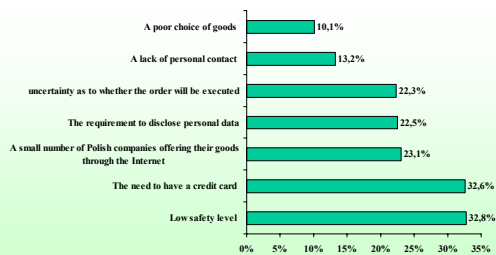
THE ANALYSIS OF THE USE OF INTERNET IN SMALL AND MEDIUM ENTERPRISES

Witold Chmielarz – Management Department of Warsaw University

PURPOSE OF THE PRESENTATIONS

• The main idea of this paper is to analyse the use of Internet in the operations of small and medium enterprises in 2002 in Poland.

• First, the concept of the questionnaire sent to the analysed companies twice is presented.

• Next, the results for each group of questions are analysed and conclusions drawn. These conclusions indicate that the role of this medium in different aspects of the operations of small and medium enterprises is growing despite the crisis.

INTRODUCTION

- The present survey has been conducted via e-mail, therefore it is obvious that all selected firms use e-mail at least occasionally
- The sample consists of private firms with up to 250 employees, active in different sectors of the economy, primarily located in central Poland. Most have their registered offices in the following three voivodships: Mazowieckie, Śląskie and Łódzkie. The survey was conducted twice: in February and in July 2002.
- Both times, slightly less than 40% of the respondents replied to the questionnaires received by e-mail. It is not surprising, as in the similar surveys conducted previously the response rate was gradually falling. At the same time, it can be observed that people are less and less willing to disclose their personal data as well as true business details.
- It may also mean that the firms that use the Internet occasionally only still do not trust this medium. Moreover, as confirmed by the surveys conducted in the last two years, a large number of firms use the net exclusively to communicate with the entities and clients they already know.

ASSUMPTIONS (1)

- The present survey was primarily designed to collect data about the actual or planned methods of using Internet for business purposes by small companies. It was assumed that the surveyed enterprises have access to the global net.
- The first group of questions concerned the way a firm uses the Internet services. The list of services to choose from contained the most popular ones: e-mail, e-banking, e-commerce, Internet news services, Internet editions of newspapers and magazines, job agency services, trainings, purchase of bonds through the Internet. The list did not contain all the possibilities that Internet has to offer, but was limited to the services most commonly used by businesses.
- The second question concerned the active uses of the Internet for business purposes. The respondents could choose from among the following: advertising, communication with suppliers and/ or customers, promotion of products and services, on-line sales of goods and services.

ASSUMPTIONS (2)

- As an advertising medium, the Internet is significantly different from the traditional media. Television and radio advertising play on people's emotions. On the other hand, in the Internet both information and advertising are communicated to passive, although pre-selected, recipients who have much more opportunity to decide what they want to watch and what information they need. The advantages of on-line advertising that are always stressed include primarily its low cost, global reach, multimedia nature of the message, interactive nature of advertising, easy contact, up-to-date information at all times, availability. In connection with these advantages, the third question concerned the role of Internet marketing in the operations of small and medium enterprises. The purpose of the question was to check how (if at all) small firms imagine marketing through the net. The following options were provided for the respondents to choose from:
- A website promoting the company and its products/ services,
- E-mail and/or discussion forums,
- Advertisements on the news service webpages,
- Exchange of advertising banners and links,
- We do not carry out marketing activities in the Internet.

ASSUMPTIONS (3)

•The fourth question concerned benefits arising from the use of the Internet. The aim was to obtain the firms' opinions on the usefulness of the Internet and benefits arising from it. The following answers were provided to choose from:
•accelerates and facilitates communication with the suppliers and customers,
•facilitates access to new customers,
•makes it possible to publish up-to-date information about the firm easily and fast,
•opens new business opportunities,
•reduces the costs,
•increases competitiveness,
•does not bring any benefits.

•In all previous surveys, speed was the most important feature of the Internet mentioned and appreciated by the respondents. Thanks to the Internet, we can contact our customers or suppliers quickly and very easily. We are also able to communicate the most recent information about the firm and its new products fast. The second factor, which was treated with more caution, was a potential low operating cost.

ASSUMPTIONS (4)

• The next question concerned the problem of safety of the firm's data after connecting it to the global net. The question was meant to check what types of security solutions are appreciated the most by business people:
• specialist software,
• public and private keys,
• certificates,
• authentication,
• electronic signature.

• Safety of data in the Internet is currently one of the most important problems. The fact that a computer or the whole intranet is connected to the Internet – a vast network of hundreds of millions of computers and users – makes it susceptible to computer viruses, as well as destruction, loss or disclosure of unsecured data. When the problem became common, installation of specialist software (firewalls) preventing unauthorised access to the firm's computer system became equally common. Every firm which offers its services in the net to individual customers uses some kind of protection. Usually it is ordinary authentication and SSL protocol. Recently, a law on the electronic signature has been adopted in Poland, but detailed regulations are not ready yet.

ASSUMPTIONS (5)

• The last issue discussed in the questionnaire concerned the methods of payment preferred by business people who buy things in the Internet:
• by bank card,
• by postal order,
• on delivery.

• Some earlier studies confirmed that these three simplest methods of payment are currently the reality of the Polish Internet. The market of Internet payments will be changing rather slowly. The number of credit card users is constantly growing, but they do not constitute a big percentage of those who make payments in the Internet in Poland.

ANALYSIS OF THE SURVEY RESULTS (1)

• Nearly 95% (90%) of the respondents also declare using Internet news services as a source of information. Surprisingly, e-banking was ranked third.
• Over 65% (60%) of the respondents declared that they use this service more frequently than Internet newspapers and magazines, which are reviewed by only 48% (56%) of the respondents. At least partly, such a high percentage of e-banking users must be a result of the advertising campaign conducted over the last few years and the fact that the users benefit more from such accounts than from traditional bank accounts, or at least it seems so at the first glance.
• The fact that one in three respondents (25%) declare using job agency services and trainings provided in the Internet is equally surprising. Furthermore, the percentage of firms that use e-commerce is also surprisingly high, even as compared with the previous surveys.
• Most of them probably buy in the Internet rather than sell their products there, nevertheless as many as 36% (44%) of the firms declare that they have bought or sold something through the Internet.
• Also, some companies have apparently started using the services of Internet brokerage houses (previously 0%). It seems that previously the problem lied in the very fact of purchase of bonds rather than in using the Internet for this purpose. This percentage is still quite low, because small and medium companies do not have big capital and therefore try not to freeze it in long-term transactions.

## INTERNET SERVICES USED BY SMEs
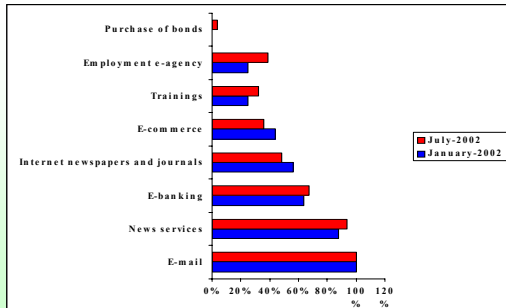
ANALYSIS OF THE SURVEY RESULTS (2)

- As far as using the Internet in the firm's operations is concerned, as many as 90% (92%) of the respondents use the Internet to contact their customers and suppliers and to advertise their firm on a wider scale.
- Fewer - 76% (80%) admit that they promote their products and services on websites. It is a common use of websites. In most companies, particularly small ones, the only purpose of the website is to provide information. Additionally, it may offer a possibility of contacting the employees or the owner of the firm or help to send an inquiry about a product.
- Using the Internet for the purposes of business in the strict sense, e.g. for on-line sales, is much less common. Over half of the respondents - 52% (48%) - are engaged in such activity, but it is still not much. A certain inconsistency can be observed here, as this percentage is higher than the percentage of those who admit to being involved in e-commerce.

## USE OF THE INTERNET IN FIRM'S OPERATIONS
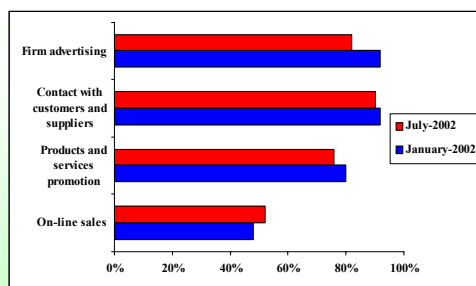
ANALYSIS OF THE SURVEY RESULTS (3)

- All respondents believe that the basic form of e-marketing is a webpage promoting the services and products offered by a firm – 100% of the answers. Nearly 90% (84%) of the respondents believe that using e-mail for the purposes of promotion is an equally good solution. 60% (56%) advertise on the websites of news services and less than half – 40% (48%) use advertising banners.
- Only 8% (4%) of the firms declare that they do not carry out any marketing activity in the Internet. Therefore, it seems that for them the only purpose of having a webpage (they declare having one) is to present the firm and perhaps its products. Such firms do not use the Internet actively for marketing purposes. The percentage of those who do not use the Internet for marketing purposes is growing systematically and fast, which is consistent with the global trends among medium and small enterprises.

MARKETING SOLUTIONS USED BY SMEs
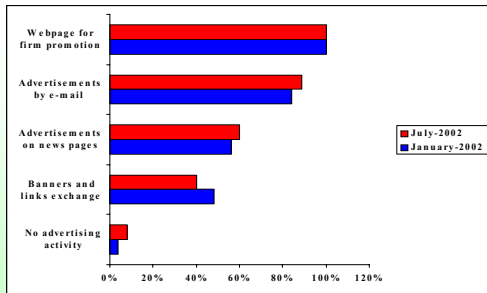
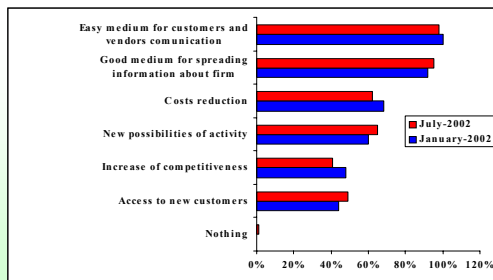Witold Chmielarz: Management Department Warsaw University   169

ANALYSIS OF THE SURVEY RESULTS (4)

- A firm can benefit from using the Internet for business in a number of different ways. None of the respondents has any doubts about it. All respondents appreciate the speed and convenience of Internet communication. They also consider the Internet a very good medium for spreading information about the firm and its products: it is fast, easy to use and, first and foremost, has a wide reach.
- Approximately 65% (68%) of the respondents believe that the Internet reduces the costs that a firm would normally incur using traditional means of communication, advertising or information. 49% (44%) declare that they have found new customers thanks to the Internet and even more say that the competitiveness of their firms has increased. For over half of the respondents the Internet means new opportunities – new customers, new markets. Lower costs are only a part of these opportunities

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BENEFITS FOR FIRMS ARISING FROM THE USE OF THE INTERNET

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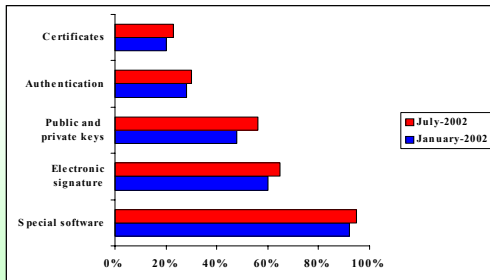
ANALYSIS OF THE SURVEY RESULTS (5)

- As far as data security is concerned, a vast majority of the respondents – 95% (92%) believe that specialist software is the best solution.
- Over half - 56% (48%) consider public and private keys a good solution. Only 30% (28%) believe in authentication and even less – 23% (20%) believe in certificates.
- 65% (60%) of the firms participating in the survey trust the electronic signature. It creates good prospects for further and even faster development of e-commerce, e-banking, Internet brokerage houses or lease companies, which will use the electronic signature on a wide scale. This additional security will certainly increase credibility of such services and the new regulations that should come soon will increase the percentage of firms which trust such security devices.

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SECURITY SOLUTIONS USED TO PROTECT THE FIRMS' DATA IN THE INTERNET

Bar chart categories (top to bottom): Certificates, Authentication, Public and private keys, Electronic signature, Special software. X-axis: 0%, 20%, 40%, 60%, 80%, 100%. Legend: July-2002 (red), January-2002 (blue).
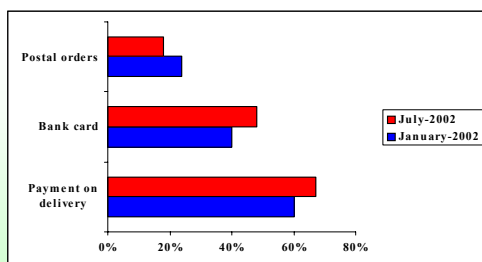

ANALYSIS OF THE SURVEY RESULTS (6)

- The last issue discussed in the survey was the methods of payment. Not surprisingly, two-thirds of the respondents – 67% (60%) say that they prefer payment on delivery. Shopping in the Internet is still treated with suspicion and the potential customers are afraid of losing money in uncertain deals.

- 48% (40%) of the firms declare that they can pay by bank card. This method is certainly convenient and fast, although still not very popular in Poland. However, its popularity is growing continuously. It certainly is one of the best and the most convenient methods of payment, provided that we know what we pay for and trust the Internet shop.

- Only 18% (24%) of the firms indicated postal order as their preferred method of payment. It is associated with the same doubts as the two methods discussed above and at the same time is more time-consuming, while in the respondents' opinion one of the most important benefits of buying in the Internet is that it is time-saving.

THE METHODS OF PAYMENT PREFFERED FOR INTERNET SHOPPING

Bar chart categories (top to bottom): Postal orders, Bank card, Payment on delivery. X-axis: 0%, 20%, 40%, 60%, 80%. Legend: July-2002 (red), January-2002 (blue).

CONCLUSIONS AND FUTURE DEVELOPMENT (1)

- Small and medium enterprises probably know how to use the Internet for their purposes and are not afraid of taking advantage of the new opportunities it offers. Their opinion on the Internet is certainly positive and they have considerable hopes for the future associated with this market. Another positive sign is that the firms are not afraid of the new opportunities, but, on the contrary, look forward to them. The fact that over 60% of the respondents already believe in the security offered by the electronic signature and will probably use it allows us to hope that these firms will soon participate in the development of new Internet services.
- However, it should be remembered that the firms participating in this survey already have access to the global net and use it in one way or another. The answers have been provided by the analysis discussed above. Obviously, it has not provided an answer to the question about the scale of using Internet by these companies or about the quality of their webpages, customer service and promotion of products and services.

CONCLUSIONS AND FUTURE DEVELOPMENT (2)

- We should also remember about the firms that did not respond to the questionnaire. Their situation cannot be as good as that emerging from the survey results.
- The survey results allow us to hope that once a firm is connected to the net and gains confidence in it, it will be able to function on the Internet market. Moreover, as the trust in transactions concluded in the net grows, the firms will start to use the opportunities offered by the Internet on a wider scale.
- The firms that have come to believe in the Internet are able to use it, even if to a limited extent only. However, it should be noted that Poland is only now entering the global computer network and the market it has created.
- It is rather disappointing that a large number of firms ignored the survey. Apart from a general negative attitude to such surveys and fear of losing anonymity (which almost certainly is connected with a lack of any activity in the Internet on a larger scale), there might be one more reason for the failure of some respondents to send their responses: they were not interested in the subject or simply unable to complete the questionnaire satisfactorily.

CONCLUSIONS AND FUTURE DEVELOPMENT (3)

- Some of the firms which have access to the Internet use it only when it is necessary, e.g. to send documents to the Social Insurance Institution (ZUS). Such firms do not use the Internet in their operations, but only to retrieve information, communicate by e-mail and load down files and programmes. For most of them, on-line sales or using e-banking and financial services is associated with a too big financial risk.
- Other important factors include insufficient quality of connections and insufficient knowledge about the Internet. Small firms believe that it is useful for big corporations and do not find it reasonable to invest in this communication medium, particularly as, during the creeping economic crisis, it is often a too big expense.
- The respondents who use the Internet daily see it as the future of their firms and notice its hidden economic potential. This attitude will certainly help in the development of the Internet in Poland. Most firms which have access to the net believe that it will soon be difficult to carry out business and maintain the firm's image without the Internet.

Thank you for your attention!

Witold Chmielarz
Management Faculty of Warsaw University

e-Banking

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e-Banking

e-Banking - form of bank services to facilitate access to customers's account with computer or the other electronic devices and connections

(Council of e-Banking)

Complex of information systems for maintenance:

- home and office banking
- tele-banking
- credit cards
- automatic teller machines ATM
- virtual transactions.

(Janc, Kotlinski)

Electronic net and information bank systems usage for client's convenience (in the point of customer-bank contact) in tradictional and modern payment systems.

The ultimate purpose is creation bank-accounting system without the paper

(Chmielarz)

e-Banking

- **Electronic banking (cyberbanking) – includes various banking activities conducted from home, business, or on the road, instead of at physical bank location.**
- **E-banking – has capabilities ranging from paying bills to securing a loan electronically**
- **It started with the use of propriety software and private networks but was not particularly popular until the emergence of the Internet**
- **Allows customers to access their accounts and execute orders through a simple-to-use Web site**
- **It is inexpensive alternative to branch banking and a chance to enlist remote customers**

(Turban)

Some of the advanteges:

- **Get current account balances at any time – you can easily check the status of your checking, savings, and money market accounts**
- **Obtain charge and credit card statements – you can even set up your account to pay off cards automatically every month**
- **Pay bills – electronic payments from your accounts are normally credited the same day or the next. The cost of paying bills electronically may well be less than the postage involved in sending out a large number of payments each month**
- **Download account transactions – it's easy to import them directly with the money transfer system**
- **Transfer money between accounts**
- **Balance your accounts –**
- **Send e-mail to your bank**
- **A new meaning for „banker's hours" – in any time, any place**
- **Handle your finances when traveling**
- **Additional services – for example free phone banking**
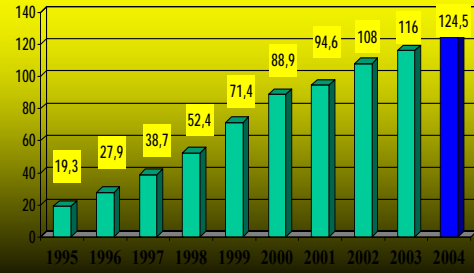
Internet-banking: part of e-Banking services realized only by Internet

Virtual banking: part od e-banking realized ONLY and EXCLUSIVELY by net (maybe Internet, too)
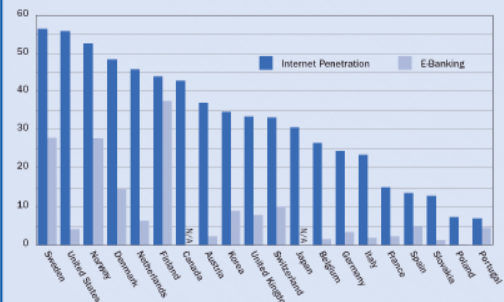
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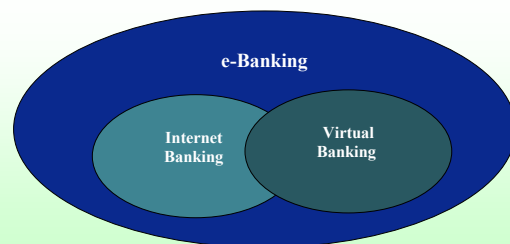
e-Banking =
home-banking+
office-banking+
selfbanking+
interbanking+
POS (point of sales)+
finance transfere nets+
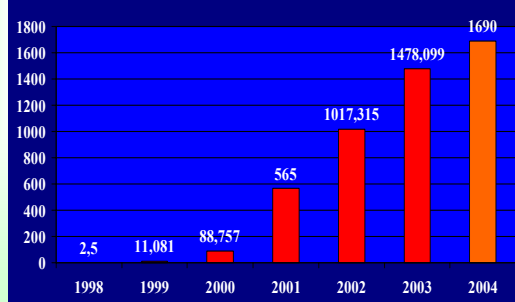**e-Payments**

Number of POS in Poland (th)

Internet Penetration and E-Banking
(% of total population)

Source: Financial Market Trends No. 81 Volume 2002 Issue 1, OECD, Paris, 2002.

Individual e-Banking client numbers in Poland (th)

Costs of bank transactions via different channels of distributions

Channel	Unit cost of transaction (US$)
Traditional bank branch	1,07
Telephone	0,54
Automated teller machine	0,27
e-Banking	0,015
Internet banking	0,01

Internet transaction cost = 1 cent

It is 107 times less than in traditional bank branch

CASE: THE COMPARISON AND ANALYSIS OF E-BANKING SERVICES FOR CORPORATE CLIENTS

Witold CHMIELARZ

Management Faculty Warsaw University

SUMMARY

The main idea of this paper is to analyse the use of e-banking services by small and medium enterprises in Poland in 2003. First, the market of e-banking services for small enterprises in Poland is described. Next, the e-banking offers of seven selected banks are compared. Finally, conclusions are drawn from this comparison.

RESEARCH ORGANIZATION

- First, the market of e-banking services for small enterprises in Poland is described on the example of selected banks, which were the most popular among corporate clients in 2002,
- Subsequently, the necessary criteria of comparison of different e-banking systems are discussed,
- As the next step, the scoring method used for all the criteria is described,
- e-Banking offers of seven selected banks are compared on the basis of the economic and functional criteria,
- A conclusion of the performed analyses is presented

E-BANKING OFFERS CAN BE DIVIDED INTO
(FORM CRITERIA):

- A virtual branch – access to e-account – a client who wants to have access to his account through the Internet must open a new account even if he already has a traditional account in the same bank,
- e-Account – a client does not have to open a new account; he gets an additional electronic access channel to his account with a quantum of services offered,
- A virtual bank – a bank offering on-line accounts only (usually Internet accounts), with no branches – clients have access to their accounts through electronic channels only; they can also contact the bank by telephone, e-mail or post.

E-BANKING IS DIVIDED INTO:
(BY TYPE OF CLIENT)

- Retail/home-banking – the system of providing services to retail clients at their place of residence, allowing them to perform certain financial operations with the use of a home computer;

- Office/corporate-banking – the system of providing services to corporate clients allowing mutual exchange of information and financial operations between banks and enterprises.

BANKS OFFER INTERNET ACCOUNTS

Bank	Product/ account
BPH PBK S.A.	Sez@m
Bank Zachodni WBK S.A.	BZWBK24
ING Bank Śląski S.A.	ING BankOnLine
Citibank	CitiDirect
Kredyt Bank	IKD
MultiBank	Business Class *
mBank	mBIZNES Konto*

BPH PBK Sez@m Biznes allows to:

- place domestic and international money transfer orders,
- pay social security contributions (ZUS) by money transfer,
- open term deposits,
- apply for an overdraft or for a change of the amount of overdraft,
- apply for bank cards,
- block bank cards,
- order and block cheque forms,
- receive information about current account balances and turnover,
- receive account statements,
- send correspondence to the Bank,
- print confirmations of the operations.

CRITERIA OF EVALUATION OF E-BANKING SERVICES

- **Technological criteria** (hardware and software requirements, security)
- **Economic criteria** (monthly fee for maintaining the account, fee for using the access channels, costs associated with making deposits/withdrawals and transfers, costs of issue and use of charge cards and time: a client needs less time to use bank services and less time is needed for processing),
- **Psychological criteria** (confidence in the system – the feeling of safety, comfort of work – the place and time of operations)
- **Organisational criteria** (organisation of the work of banks and their opening hours)
- **Functional criteria** - concern the range of operations available within a given e-banking system and the functionality of a system depends mainly on the number of operations available within that system

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COMPARISON AND ANALYSIS OF E-BANKING SERVICES OFFERED BY POLISH BANKS TO CORPORATE CLIENTS

- **Economic criteria (costs):**
- **Fees for maintaining business accounts**
- **Fees for using different access channels**
- **Charge cards for owners of small and medium enterprises**
- **Costs of internal and external transfers by telephone and Internet in different banks**
- **Costs of standing orders and payment orders by telephone and Internet in different banks**

- **Functional criteria – mentioned below**

VALUATION SYSTEM

In order to achieve comparability of the costs and the functional criteria of evaluation, different costs of the services discussed here have been assigned different scores:

- „1" - for the lowest cost of a given service,
- „0.5" - for the average cost of a given service,
- „0" - if the service is not offered of the cost is the highest

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SCORES OBTAINED BY THE SELECTED BANKS FOR DIFFERENT ECONOMIC CRITERIA

Bank	Economic criteria							
	Interest	Fees for maintaining accounts	Access channels	Transfers	Standing orders	Cards	ATMs	Total
BPH PBK	0.5	0.5	1	0.5	1	1	0.5	5
BZ WBK	0	0	0.5	0.5	0	0.5	0	1.5
Citibank Handlowy	0	0.5	1	0	0	1	1	3.5
ING Bank Śląski	0	0	1	0	0	0.5	0	1.5
Kredyt Bank	0.5	0	1	1	0.5	0	0	3
MultiBank	1	1	1	0.5	0.5	0.5	0.5	5
mBank	1	1	1	0.5	0	0.5	0.5	4.5

RESULTS:

- A comparison of the offers of the banks discussed here reveals that, as far as the economic criteria are concerned, BPH PBK and Multibank obtained the highest scores: an account with one of these banks is the most economic choice.
- The next position is occupied by mBank with the score of 4.5. Other banks obtained scores from 1.5 to 3.5.
- From the economic point of view, the accounts with BZ WBK and ING Bank Śląski are the worst options (both obtained 1.5 points).
- The offers of the seven banks discussed here will be compared with regard to the functional criteria on the basis of the services available through electronic channels.

Comparison with regard to the functional criteria

Functional criteria	BPH PBK	BZ WBK	Citibank Handlowy	ING Bank Śląski	Kredyt Bank	MultiBank	mBank
Bank orders:							
Domestic transfers to be executed at once	1	1	0.5	0.5	1	0	0
Domestic transfers to be executed in the future	0	1	1	1	1	1	1
Foreign transfers	1	0	0	0	0	1	0
Payment of social insurance contributions (ZUS)	1	1	0	1	1	1	1
Making/ withdrawal of deposits	1	1	0.5	1	1	1	0.5
Requests for bank cards/ cheques	1	1	1	1	1	1	1
Blocking of bank cards/ cheques	1	0.5	0.5	1	0.5	0.5	0.5
Information from the bank about:							
Balance and current operations	1	1	1	1	1	1	1
Balance and archival operations	1	1	1	0.5	1	1	1
Foreign exchange rates	1	1	1	1	1	1	1
Cooperation with external applications							
Data import	0	0	1	0	1	0	0
Data export	0	0	1	0	0	0	0
Other:							
Correspondence with the bank	1	1	1	1	1	1	1
Defining of a list of recipients	0.5	1	1	1	1	1	1
Change of access password/ PIN	1	1	1	1	0.5	0.5	0.5
Demo version	1	1	1	1	0	1	1
Total	12.5	12.5	12.5	12	11	12	10.5

Results:

- The total scores obtained by the selected banks for the functional criteria range from 10.5 to 12.5.
- The fact that the differences are so small may indicate a wide range of services available to the clients of these banks through the Internet or telephone.
- The functional criteria are very important for the clients, who will certainly try to choose the bank that offers the widest range of such services.
- As shown in the table, three banks obtained the same score (the highest): BPH PBK, BZ WBK and Citibank.
- ING Bank Śląski and Multibank occupy the second position with the score lower by 0.5 points only.
- They are followed by Kredyt Bank (11 points) and mBank (the lowest score: 10.5 points).

SUMMARY OF THE COMPARISONS

Criteria	BPH PBK	BZ WBK	Citibank Handlowy	ING Bank Śląski	Kredyt Bank	Multibank	mBank
Economic	5	1.5	3.5	1.5	3.5	5	4.5
Functional	12.5	12.5	12.5	12	11	12	10.5
Total	17.5	14	16	13.5	14.5	17	15

- All banks have scores between 13.5 and 17.5.
- BPH PBK obtained the highest total score (it occupied the first position with regard to both the economic and the functional criteria), followed by Multibank with the total score by 0.5 points lower.
- Citibank lost one point to Multibank and took the third position.
- ING Bank Śląski obtained the lowest score, despite the big number of points earned for the functional criteria.
- Its last position in the economic ranking (ex-equo with BZ WBK) was critical for the total score.

CONCLUSIONS

- As far as the economic criteria are concerned, three banks: BPH PBK, Multibank and mBank obtained the highest scores. In this ranking, based primarily on the costs incurred by corporate clients for maintaining an account and using the services available with that account, the offers of BZ WBK and ING Bank Śląski obtained the lowest scores (0 points for most of the analysed criteria). The analysis of the banks' offers with regard to the functional criteria shows that the range of services available through the Internet or by telephone is very similar in all banks. All banks obtained from 10.5 to 12.5 points and three of them: BPH PBK, BZ WBK and Citibank had the same score: 12.5.

- After summing up the points earned by each bank in both categories, it appears that BPH PBK obtained the highest score: 17.5 (it occupied the first position with regard to both the functional and the economic criteria).
- The second position in the general classification is occupied by Multibank with a score by 0.5 lower.
- The last position is occupied by ING Bank Śląski, whose Internet accounts for small and medium enterprises are the most expensive. This bank remained on the last position despite the wide range of the services offered.

THANK YOU FOR YOUR ATTENTION!

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