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Prezentace předmětu:  
**INFORMATION MANAGEMENT**

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# INFORMATION MANAGEMENT

## 2. DATA, INFORMATION, AND KNOWLEDGE



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# Introduction

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**Data, information, and knowledge affect the lives of all of us, whether it's day-to-day activities or work activities. This is because we live in the information society, where information has become one of the key sources of each organization.**

**This chapter deals primarily with the relationship of data, information, and knowledge. Information literacy, asymmetry of information, complete and perfect information will also be mentioned.**



# Goals of the chapter

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- ✓ **Define and learn to recognize the differences between data, information, and knowledge**
  - ✓ **Indicate what information literacy is**
  - ✓ **Inform the reader about what information literacy requirements are**
  - ✓ **Clarify the concept of information asymmetry and occurrence in the real world**
  - ✓ **Define complete and perfect information**
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# Data vs Information vs Knowledge

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**What is the relationship between data, information, and knowledge?**

**Normally, this li-near chain is commonly referred to in the literature:**

**data -> information -> knowledge.**

**Information is thus generated from the data, and it is then possible to obtain and derive knowledge from the information.**

**Further, all the above terms will be defined in more detail in the presentation.**

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# Data

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**Data, in general, represent the reflection of certain phenomena, processes or properties within a real-world part. It is, therefore, the expression of certain facts and thoughts in the prescribed form so that they can be transferred and processed.**

**According to Vaňek (2013), data objects can be symbolic, manuscripts, forms, production documentation, computer files, visual (visual), technical drawings and diagrams, artworks, technical means, acoustic, works, speech records.**

**Doucek (2010) states that data is a formalized record of human knowledge by means of symbols (characters). According to Sklenák (2001), data is the basic raw material from which information can arise. The meaningful information then arises in the process of human interpretation.**

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# Data

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In the context of information technology, data can be defined as a composite designation for numbers, text, sound, images and any other perceptions in a format that can be processed by computer and are an inherent element of an enterprise information system.

Data is obtained by writing, measuring, or observing, and can be divided into continuous and attributable data. The data is primarily used for the following activities: calculations analyzes and planning. The data can also be generated automatically as output from different sensors or other devices recording the measured data.

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**One of the basic breakdowns divides the data into the following groups:**

- ❑ Quantitative - these are the numerical characteristics of the observed phenomenon (eg price, quantity, temperature, etc.), sometimes the term "hard" is used**
- ❑ Qualitative - these are the non-numerical characteristics of the observed phenomenon (eg, customer satisfaction with the product or service), sometimes the term "soft" data**

**Qualitative data is broken down as follows:**

- nominal variables**
  - ordinal variables**
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# Data

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**Nominal data - two values of a nominal variable can be said to be identical or different (eg manufacturer, model, type ...)**

**Ordinary data - as nominal, in addition to two values of the ordinal variable, we can determine the order (eg customer satisfaction rate, product quality evaluation ...)**

**Quantitative data is broken down as follows:**

- **Differential variables**
- **Ratio variables**

**Differential (interval) - as ordinal, in addition, it can be determined how much one value is greater than the other one.**

**Ratio - as a difference, you can also calculate how many times one value is greater than the second.**

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# Data

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According to Sklenák (2011), the following can be distinguished from the point of view of the data:

- ❑ **Structured data** - explicitly capture facts, attributes, objects, etc. The existence of certain data elements is an important feature. A typical example is data storage using relational database systems, where elements such as fields, records, sessions, databases are used. In this way, only those data that are necessary for solving information needs and solutions to decision-making problems can be selected.
  - ❑ **Unstructured data** - expressed as "by-pass flow" without any further resolution, for example video, sound recordings or pictures. Also included are text documents.
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# Data

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According to Sklenák (2011), the data is actually a "raw material" from which information can be generated. For example, data "4564135" or "Porthos" certainly represent some-thing real from the outside world, but without any further description or context makes no sense.



# Information

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**Information is the result of data processing. Without data, no information could be generated.**

**In conjunction with the data, the word "information" can be defined as data that is used to create a meaningful and useful context and can be used in the decision-making process.**

**The information thus becomes processed data, which the user attributes to a particular meaning, which satisfies the specific information needs of the given recipient.**

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# Information

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**The basic conditions for the usability of the information are the following assumptions:**

- communicability of information - the possibility of disseminating knowledge through transmission channels,**
  - clarity - encoding knowledge into the language known to the recipient,**
  - novelty,**
  - reducing uncertainty in the decision-making process,**
  - usability for knowledge and decision making by explaining the meaning.**
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# Information

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The main features (attributes) of information include:

- the inseparability of information from the physical carrier,
  - aging - it ages not over time, but with newer, more relevant,
  - cumulative - creating new information will not destroy old,
  - utility value,
  - accuracy, truthfulness - number of errors or data storage errors,
  - accessibility - the ease and speed of obtaining,
  - flexibility - usability for more than one user;
  - relevance, which is characterized by its fullness, completeness,
  - clarity - degree of ambiguity and ambiguity,
  - verifiability
  - descriptive (identifying) attributes.
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# Information

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Some properties of the information are quantifiable according to Vaněk (2013) (accuracy, truthfulness, accessibility, speed, flexibility, dispersion).

Some attributes can not be quantified (relevance, clarity, verifiability).

- relevant - relate to the problem,
  - valid - they express what they have (do not show any system errors);
  - reliable - getting them by the same methods always results (they do not show any random errors),
  - fast enough and cost-effective - the most important information is current.
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# Information

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Within the theory of information, we often encounter the following terms: syntax, semantics, and pragmatics. According to Doucek (2010), these terms can be defined as follows:

- ❑ The syntax is given by the rules for creating formal structures, and in the broader sense, it includes not only the traditional "grammar" (sentence composition) but also the shared form of writing and encoding of symbols.
  - ❑ Semantics relates to the relationship of symbols and designated reality, thus all-owing symbols or their structures to attribute content. At this level, we talk about messages or messages that contain information.
  - ❑ Pragmatics refers to the relationship between the symbols and the recipient and, in a particular situation, guides his / her actions. It is only at this level that information gains importance and influences **human thinking and action.**
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# Knowledge

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**Knowledge is, according to Doucek (2010), an individual character. It is primarily bound to the individual and its nervous system. There is nothing to do with the fact that its shaping, transmission, and codification are influenced by the social (culturally).**

**Knowledge is an organized pattern of human knowledge that results from self-organization of the nervous system.**

**The concept of knowledge can be characterized as a certain ability or information on how to use data and information in different situations.**

**Its formally expressed form uses language, or symbols, which then form partial knowledge. It is stored as data that is then individually interpreted by individuals as information.**

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# Knowledge

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Knowledge can also be defined as interconnected structures of related knowledge and their representation in the form of a cognitive model, together with the ability to perform various cognitive operations with them.

Thanks to these operations, we can partly predict what can happen in the real world. (Sklenák, 2001)



# Knowledge

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There are different concepts of knowledge and sharing.

Knowledge	Individual	Shared
explicit	presented using language and symbols	communicated in the company or embedded in the used models
implicit	the self-organizing process of the nervous system forming patterns	various aspects affecting communication, including information technology

Table 1: Different concepts of knowledge and their sharing

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# Knowledge

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According to Ivánek, Kempný, and Laš (2007), the knowledge engineering is applied in the field of artificial intelligence, which deals with the acquisition, processing, representation and automated use of knowledge.

Knowledge engineering can also be defined in the context of information engineering, a discipline dealing with the processing of information in a usable form.

Knowledge engineering is then divided as part of information engineering, focusing on information on how to reach new information, ie information on the judgment in specific situations. The practical result of knowledge engineering is expert systems, which are programs that provide knowledge-based conclusions.

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# Information literacy

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**Information literacy together with financial literacy is one of the basic prerequisites for orienting itself in today's dynamic world.**

**Information literacy is, according to Vaněk (2013), able to process and use information in different formats, from different sources and the ability to understand them. The information is presented in the present environment mainly in electronic form, through information and communication technologies.**

**Information literacy involves several steps, namely the ability to identify the problem, understand and formulate questions whose answers can lead to a solution.**

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# Information literacy

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According to Vaněk (2013), information literacy requires meeting the following requirements:

- identify problems, define them and identify issues that require a child response,
  - identify the circles of information that needs to be found for problem-solving,
  - find the required information,
  - evaluate, filter, analyze, and synthesize information,
  - share and transfer information,
  - present information.
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# Information literacy

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**The big problem today is that data and information are growing faster and in larger volumes.**

**This state of affairs generates more often in people so-called informational congestion, which expresses situations in which an individual can not effectively deal with information because information is surplus and unable to process it in adequate time.**

**Everything is due to the limited possibilities for people to find, process and understand information.**

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# Information literacy

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The notion of information concealment was mentioned in the 1960s when Miller (1960) defined seven different categories of information congestion.

- deletion, oversight - inability to process some suggestions,
  - error - some information is not processed correctly,
  - sorting into queues, sequencing - processing of some information is postponed, they will be processed later,
  - filtering - processing only the information that appears to be the highest priority,
  - zooming in - lowering discrimination standards by reducing accuracy in input and response evaluation,
  - multiple channels - split incoming information into parts to divide responses,
  - escape - complete ignoring incoming information.
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# Information literacy

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There are many causes of information overflow. The most common are, for example, according to Vaněk (2013) the following causes:

- ❑ the increasing amount of information we sometimes call the information explosion is not just about data volumes, but also about the number of sources where the data is,
  - ❑ problems with sorting information and assessing to what extent the information is useful,
  - ❑ verification of information as the availability of information sources has increased and not every source is able to provide true, accurate or verifiable information,
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# Information literacy

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- the accuracy of the results obtained and timeliness can be assessed from the point of view of the user himself/herself, from the point of view of the capabilities of the information system used, sources of inaccurate information may be obsolete or inconsistent databases,
  - lack of information literacy,
  - communication.
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# Asymmetry of information

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The concept of asymmetry occurs in several areas. This term is often used by economists (asymmetry of information), computer science (asymmetric encryption), as well as military strategists (asymmetric war). The word asymmetry in simple terms then means non-symmetry and is, therefore, the opposite of symmetry and therefore symmetry.

A large economic encyclopedia (Žák, 2002) defines asymmetric information as "an economic situation in which economic negotiators (eg sellers and buyers) have different information. Asymmetric information thus becomes (together with the existence of mono-poly, externalities and public goods) one of the causes of market failure".

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# Asymmetry of information

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A widely concept of asymmetric information such as market failure along with imperfect information is also the Economic Dictionary (Hindls, Holman and Hron, 2003).

Vaněk (2013) states that the notion of information asymmetry means that one party to the transaction is better informed than the other (the counterparty). It follows from this definition that one party or participant has more information, has different or better information. In practice, this leads to a growing degree of uncertainty in decision-making.

This uncertainty results from the fact that decision-makers often do not have complete information about the situation they are addressing because they do not know the detailed characteristics of all the other participants in the transaction, they do not have information about the results of previous transactions, or know all possible alternatives to a possible procedure at a given moment.

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# Asymmetry of information

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Information asymmetry is one of the causes of market imbalances. The modern concept of asymmetry of information emphasizes the fact that our information on the current state of the markets is imperfect and, in particular, that the various market players differ significantly in the quality of their information, which has serious consequences for the behavior of these markets. Using asymmetric information, it is possible to explain the behavior of economic subjects in such phenomena as negative selection, moral hazard or the preference of existing conditions.

It is perhaps a little surprising that the asymmetry of information is happening nowadays, despite the general availability of modern technologies that allow rapid transfer of information. Although it is possible to trace information, it is not always possible to do so in a very short time and there is always a risk that the information will not be up to date.

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# Asymmetry of information

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There are various causes of information asymmetry. One of the most important is the price of information because obtaining information requires some cost. The rationally behaving user then seeks to obtain as much information as possible so that the cost of obtaining them does not exceed the benefit of the information. Other factors contributing to the asymmetric distribution of information include, for example, cultural or religious differences in perceptions of information.

People and institutions have been using asymmetry of information for many centuries in various fields of human activity where it is necessary to gain an advantage over the other (politics, trade, war conflicts, gambling, etc.).

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# Asymmetry of information

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The information asymmetry is not always advantageous. There are also cases where it is not in the interest of a better-informed party to maintain too much asymmetry of information (eg improving market functioning, international cooperation, etc.).

In these cases, a better-informed party will share a piece of information to reduce or eliminate asymmetry of information. In addition to free sharing, there is also information disclosure required in order to reduce the informational asymmetry between market participants (eg, the reporting of market participants' reporting obligations as the mandatory scope of the business report).

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# Complete and perfect information

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We are talking about complete information according to Vaněk (2013), if all participants have the same information, including information about all the remaining participants.

The concept of complete information is often used, for example, in economics or game theory where complete information is one of the necessary theoretical preconditions for perfect competition.

We are talking about the perfect or perfect information if it provides the same level of information for all solutions to the problem. In the real world, most information is imperfect.

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